



# Linked Data: Metadata Schemata of the Music Scores of Jose Maceda Collection

Sonia M. Pascua

Faculty

University of the Philippines School of Library and  
Information Studies

[sonia@slis.upd.edu.ph](mailto:sonia@slis.upd.edu.ph), [smpascua@up.edu.ph](mailto:smpascua@up.edu.ph)

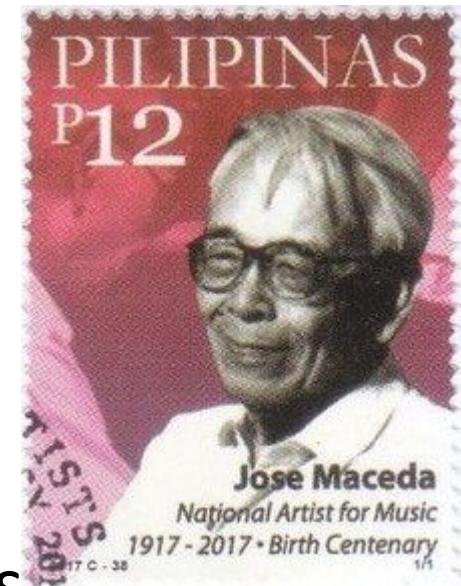


# Outline

- Jose Maceda
  - his collection
  - his compositions - Music Scores ;
- University of the Philippines Center for Ethnomusicology (UPCE)
- Motivation of the Study
- The Paper

# Jose Maceda

- Birth : January 31, 1917, Manila
- Death: May 5, 2004, Quezon City
- Philippine composer
- An ethnomusicologist



Ethnomusicology - a branch of musicology defined as "the study of social and cultural aspects of music and dance in local and global contexts."



# Jose Maceda Collection

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- Covers over sixty-eight ethno-linguistic groups in the country and parts of South East Asia reflecting the region's traditional music before many of the musical styles vanished, or substantially changed as a result of social change, modern civilization and cultural globalisation
- Is composed of over 10,000 field notes, pictures, recordings and his personal musical scores together with actual traditional musical instruments.

[http://portal.unesco.org/ci/en/ev.php-URL\\_ID=1538&URL\\_DO=DO\\_TOPIC&URL\\_SECTION=201.html](http://portal.unesco.org/ci/en/ev.php-URL_ID=1538&URL_DO=DO_TOPIC&URL_SECTION=201.html)



# Significance of the Collection

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- First countries in Asia to have a collection included in the [Memory of the World Register](#)
- It is a memorial of the orally transmitted cultural contributions to mankind
- The collection has been preserved
- However should be protected



# University of the Philippines Center for Ethnomusicology (UPCE)

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- Upon its inscription in the UNESCO Memory of the World Heritage
- The University of the Philippines Center for Ethnomusicology that houses the JMC was able to generate an initial allocation from the Philippine government to start implementation of its long-standing plan to rehabilitate and digitize the sound archive - which has reached the end of its analogue life-span and which is in an endangered state of deterioration
- However funds were not sufficient to cover the preservation and conservation of the collection



# Motivation of the Study

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- Application for OPEN GRANT
- To the Office of the Vice Chancellor for the Research and Development
- Title: A Multi-Disciplinal Research and Documentation on Multimedia Archiving for Heritage Conservation
- Requested by: Dr. Ramon P. Santos, Director of UPCE



# Project

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- Multi-Disciplinary
- Research
- Documentation
- Multimedia
- Archiving
  
- for Heritage Conservation

## Project – Multi - Disciplinal

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- Collaboration of different faculties of the University of the Philippines in sharing various expertise towards the formulation of the comprehensive body of technical knowledge and principles in heritage conservation.

## Project – Research

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- Study and exploration techniques and new strategies to be undertaken by multimedia practitioners and academic scientists based on existing collection of archival materials, towards a more efficient preservation, conservation and restoration of the multimedia archives.

# Project – Documentation

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- Recording, analysis and critical assessment of the findings and procedures in the course of the research.

## Project – Multimedia

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- Refers to the sound and visual/written materials as well as video data recorded on different platforms in both analogue and digital domains, stored, compiled and catalogued as materials for research and other academic and scholarly studies.



## Project – Archiving

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- Refers to storing and organization of original documents and raw data for safekeeping, preservation and preventive conservation.



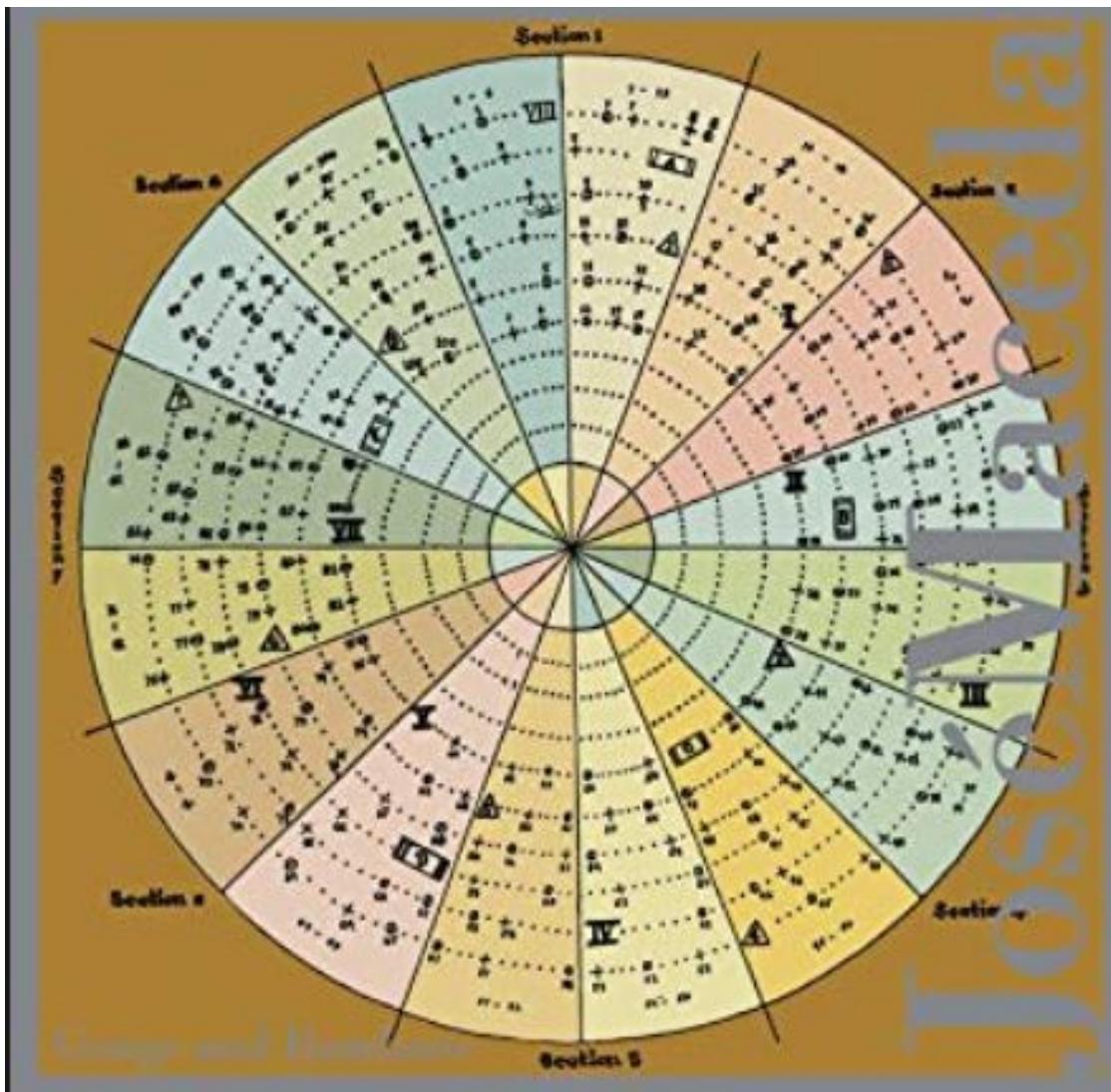
# Project – Aspects and Components

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1. Physical conservation
2. Physical restoration
3. Content Conservation
4. Content Restoration
5. Digitization
6. *Cataloguing*
7. *Taxonomy*
8. *Database / Presentation (user interface)*
9. *Storage – originals and duplicates*
10. Communication Planning and Dissemination



# Jose Maceda's Music Scores





## The Paper

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Linked Data: Metadata Schemata  
of the Music Scores of Jose  
Maceda Collection

## Background of the Study

With the ongoing digitization of JMC, it wherefore needs a structural framework to organize and classify digitally converted collections.

# Cataloguing and Databasing

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This study created a description of the data (Metadata) from the spreadsheet where Jose Maceda Music Scores description and index were stored

# Objectives of the study

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- To provide metadata schemata by defining the Jose Macea Collection (JMC) Music Scores Ontology (JMCMSO) and have a representation of the musical scores that is needed for the Jose Macea Compositions.
- To allow meaningful exploration of these scores as an item, its associations with other items, its properties as an item, and the links to the location of the actual item of the collection.
- To explore a solution to the problem of the current state of metadata-creation practices and the need to represent concepts in a computing medium and the web.



# Introduction

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Web Ontology as a representation for authoring knowledge databases is a known semantic for the web and is recommended for JMC's need for metadata schemata because it describes a common vocabulary for sharing knowledge in a particular domain which in JMC's case music domain.



# Ontology vs Taxonomy

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Taxonomy is usually used to a hierarchy or concepts (i.e. relation between the concepts is parent/child, or subClass/superClass, or broader/narrower)



# Ontology vs Taxonomy

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- While in an ontology, arbitrary complex relations between concepts can be expressed (X marriedTo Y; or A worksFor B; or C locatedIn D, etc )
- It organizes the collection too through categories while they are related to each other

# Ontology vs Taxonomy

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For this study, an ONTOLOGY is  
carried out...

JMCMOSO

**Jose Maceda Collection Music Score  
Ontology**



# Metadata

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- Dealing with data about other data, attributes and elements are necessary to describe the resource in question
- descriptive records for information resources for their effective retrieval and access
- meaning or semantics of the data.



## Metadata – Linkage

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- Elements may be contained in a record separate from the item (e.g. library's catalog)
- The metadata may be embedded in the resource itself (e.g. CatalogingInPublication)



## Metadata – Standards

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- With the information overload
- Metadata standards improve retrieval of relevant resources
- Enabled field-based searches
- Permitting indexing of non-textual objects
- Allow access to the surrogate content distinct from the access of the content of the resource itself.

# Metadata in Existing Library Standard

## Bibliographic Catalog

PQ English literature--Early modern, 1500-1700--  
History and criticism.

6277 O'Connor, John Joseph, 1918 (June 15)-

02 Amadis de Gaule and its influence on Elizabethan literature, by John J. O'Connor. New Brunswick, N. J., Rutgers University Press [1970]

ix, 308 p. facsimis. 25 cm. 9.00

Bibliography : p. 287-293.

1. Amadis de Gaula. 2. English literature—Early modern (to 1700)—History and criticism.

PQ6277.O2  
SBN 8135-0622-0

863'.2

76-96031  
MARC

Library of Congress

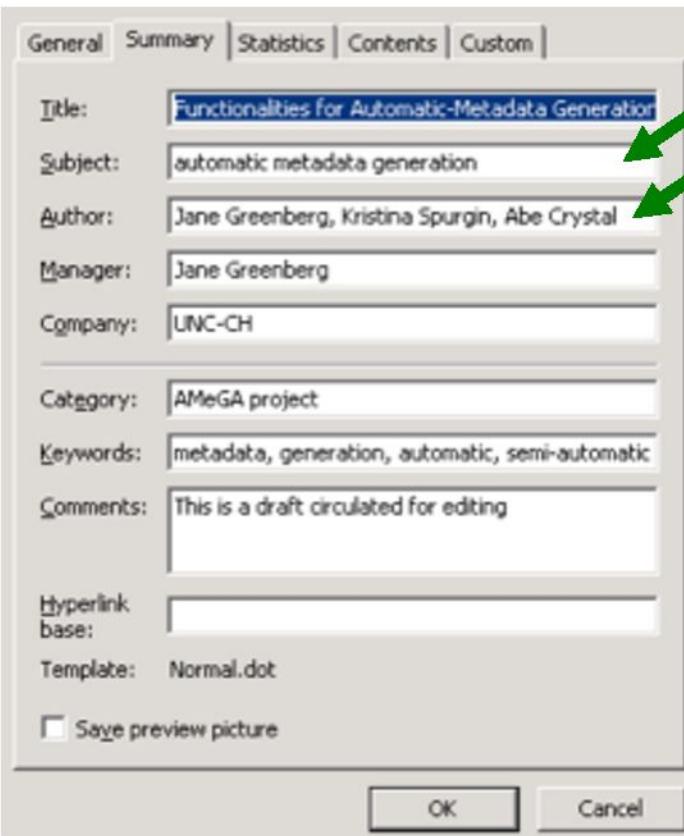
70 (4)

# Metadata Example for Specimen



<Species> Pinus  
serotina </Species>  
<Date.ID><scheme=S  
PEC.W3C  
DTF">1958-05-10  
</Date.ID>

# MS Word dialog box and output



```
xmlns:st1="urn:schemas-microsoft-com:office:smarttags"<o:DocumentProperties>
<o:Subject>automatic metadata generation</o:Subject>
<o:Author>Jane Greenberg, Kristina Spurgin, Abe Crystal</o:Author>
<o:Keywords>metadata, generation, automatic, semi-automatic</o:Keywords>
<o>Description>This is a draft circulated for editing</o>Description>
<o>LastAuthor>Kristina M Spurgin</o>LastAuthor>
<o:Revision>2</o:Revision>
<o>TotalTime>13</o>TotalTime>
<o>LastPrinted>2004-11-06T18:41:00Z</o>LastPrinted>
<o:Created>2004-11-12T16:50:00Z</o:Created>
<o>LastSaved>2004-11-12T16:50:00Z</o>LastSaved>
<o:Pages>1</o:Pages>
<o:Words>9160</o:Words>
<o:Characters>54690</o:Characters>
<o:Category>AMeGA project</o:Category>
<o:Manager>Jane Greenberg</o:Manager>
<o:Company>UNC-CH</o:Company>
```

# Existing Library Standard - Marc 21

## MARC Elements

245 14 †a The great cat massacre and other episodes in French cultural history / †c Robert Darnton.

250 ## †a 1st Vintage Books ed.

260 ## †a New York : †b Vintage Books, †c 1985.

300 ## †a xiii, 298 p. : †b ill. ; †c 21 cm.

504 ## †a Includes bibliographical references and index.

FIELD

TAG

INDICATOR

DELIMITER

SUBFIELD CODE

Zeroing in on ISBD description fields

# Metadata Schemata - Relational Databases

The diagram illustrates three relational tables connected by the common attribute **AuthorID**.

**PubID**      **Publisher**      **PubAddress**

PubID	Publisher	PubAddress
03-4472822	Random House	123 4th Street, New York
04-7733903	Wiley and Sons	45 Lincoln Blvd, Chicago
03-4859223	O'Reilly Press	77 Boston Ave, Cambridge
03-3920886	City Lights Books	99 Market, San Francisco

**AuthorID**      **AuthorName**      **AuthorBDay**

AuthorID	AuthorName	AuthorBDay
345-28-2938	Haile Selassie	14-Aug-92
392-48-9965	Joe Blow	14-Mar-15
454-22-4012	Sally Hemmings	12-Sept-70
663-59-1254	Hannah Arendt	12-Mar-06

**ISBN**      **AuthorID**      **PubID**      **Date**      **Title**

ISBN	AuthorID	PubID	Date	Title
1-34532-482-1	345-28-2938	03-4472822	1990	Cold Fusion for Dummies
1-38482-995-1	392-48-9965	04-7733903	1985	Macrame and Straw Tying
2-35921-499-4	454-22-4012	03-4859223	1952	Fluid Dynamics of Aquaducts
1-38278-293-4	663-59-1254	03-3920886	1967	Beads, Baskets & Revolution



# Metadata for Web - Linked Data

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- The information held within these databases is represented as web documents
- As such information extraction is of inverse process
- One is extracting the information out of the representation or description (OPAC in MARC 21 or in an RDA systems)



# Metadata for Web - Linked Data

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- However by making information explicit on the Web
- This loopy step is bypassed and directly make the actual information available
- This approach is also motivated by the fact that, even after running an information extraction process, we still need a way to make this information available explicitly in order for **machines** to be able to reuse it

# Web Evolution

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Web 0.0 - no Browser as an application to display, interpret and execute information; Desktop applications were used

# Web Evolution

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Web 0.0 - no **Browser** as an application to display, interpret and execute information; Desktop applications were used.

Web 1.0 - **Read Web**; when catalogs of an institutions, organizations, industries, companies and etc. were started to be shared through web pages / websites; Known as Static Web.



# Web Evolution

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Web 0.0 - no **Browser**

Web 1.0 - **Read Web**; Known as Static Web.

Web 2.0 - **Read / Write Web**; when interactivity was introduced; User started to make edits onto the web through blogging, uploading pictures, commenting, tagging and etc.

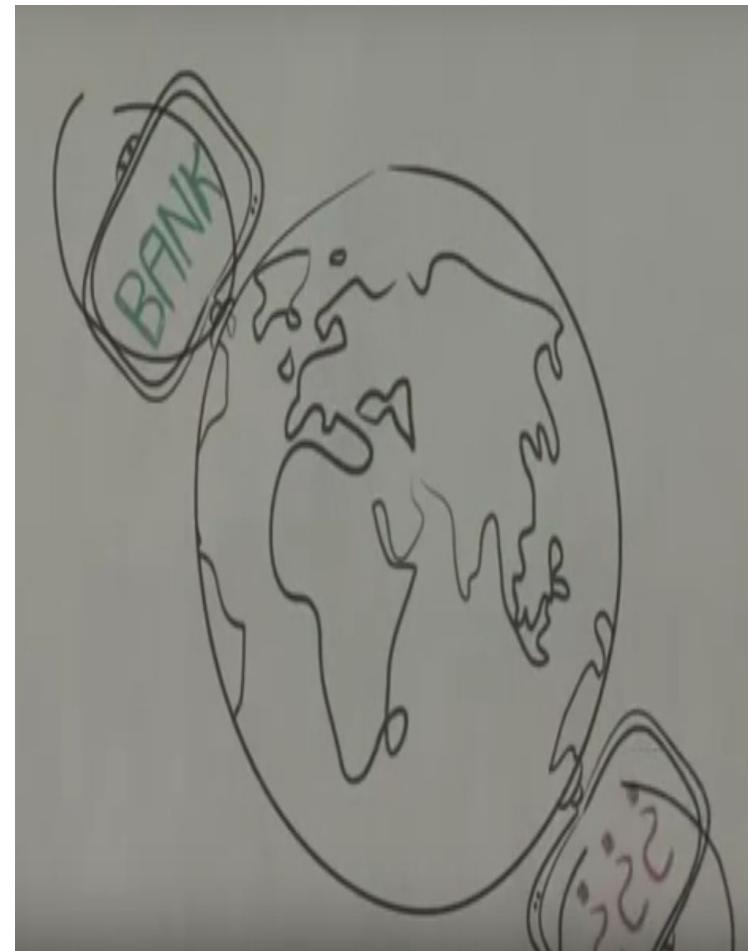
Web 3.0 - **Semantic Web**; putting intelligence to where? to what? --- to computer



# Web 3.0 - the challenge

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- How we can build definitions and descriptions that are understandable to computers?
- How we define uniquely each concept that would make consistent understanding to all computers



# Web 3.0 - Semantic Web - Linked Data

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In his TED talk in 2009 after 20 years passed of inventing the World Wide Web, Tim Berners-Lee introduced a project of open data for the web and reframe the way we use it together.

# Web 3.0 - Semantic Web - Linked Data

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Provides a machine readable vocabulary that allows compatibility with the World Wide Web (www) architecture.



## Linked Data - Union Database

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We do copylogging so that:

- we do not reinvent the wheel
- we have consistent definition
- we have unique definition
- we have correct and appropriate definition

all of these to have one understanding...

And that's definitely one of the goals of linked data...



## Linked Data - Union Database

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We do copylogging so that:

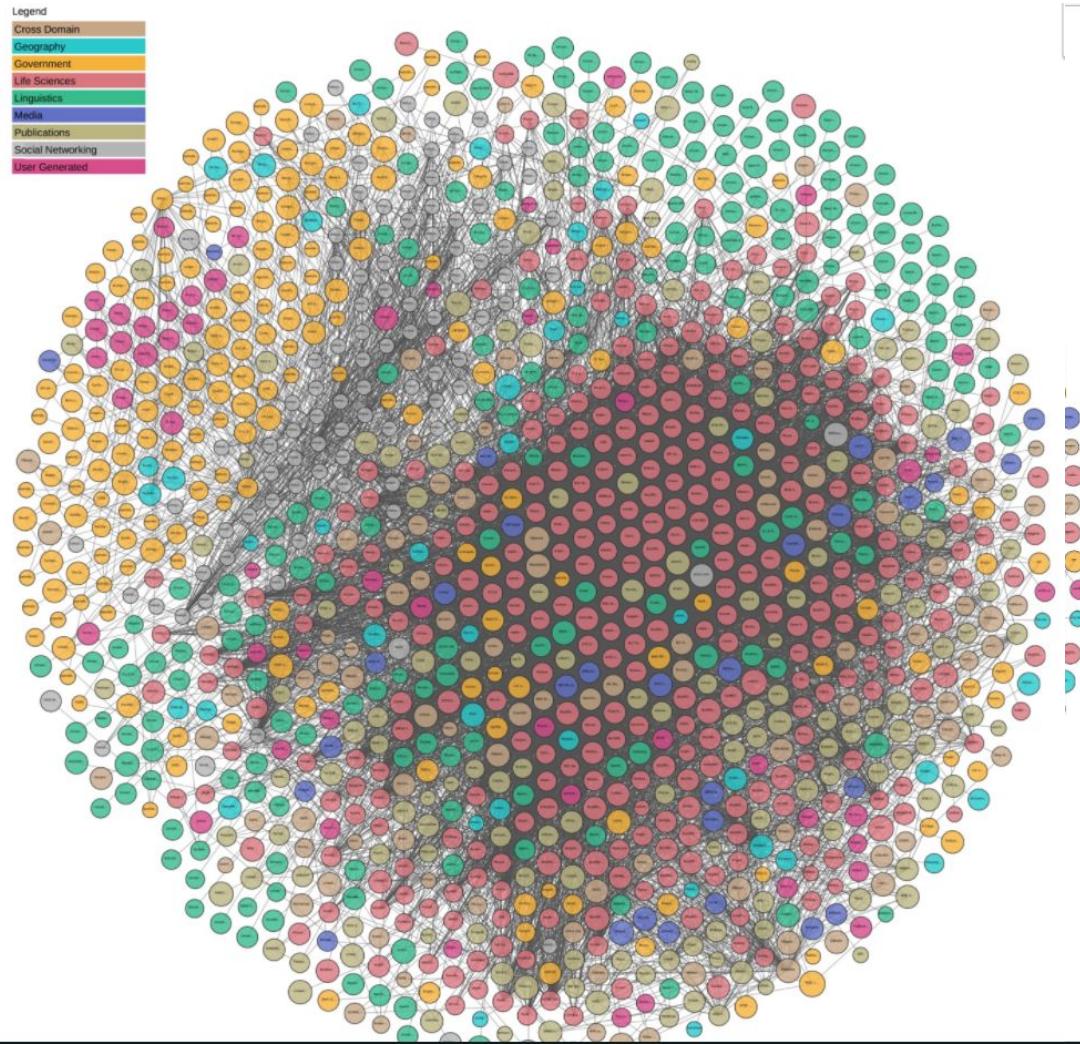
- we do not reinvent the wheel
- we have consistent definition
- we have unique definition
- we have correct and appropriate definition

all of these to have one understanding...

And that's definitely one of the goals of linked data...that computers will only have to refer to one meaning...



# The Linked Open Data Cloud





# The Study

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- Explores a solution to the problem of JMC and the need to represent concepts in a computing medium.
- Authors accounted the current state of metadata-creation practices across digital repositories and collections for comparative evaluation in terms of usage and representation capabilities.
- Data extensibility, consistency, and information sharing appear to be some of the major challenges in the field of cataloging.



# The Study

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- Likewise there is disparity in the metadata elements in the current metadata schemas such as existing library standards.
- In a nationwide survey done by Park and Tosaka in 2010 on metadata interoperability in digital repositories and collections of most cataloging and metadata professionals, results show that Marc 21 is most widely used metadata schema, content standard, and subject-controlled vocabulary while RDF is notably the second.

# Resource Description Framework RDF / XML

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```
01. <?xml version="1.0" encoding="UTF-8"?>
02.
03. <rdf:RDF
04.   xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
05.   xmlns:dc="http://purl.org/dc/elements/1.1/"
06.   xmlns:region="http://www.country-regions.fake/">
07.
08.   <rdf:Description rdf:about="http://en.wikipedia.org/wiki/Oxford">
09.     <dc:title>Oxford</dc:title>
10.     <dc:coverage>Oxfordshire</dc:coverage>
11.     <dc:publisher>Wikipedia</dc:publisher>
12.     <region:population>10000</region:population>
13.     <region:principaltown rdf:resource="http://www.country-
14.       regions.fake/oxford"/>
15.
16.   </rdf:Description>
17.
18. </rdf:RDF>
```



## Why RDF?

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- RDF was chosen for the description of the music scores because of the simplicity of its application for cataloging compared to MARC 21 that has more than 200 bibliographic elements.



## Rationale - Semantic Web

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- the Semantic Web is the so called Web 3.0 web technology - a way of linking data between systems or entities that allows for rich, self-describing interrelations of data available across the globe on the web.



## Rationale - Semantic Web

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- Creating ontologies for music-related information is more like creating semantic web vocabulary in relation to the said type of information.
- Its specification provides main concepts and properties for describing music (i.e. artists, albums and tracks)

# Methodology



# Linked Data Process

Concept?

# Linked Data Process

Concept - Music Score



# Linked Data Process

Concept - Music Score



Defined? -



# Linked Data Process

Concept - Music Score



Defined? - Yes

# Linked Data Process

Concept - Music Score



Defined? - Yes



Refer to linked data domain  
to use the URI / URL



# Linked Data Process

Concept - Music Score



Defined? - No



Authorize to define?

# Linked Data Process

Concept - Music Score

Defined? - No

Authorize to define?

Yes

No

# Linked Data Process

Concept - Music Score



Defined? - No



Authorize to define?



No

Manifesto is not accepted by the standard

# Linked Data Process

Concept - Music Score



Defined? - No



Authorize to define?



Yes

Manifesto is accepted by the standard,  
ontology is added to Linked Open Data Cloud

# Ontology Creation Process





# Ontology Creation Process

- determine the scope and domain of the music terms as provided by the user needs;
- identification and use of the Music Ontology and other existing namespaces of description to describe the music scores of Jose Maceda compositions;
- extend them in creating the "music score web ontology"
- identify and use a tool to create queries based on the need identified by the librarian and library staff (
- testing; running queries



## Music Ontology - extend

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- Is an online community effort collaborating to express music-related information in the Semantic Web.
- As an active community, it is designed to allow simultaneous deployment and extension to scalable music vocabularies and terminologies.
- Moreover as a framework, it has a namespace document specification



# “Music Ontology”

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- Provides the terms, RDF classes and properties that semantic web applications use in a variety of RDF-compatible document and formats.
- Is identified by the namespace URI: '<http://purl.org/ontology/mo/>'



# “Music Ontology”

---

- Uses RDF Music-Ontology-based description that allows integration to other RDF vocabulary.
- Music Ontology RDF/XML Ontology namespaces referenced allows reuse of other ontologies.
- Allows also other ontologies to be plugged on top of Music Ontology namespaces referenced, a way to extend the ontology

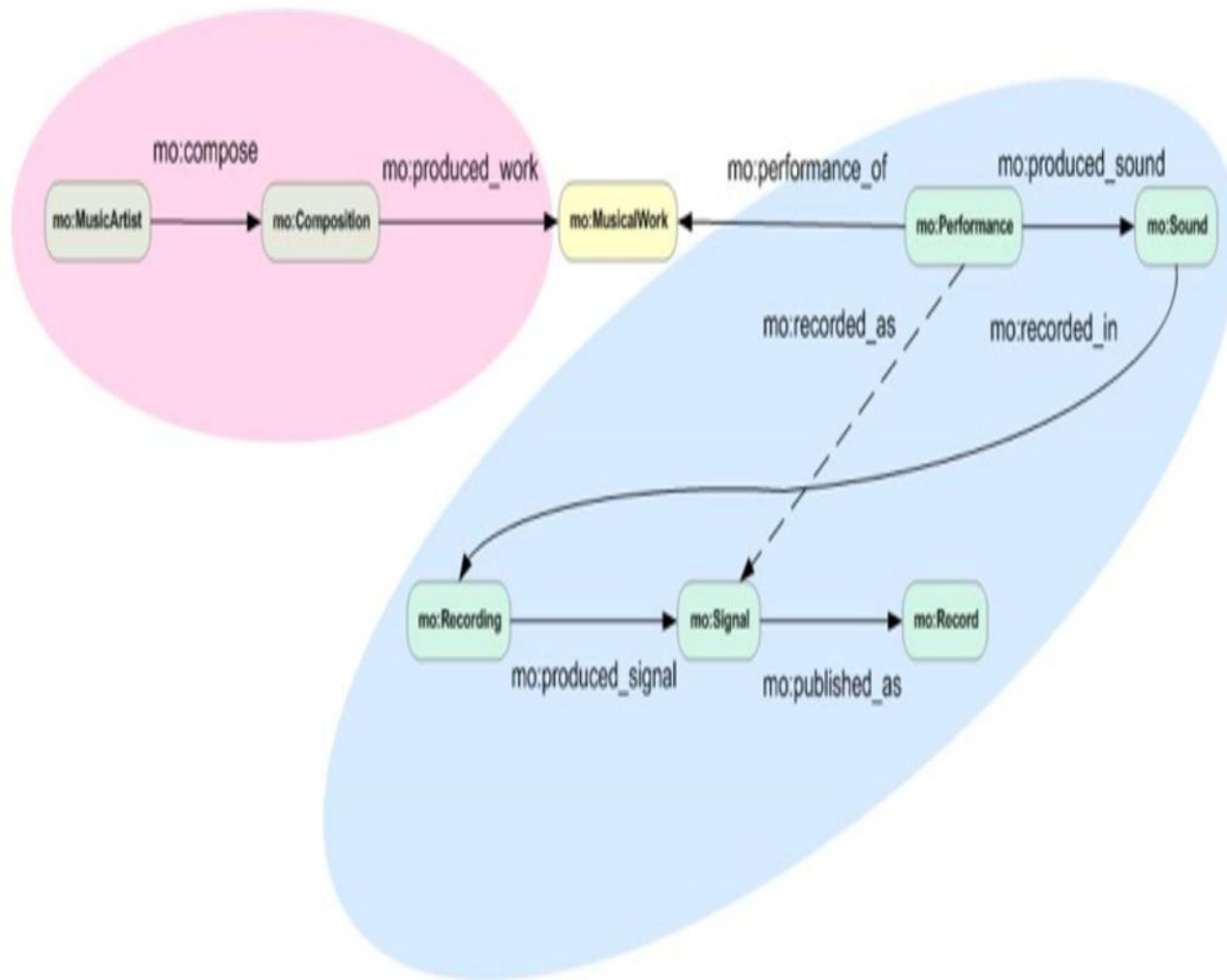


# “Music Ontology”

---

- Provides easy process of basic facts about terms in Music Ontology in a way that definitions are presented using a computer language
- With the Music Ontology document as its output, the **Music Score Web Ontology (MSWO)** document created in this study can then be integrated with other documents to further create a unified database of information related to music

# Music Ontology Workflow



# Music Ontology Workflow

## Music Ontology At A Glance

An alphabetical index of Music Ontology terms, by class (categories or types), by property and by individuals. All the terms are hyperlinked to their detailed description for quick reference.

Classes: | [AnalogSignal](#) | [Arrangement](#) | [AudioFile](#) | [CD](#) | [Composition](#) | [CorporateBody](#) | [DAT](#) | [DCC](#) | [DVDA](#) | [DigitalSignal](#) | [ED2K](#) | [Festival](#) | [Genre](#) | [Instrument](#) | [Instrumentation](#) | [Label](#) | [Libretto](#) | [Lyrics](#) | [MD](#) | [MagneticTape](#) | [Medium](#) | [Membership](#) | [Movement](#) | [MusicArtist](#) | [MusicGroup](#) | [MusicalExpression](#) | [MusicalItem](#) | [MusicalManifestation](#) | [MusicalWork](#) | [Orchestration](#) | [Performance](#) | [PublishedLibretto](#) | [PublishedLyrics](#) | [PublishedScore](#) | [Record](#) | [Recording](#) | [RecordingSession](#) | [Release](#) | [ReleaseEvent](#) | [ReleaseStatus](#) | [ReleaseType](#) | [SACD](#) | [Score](#) | [Show](#) | [Signal](#) | [SignalGroup](#) | [SoloMusicArtist](#) | [Sound](#) | [Stream](#) | [Torrent](#) | [Track](#) | [Transcription](#) | [Vinyl](#) |

Properties: | [activity\\_end](#) | [activity\\_start](#) | [amazon\\_asin](#) | [arranged\\_in](#) | [arrangement\\_of](#) | [available\\_as](#) | [biography](#) | [bitsPerSample](#) | [bpm](#) | [catalogue\\_number](#) | [channels](#) | [collaborated\\_with](#) | [compilation\\_of](#) | [compiled](#) | [compiler](#) | [composed\\_in](#) | [composer](#) | [conducted](#) | [conductor](#) | [contains\\_sample\\_from](#) | [derived\\_from](#) | [discography](#) | [discogs](#) | [dimix\\_of](#) | [dimixed](#) | [dimixed\\_by](#) | [download](#) | [ean](#) | [encodes](#) | [encoding](#) | [engineer](#) | [engineered](#) | [event\\_homepage](#) | [exchange\\_item](#) | [fanpage](#) | [free\\_download](#) | [genre](#) | [grid](#) | [group](#) | [gtin](#) | [headliner](#) | [homepage](#) | [image](#) | [imdb](#) | [instrument](#) | [interpreter](#) | [ipi](#) | [ismn](#) | [isrc](#) | [iswc](#) | [item](#) | [key](#) | [label](#) | [lc](#) | [licence](#) | [listened](#) | [listener](#) | [lyrics](#) | [mailorder](#) | [mashup\\_of](#) | [media\\_type](#) | [medley\\_of](#) | [member](#) | [member\\_of](#) | [membership](#) | [meter](#) | [movement](#) | [movement\\_number](#) | [musicbrainz](#) | [musicbrainz\\_quid](#) | [musicmoz](#) | [myspace](#) | [olga](#) | [onlinecommunity](#) | [opus](#) | [origin](#) | [other\\_release\\_of](#) | [paid\\_download](#) | [performance\\_of](#) | [performed](#) | [performed\\_in](#) | [performer](#) | [possess\\_item](#) | [preview](#) | [preview\\_download](#) | [primary\\_instrument](#) | [produced](#) | [produced\\_score](#) | [produced\\_signal](#) | [produced\\_signal\\_group](#) | [produced\\_sound](#) | [produced\\_work](#) | [producer](#) | [publication\\_of](#) | [published](#) | [published\\_as](#) | [publisher](#) | [publishing\\_location](#) | [puid](#) | [record](#) | [record\\_count](#) | [record\\_number](#) | [record\\_side](#) | [recorded\\_as](#) | [recorded\\_in](#) | [recording\\_of](#) | [records](#) | [release](#) | [release\\_status](#) | [release\\_type](#) | [remaster\\_of](#) | [remix\\_of](#) | [remixed](#) | [remixer](#) | [review](#) | [sample\\_rate](#) | [sampled](#) | [sampled\\_version](#) | [sampled\\_version\\_of](#) | [sampler](#) | [sell\\_item](#) | [signal](#) | [similar\\_to](#) | [singer](#) | [supporting\\_musician](#) | [tempo](#) | [text](#) | [time](#) | [track](#) | [track\\_count](#) | [track\\_number](#) | [translation\\_of](#) | [tribute\\_to](#) | [trmid](#) | [upc](#) | [want\\_item](#) | [wikipedia](#) |

Individuals: | [album](#) | [audiobook](#) | [bootleg](#) | [compilation](#) | [ep](#) | [interview](#) | [live](#) | [official](#) | [promotion](#) | [remix](#) | [single](#) | [soundtrack](#) | [spokenword](#) |

Figure 2. Definitions of Music Ontology expressed in OWL

# Music Ontology Namespaces referenced

## Ontology namespaces referenced

Prefix	XML Namespace	Specification
fbr	<a href="http://purl.org/vocab/fbricore#">http://purl.org/vocab/fbricore#</a>	<a href="#">Expression of Core FRBR Concepts in RDF</a>
timeline	<a href="http://purl.org/NET/c4dm/timeline.owl#">http://purl.org/NET/c4dm/timeline.owl#</a>	<a href="#">The Timeline ontology</a>
event	<a href="http://purl.org/NET/c4dm/event.owl#">http://purl.org/NET/c4dm/event.owl#</a>	<a href="#">The Event ontology</a>
time	<a href="http://www.w3.org/TR/owl-time/">http://www.w3.org/TR/owl-time/</a>	<a href="#">The Time ontology</a>
dc	<a href="http://purl.org/dc/elements/1.1/">http://purl.org/dc/elements/1.1/</a>	<a href="#">Dublin Core Element Set v1.1</a>
dcterms	<a href="http://purl.org/dc/terms/">http://purl.org/dc/terms/</a>	<a href="#">Dublin Core Element Refinements and Encoding Schemes</a>
foaf	<a href="http://xmlns.com/foaf/0.1/">http://xmlns.com/foaf/0.1/</a>	<a href="#">Friend of a Friend (FOAF) Vocabulary</a>
rel	<a href="http://purl.org/vocab/relationship/">http://purl.org/vocab/relationship/</a>	<a href="#">Relationship: A vocabulary for describing relationships between people</a>
sim	<a href="http://purl.org/ontology/simil/">http://purl.org/ontology/simil/</a>	<a href="#">Similarity Ontology: A vocabulary for describing similarity level between relations</a>

**Music Ontology /XML Ontology namespaces references to reuse the other existing ontologies**



# Music Ontology Extension Modules

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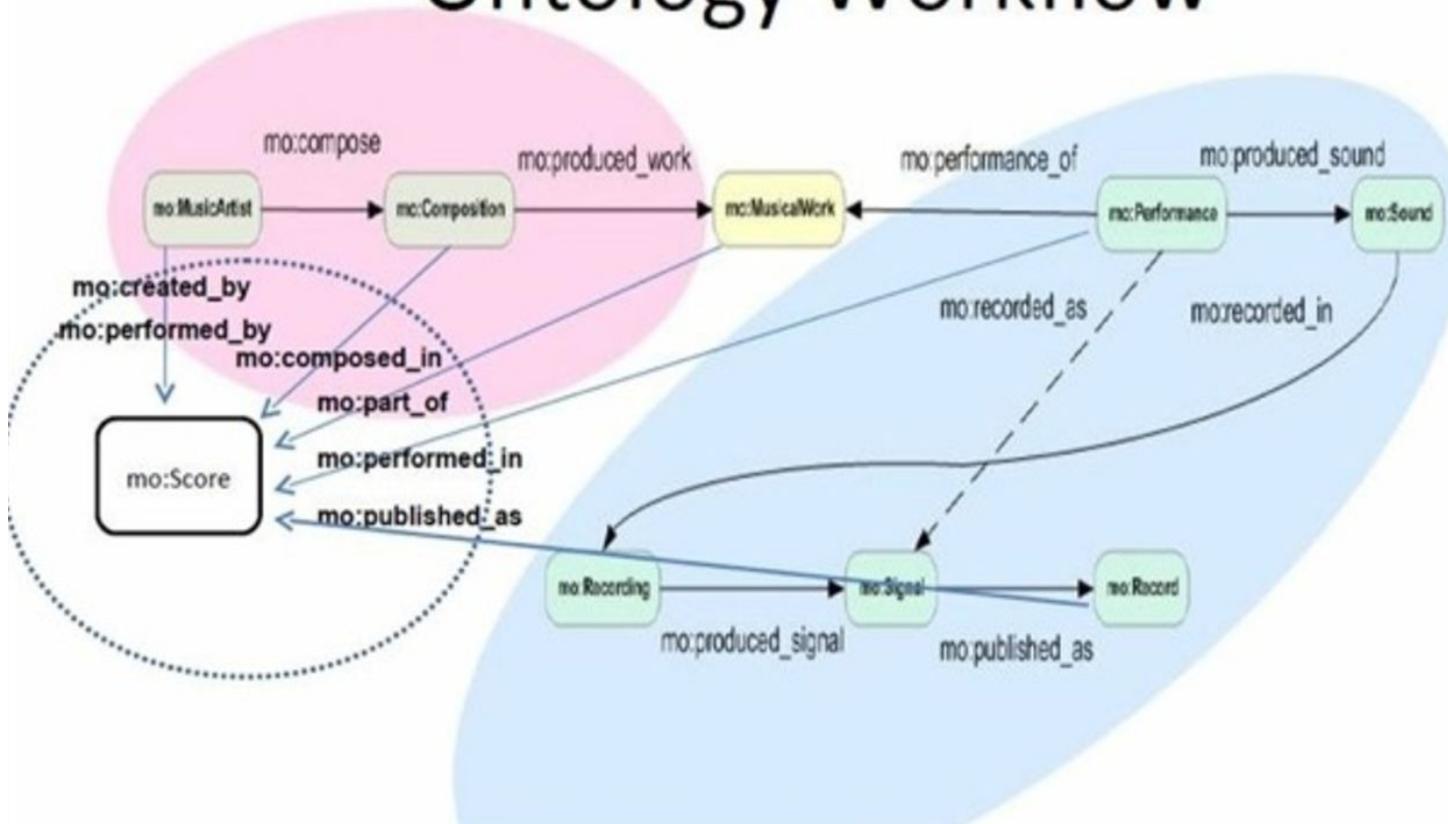
Below is the current list of available Extension Module

- Music Features Ontology
- Instrument Taxonomy
- Similarity Ontology
- Play Back Ontology
- Association Ontology Music Ontology Modules

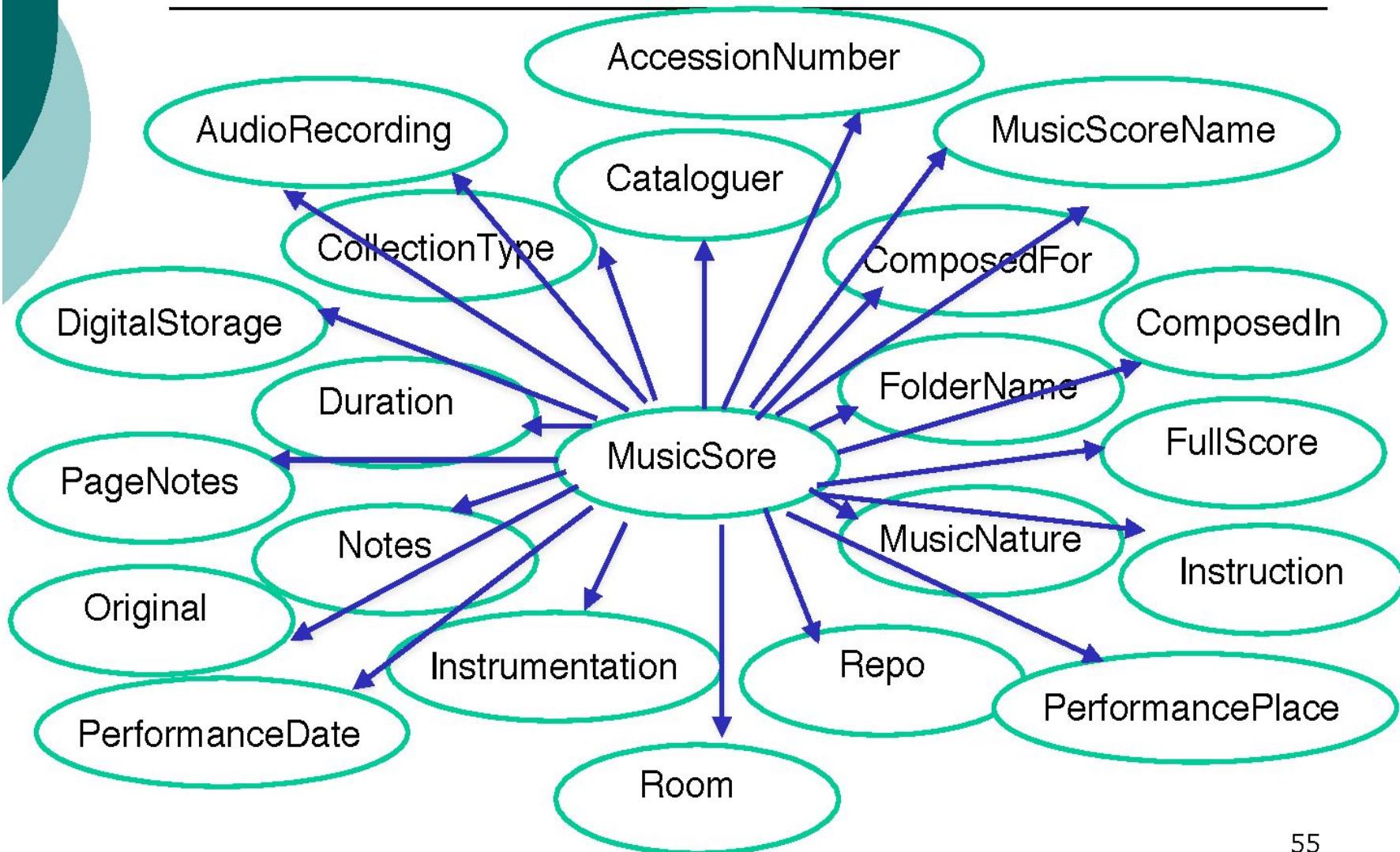
---

**By extending the Music Ontology Framework, the Music Scores of Jose Maceda Compositions are described**

# Music Ontology with Music Score Ontology Workflow



# Design framework of Music Score Web Ontology for extension to Music Ontology





# Design framework of classes for extension to Music Ontology

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- – score as an informational object

**Class: mo:Score**

- published\_score is an object published score

**Class: mo:PublishedScore**

- published\_as associates published score to a Record

**Property: mo:published\_as**

- composed\_in associates a score event to a composition

**Inverse-of:mo:composed\_in**

- created\_by associates a score event to the maker

**Property: mo:created\_by**

- Foaf:maker associates a score event to the other contributor to create it

**Property: foaf:maker**

- produced\_score associates an arrangement event to a Score

**Property: mo:produced\_score**

- Performed\_by associates a composition event to the performer of a performance

**Property: mo:performed\_by**

- Foaf:maker associates a composition event to the other contributor who creates it

**Property: foaf:maker**



# Ontology Fit for Evaluation

On the other hand, as creation of ontology is involved steps introduced by Raimond (2008) was taken into consideration to establish directed metric for evaluation of ontology:



# Ontology Fit for Evaluation

- Constructing a dataset of verbalized user needs
- Analyzing these needs to extract a set of features
- Evaluating how well these features map to our knowledge representation framework



## Semantic Tool - Arc2 Framework

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- an open source framework that is easy to implement
- It runs in most servers and becomes one of the most installed RDF libraries
- Allows validation of the web ontology developed with regards to real-world information-seeking behaviors, the librarian and library staff in this study



## Results and Discussion

---

Title	Date	Performance/ Recording	Instrumentation/Duration	Notes
Ugma-ugma	1963	1964 (Philam Life Theater), 1963 (UCLA), 1968 (Brazil), 1981 (UP College of Music)	[rattles, notched bamboo tube with another tube as scraper, SATB voices, carabao horn, whistle, sho, chinese bells, clapper, mouth harp, pai pan, bamboo sticks, gabbang, kulintang, gender, agung, gandingan, komodan]	16 mins. In Tagalog, Ugma-Ugma means structured or pieced together, and in Ilonggo, it means tomorrow. In other languages, it may have other connotations, but in the Malayan linguistic structure, it also enunciates a sound pattern characterized principally by the glottal stop after the vowels, "a" and before the vowels "u". </br></br> Linguistic sound patterns of various languages all over the world make up a variety of physical sounds which when juxtaposed with other musical instruments create a kaleidoscope of noises not possible with "melodic" instruments. </br></br> In this work, Malayo-Polynesian phones are set against an artificial orchestra consisting of scraper, carabao horn, whistle, mouth organ, bells, clapper, buzzer, tubes, mouth harp, Chinese clapper, bamboo sticks, xylophone, gongs in a row, metallophone,, gongs in a pair and suspended gongs. These instruments are grouped according to their general sound qualities. very high background of sharp and slow-decaying sounds. Extremes of almost inaudible twangs and heavily-cluttered noises are brought in opposition, and especially sensitive sound-curves are prolonged as solo parts.
Agungan	[1966]	1966 (UP College of Music)	Orchestra for 6 gong families, drums and flutes [4 kulintang, agung, gandingan, tiruray?, topayya, agung malaki?, agung malit?, palook, drums, flutes (low and high)?, cymbals]	For an "orchestra of 6 gong families drums and flutes, 15mins. Decay's densities, colors, sounds struck with sticks, hands, sliding palms. Uses six gong-families or qualities of gong-sounds to project the variety of sounds than can be produced within a certain homogenousness of sounds - the sounds of gongs. In this artificial orchestra, a musical permutation of sound-events is based on isolated sounds produced by the people who play these instruments; however, the organization of these sounds is not a mere copy of native musical invention. Rather, it is a result of new concepts seeking to draw out the physical qualities of non-pitch sounds. Some of these qualities are sound-density (when the peal of about 60 gongs are heard together in a mixture of time delays); color (mixtures of scale-structures, instrumental blends, types of attacks, effect sounded by mallets of varies materials, hand-slides, dampening, etc); and rhythm (there is no metric regularity of phrases anywhere). </br></br> *program notes 'Music of Today: A concert of avant garde and Asian music', 4 & 5 February 1966, UP College of Music.

Ms. Grace Ann Buenaventura, UP CE Librarian provided the list of the description of the music scores of Jose Maceda Compositions in excel format as shown above.



# User Requirements Gathering

---

- The table is used for knowledge acquisition to determine the different concepts, attributes and relationships that are cataloged and modeled by MSWO
- This also determines the scope and domain of the terminologies and description of the MSWO.
- During this process users are asked to inspect thoroughly the properties of the entities and their relationships.

Using RDF / XML, the music scores are defined and described

Depicts the relationships between the classes and properties building the knowledge models of the MSWO.

---

```
@prefix : <http://smpascuacom.ipagemysql.com/ms/musicscore#> .
@prefix event: <http://purl.org/NET/c4dm/event.owl#> .
@prefix foaf: <http://xmlns.com/foaf/0.1/> .
@prefix mo: <http://purl.org/ontology/mo/> .
@prefix owl: <http://www.w3.org/2002/07/owl#> .
@prefix rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#> .
@prefix rdfs: <http://www.w3.org/2000/01/rdf-schema#> .
@prefix xml: <http://www.w3.org/XML/1998/namespace> .
@prefix xsd: <http://www.w3.org/2001/XMLSchema#> .

:AccessionNumber a owl:DatatypeProperty ;
  rdfs:comment "Used to account the acquisition detail of the music score." ;
  rdfs:domain :MusicScore ;
  rdfs:range xsd:string .

:AudioRecording a owl:DatatypeProperty ;
  rdfs:comment "Used to identify if the music score has recording or none. " ;
  rdfs:domain :MusicScore ;
  rdfs:range xsd:string .

:Cataloguer a owl:DatatypeProperty ;
  rdfs:comment "Used to identify the cataloguer of the music score. " ;
  rdfs:domain :MusicScore ;
  rdfs:range xsd:string .
```

# MSWO - Triples Model

Subject	Predicate	Object
MusicScoreName	type	Udlot-Udlot
MusicScoreName	type	Ugnayan
MusicScore	has	AccessionNumber
MusicScore	has	AudioRecording
MusicScore	has	Cataloguer
MusicScore	has	CollectionType
MusicScore	has	ComposedFor
MusicScore	has	ComposedIn
Composer	subClassOf	FOAF
MusicScore	has	DigitalStorage
MusicScore	has	Duration

# Logical Design of the MSWO - Triples Model with qnames

Subject	Predicate	Object
mo:MusicScore	rdf:subPropertyOf	ms:MusicScoreName
MusicScoreName	rdf:type	ms:Distemperament
MusicScoreName	rdf:type	ms:Udlot-Udlot
MusicScoreName	rdf:type	ms:Ugnayan
mo:MusicScore	rdf:type	ms:AccessionNumber
mo:MusicScore	rdf:type	ms:AudioRecording
mo:MusicScore	rdf:type	ms:Cataloguer
mo:MusicScore	rdf:type	ms:CollectionType
mo:MusicScore	rdf:type	ms:ComposedFor
mo:MusicScore	rdf:type	ms: ComposedIn
foaf:Composer	rdf: subClassOf	ms:JoseMaceda

## Other domains used in JMCMOS

Concepts	Ontology	Comments
MusicalWork	FRBR / Work	An abstract musical creation
<u>MusicalManifestation</u>	FRBR / Manifestation	Can be a Record or Track
MusicalItem	FRBR / Item	Can be a Stream, CD or Vinyl
<u>MusicalArtist</u>	FOAF	Any person contributing to a musical event
MusicGroup	FOAF	Any group contributing to a musical event
Composition	Event	Creation of <u>MusicalWork</u>



# Scope and Limitations

---

- The limitation of this study is that this MSWO is a description and classification on semantic web done using Arc2 Framework.
- Databasing is also aided by the said framework.
- Additionally scripts and query are executed through the provided endpoint and generate output results in RDF format.



## Scope and Limitations

---

- As for the data set, due to a bound nature of proprietorship, three sample music scores out of 23 compositions are used representing three periods that assemblage the compositions of Dr. Jose Maceda
- These scores are namely, Distemperament, Udlot Udlot and Ugnayan. Non-disclosure agreement is provided to exercise the legality on the set of data.



# Evaluation of Methodology

---

- this study uses a Query-driven ontology evaluation methodology
- that allows validation of the web ontology developed with regards to real-world information-seeking behaviors
- evaluation the created knowledge representation framework against a dataset of verbalized music-related user needs is considered

# Given Data

---

MusicScoreName	AccessionNumber	Composer	Cataloguer	YearWritten	WrittenBy	FullScore	Original	Collectiontype
Ugnayan	UPCE-S-001a	Jose Maceda	Joshua Gapasin	1963	Jose Maceda	Yes	No	Scores
Ugnayan	UPCE-S-001b	Jose Maceda	Joshua Gapasin	1963	Jose Maceda	Yes	Yes	Scores
Udlot-Udlot	UPCE-S-023a	Jose Maceda	Joshua Gapasin	1975	Jose Maceda	Yes	No	Scores
Distemperament	UPCE-S-021a	Jose Maceda	Joshua Gapasin	1992	Jose Maceda	No	Yes	Scores
Distemperament	UPCE-S-021b	Jose Maceda	Joshua Gapasin	1992	Jose Maceda	Yes	No	Scores
Distemperament	UPCE-S-021c	Jose Maceda	Joshua Gapasin	1992	Jose Maceda	Yes	No	Scores
Distemperament	UPCE-S-021d	Jose Maceda	Joshua Gapasin	1992	Jose Maceda	No	Yes	Scores
Distemperament	UPCE-S-021e	Jose Maceda	Joshua Gapasin	1992	Jose Maceda	Yes	No	Scores

# Constructing a dataset in RDF.

```
<!DOCTYPE rdf:RDF [
    <!ENTITY ms  "http://smpascuacom.ipagemysql.com/ms/musicscore#" >
        <!ENTITY mo  "http://purl.org/ontology/mo/" >
        <!ENTITY foaf "http://xmlns.com/foaf/0.1/" >
    <!ENTITY event "http://purl.org/NET/c4dm/event.owl#" >
    <!ENTITY rdf  "http://www.w3.org/1999/02/22-rdf-syntax-ns#" >
    <!ENTITY rdfs "http://www.w3.org/2000/01/rdf-schema#" >
    <!ENTITY owl  "http://www.w3.org/2002/07/owl#" >
    <!ENTITY xsd  "http://www.w3.org/2001/XMLSchema#" > ]>

<rdf:RDF
    xmlns      = "&ms;"
    xml:base   = "&ms;"
    xmlns:ms   = "&ms;
        xmlns:mo    = "&mo;"
        xmlns:foaf   = "&foaf;"
        xmlns:event  = "&event;"
        xmlns:rdf   = "&rdf;"
        xmlns:rdfs  = "&rdfs;"
        xmlns:xsd   = "&xsd;"
    xmlns:owl   = "&owl;">>

    <!-- ***** Ontology ***** -->
    <owl:Ontology rdf:about="&ms;MusicScoreOntology">
        <rdfs:comment>AN OWL ontology for Music Scores</rdfs:comment>
        <rdfs:label>Music Scores Ontology</rdfs:label>
        <creator>Sonia Pascua</creator>
        <course>MS Thesis</course>
        <Adviser>Dr. Jaime Caro</Adviser>
```

To verify the syntax of MSWO, xml code is loaded to the RDF Translator powered by <http://www.w3.org/RDF/Validator/rdfval>

---



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## Validation Results

Your RDF document validated successfully.

---

### The original RDF/XML document

```
1: <!DOCTYPE rdf:RDF [  
2:     !ENTITY ms  "http://smpascuacom.ipagemysql.com/ms/musicscore#" >  
3:     !ENTITY mo  "http://purl.org/ontology/mo/" >  
4:     !ENTITY foaf "http://xmlns.com/foaf/0.1/" >  
5:     !ENTITY event "http://purl.org/NET/c4dm/event.owl#" >  
6:     !ENTITY rdf  "http://www.w3.org/1999/02/22-rdf-syntax-ns#" >  
7:     !ENTITY rdfs "http://www.w3.org/2000/01/rdf-schema#" >  
8:     !ENTITY xsd  "http://www.w3.org/2001/XMLSchema#" >
```



# TOOL

---

- Arc2 Framework is the semantic tool used as an application to aid the semantic validation and verification
- It allows validation of the web ontology developed with regards to real-world information-seeking behaviours
- Databasing is aided by the said framework.
- Additionally scripts and query are executed through the provided endpoint and generate output results in RDF format.



# Query Engine

---

- Arc2 Framework aided the execution of scripts to generate results for the competency questions.
- Queries are executed through the provided endpoint and results are generated in both tabular and RDF format.
- The query tool endpoint was implemented using PHP while its SPARQL query engine was provided by MySQL through the PHP MyAdmin interface.
- It is accessible and provided to the testers and validators at <http://smpascua.com/MSWO/endpoint.php>

# Query Engine - Arc2 Framework

The screenshot shows a web-based SPARQL endpoint interface. At the top, the URL is `smpascua.com/MSWO/endpoint.php`. Below the address bar, the title is "ARC SPARQL+ Endpoint (v2010-10-12)". A note states "This interface implements SPARQL and SPARQL+ via HTTP Bindings". It lists enabled operations: select, construct, ask, describe, load, insert, delete, dump. The maximum number of results is set to 250. The main area contains a query editor with the following SPARQL query:

```
SELECT * WHERE {  
  GRAPH ?g { ?s ?p ?o . }  
}  
LIMIT 10
```

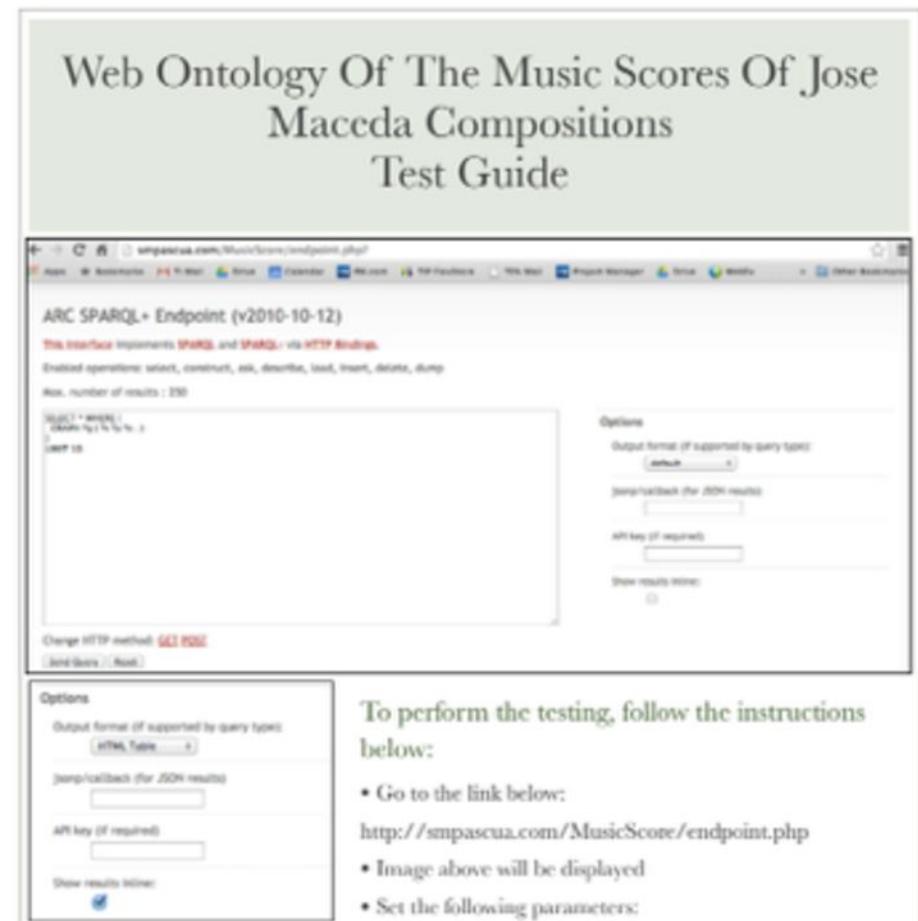
To the right is an "Options" panel with the following settings:

- Output format (if supported by query type): `default`
- jsonp/callback (for JSON results):
- API key (if required):
- Show results inline:

At the bottom left, there are buttons for "Change HTTP method: GET POST", "Send Query", and "Reset".

# Test Guide

To perform the testing, instructions and test procedures are provided. It outlines the step by step process on how to access the query tool, set up the appropriate configuration for the tool and the output of the test scripts.



The screenshot shows a web browser window titled "Web Ontology Of The Music Scores Of Jose Maceda Compositions Test Guide". The main content area displays a SPARQL query results page from the "ARC SPARQL+ Endpoint (v2010-10-12)". The query results are listed in a table with columns "URI", "Label", and "Type". The results are as follows:

URI	Label	Type
http://smpascua.com/MusicScore/endpoint.php	ARC SPARQL+ Endpoint (v2010-10-12)	Service
http://smpascua.com/MusicScore/endpoint.php?query=SELECT+*+WHERE+{+?s+?p+?o+}+LIMIT+10	SPARQL+ Endpoint	Service

Below the results, there are two sets of "Options" for changing the output format and performing callbacks. The top set is for the main results table, and the bottom set is for the query results table. Both sets include fields for "Output format (if supported by query type)" (set to "Table"), "Jump/callback (for JSON results)", "API key (if required)", and "Show results inline" (checkbox checked).

To perform the testing, follow the instructions below:

- Go to the link below:  
<http://smpascua.com/MusicScore/endpoint.php>
- Image above will be displayed
- Set the following parameters:

# Test Plan and Procedure

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## *WEB ONTOLOGY OF THE MUSIC SCORES OF JOSE MACEDA COMPOSITIONS USING ARC2 FRAMEWORK* TEST PLAN & PROCEDURE

Version <1.0>

<07/17/2015>

# Test Resources - Human

• Human Resource	Role	Specific Responsibility	Methodologies to be tested
Dr. Ramon Santos	Director, UPCE / Thesis Adviser	Validator	1,2,3
Dr. Verne dela Pena	OIC, Department Musicology / Thesis Panel Member	Validator and Tester	1,2,3
Ms. Grace Ann Buenaventura	Librarian	Tester	1,2
Ms. Roan May Opiso	Library Staff	Tester	1,2
Others	Library Staff	Tester	1,2

# Test Resources - System

---

System Resource	Name/Type/Version/Serial No.	Description
Computer	MacBook/Air/PC001	<u>Hardware</u>
Application 1	XAMPP/ver 1.8.2-3	IDE
Application 2	PHP/ver 5.5.19	Language
Application 3	MySQL/ ver 5.5.4	Database
Application 4	Apache/ ver 2.4.7	Web Server
Application 5	phpMyAdmin / ver 4.0.9	Database UI
Application 6	Arc2 Framework / ver 9.1.8	Semantic Tool

# Inferences of the Given Data

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UP Center for Ethnomusicology

Document Title: User Requirements Analysis

Provided By: Ms. Grace Ann Buenaventura

This document enumerates all the queries that the librarian and library staff of UPCE receive from the Center's users in their quest for library materials. Scripts are created based on these queries to retrieve the said requirements.

Preliminary Details:

## I. Test Query Prefixes

These prefixes are affixed on top of the select queries.

For Web Hosting

```
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX ms: <http://smpascuacom.ipagemysql.com/ms/musicscore#>
```

For Local Hosting

```
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX ms: <http://localhost/ms/musicscore#>
```

## II. General Retrieval:

Retrieve a specific music score

```
SELECT DISTINCT ?MusicScoreName WHERE { ?x rdf:type ms:MusicScore . ?x ms:MusicScore-
Name ?MusicScoreName .?x ms:MusicScoreName "Ugnayan" }
```

Retrieve all details of all music scores

```
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX ms: <http://smpascuacom.ipagemysql.com/ms/musicscore#>
SELECT * WHERE { ?x rdf:type ms:MusicScore . ?x ms:MusicScoreName ?MusicScoreName . ?x
ms:AccessionNumber ?AccessionNumber}
```

# Evaluation of Methodology

Subject	Predicate	Object	vs MO Terms
mo:MusicScore	rdf:subPropertyOf	ms:MusicScoreName	<input checked="" type="checkbox"/>
MusicScoreName	rdf:type	ms:Distemperament	<input type="checkbox"/>
MusicScoreName	rdf:type	ms:Udlot-Udlot	<input type="checkbox"/>
MusicScoreName	rdf:type	ms:Ugnayan	<input type="checkbox"/>
mo:MusicScore	rdf:type	ms:AccessionNumber	<input type="checkbox"/>
mo:MusicScore	rdf:type	ms:AudioRecording	<input type="checkbox"/>
mo:MusicScore	rdf:type	ms:Cataloguer	<input type="checkbox"/>
mo:MusicScore	rdf:type	ms:CollectionType	<input type="checkbox"/>
mo:MusicScore	rdf:type	ms:ComposedFor	<input type="checkbox"/>
mo:MusicScore	rdf:type	ms: ComposedIn	<input type="checkbox"/>
foaf:Composer	rdf: subClassOf	foaf:JoseMaceda	<input checked="" type="checkbox"/>
mo:MusicScore	rdf:type	DigitalStorage	<input type="checkbox"/>
mo:MusicScore	rdf:type	Duration	<input type="checkbox"/>
mo:MusicScore	rdf:type	FolderName	<input type="checkbox"/>
mo:MusicScore	rdf:type	FullScore	<input type="checkbox"/>
mo:MusicScore	rdf:type	Instruction	<input type="checkbox"/>

- 3 out of 37 descriptions use existing namespaces - MO, RDF & FOAF



## Conclusion

---

The description shown is a rather straightforward extension of the metadata schema registry

# Conclusion

---

- The separation of syntactic and semantic features is useful to understand the functionality of the extended functions.
- A metadata schema registry can serve not only as an authoritative information source of metadata schemas but also as a center that provides software tools defined in association with the schemas.
- It is crucial to organize a network of collaborating metadata schema registries in order to share metadata schemas.
- We need to establish a process model for long-term maintenance of metadata schemas that would allow us to manage the life cycle of metadata schemas across languages.
- We need to develop a process model for enhancing reusability of metadata schemas across communities. RDF / XML-based ontology technologies seem to be useful for developing the process model.

# Conclusion

---

- This study attempts to define web ontology for the music scores of Jose Maceda Compositions.
- Additionally an assessment is carried out for the data queries, consistency, and information sharing of the schematic framework used by the said ontology which defines the taxonomy and organization of the collection.
- With the use of MSWO, technological infrastructure used by metadata schemata and controlled vocabularies for access and web services are discovered and defined within the context of Jose Maceda Compositions thereby contributing to continuous research and innovation on information processing and future web and its services.



## Future Works

---

- Description of the entire Jose Maceda Collection in RDF
- Development of the API for database management
- Integrate to the existing Web Portal of the UP CE
- Submission of Manifesto of the entire collection to the Linked Data Initiative for contribution on Union Database



# References

---

1. The musics of Asia : papers read at an international music symposium held in Manila, April 12-16, 1966 / [Ed. by] Jose Macea [Manila : National Music Council of the Philippines, in cooperation with the UNESCO National Commission of the Philippines], [1971].
2. Jose Monserrat Macea [videorecording] : breaking music's frontiers / National Commission for Culture and the Arts and Cultural Center of the Philippines ; written by Ramon Santos ; directed by Jon Red ; produced by Libertine Santos de la Cruz. [Pasay City] : Cultural Promotions Division, Cultural Resources Dept., Cultural Center of the Philippines, c2002.
3. <http://www.dlib.org/dlib/june00/payette/06payette.html>
4. [http://portal.unesco.org/ci/en/ev.php-URL\\_ID=1538&URL\\_DO=DO\\_TOPIC&URL\\_SECTION=201.html](http://portal.unesco.org/ci/en/ev.php-URL_ID=1538&URL_DO=DO_TOPIC&URL_SECTION=201.html)



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---

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Maraming Salamat po!!!

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