

VRA Analysis: Analyzing Digital Art Repositories.

Introduction:

The purpose of this project is to test the effectiveness and implementation of the Visual Resources Association (VRA) Core 4.0 metadata schema through the analysis of three repositories. The first repository, The Cleveland Museum of Art, includes more than 45,000 objects and spans 6,000 years of achievement in the arts.¹ The University of Chicago's Art History Image Collection on Luna database is an art repository developed in collaboration with faculty, instructors, and students containing nearly 200,000 images for teaching and research.² The Art Gallery of Ontario housed on ARTstor is an art repository housing 95,000 works within the permanent collection and the digital ARTstor collection holds approximately 600 images.³ Within these three collections, VRA elements, usage, frequency, infrequency, consistency, accuracy, controlled and uncontrolled vocabulary, and correctness are analyzed.

VRA

History: VRA Core, a data standard for the description of works of visual culture and the images documenting them, was originally developed in 1996 based on the Dublin Core metadata schema.⁴ The new schema added necessary features for the description and management of visual resources.⁵ With VRA's creation, image repositories could separate the descriptions of the Images, Works, and Collections housed in their repository.⁶ Repositories can now combine metadata needs into one schema, rather than relying on several different schemas. The current version, VRA Core 4.0, was released in 2007, expressed as an XML schema; the newest version allows the best possibility of interoperability throughout repositories.⁷ VRA Core is an extension of the metadata schema METS. The Metadata Encoding & Transmission Standard is an XML-

¹ "General Museum Fact Sheet," ClevelandArt, accessed June 10, 2023,

<https://www.clevelandart.org/sites/default/files/documents/other/General%20Museum%20Fact%20Sheet%202014.pdf>.

² "Luna," Collections, The Visual Resources Center, Accessed June 5, 2023, <https://vrc.uchicago.edu/collections/luna>.

³ "Art Gallery of Ontario," ARTSTOR, Accessed May 15, 2023, <https://www.artstor.org/collection/art-gallery-ontario/>.

⁴ "VRA Core 4.0 Introduction," VRA Core Schemas and Documentation, last modified October 28, 2014, <https://www.loc.gov/standards/vracore/schemas.html>.

⁵ VRA Core, "VRA Core 4.0 Introduction."

⁶ Ibid

⁷ Ibid

expressed standard for encoding descriptive, administrative, and structural metadata of objects that contain cultural heritage resources created in 1996.⁸

Structure: VRA Core was designed for the retrieval and indexing of data for both humans and computers. There are approximately 19 core elements that include: Work, Image, or Collection, agent, culturalContext, date, description, inscription, location, material, measurements, relation, rights, source, stateEdition, stylePeriod, subject, technique, textref, title, and worktype.⁹ One unique ID attribute is required: Work, Image, or Collection.¹⁰ Additionally, various elements include sub-elements that have a parent:child hierarchical relationships, but were not analyzed in this research.¹¹ VRA Core 4.0 allows for the choice of two versions: unrestricted and restricted. The unrestricted schema imposes no requirements on values entered for elements, sub-elements, or attributes; this schema is important for institutions looking to exchange data and include locally created elements.¹² While the restricted schema imposes requirements on data values entered into the type attributes; this schema is beneficial for data from multiple resources within the same repository.¹³

⁸ “METS: An Overview & Tutorial,” METS, accessed June 5, 2023, https://www.loc.gov/standards/mets/METSOverview.v3_en.html.

⁹ https://www.loc.gov/standards/vracore/VRA_Core4_Element_Description.pdf

¹⁰ “VRA Core 4.0 Element Description and Tagging Examples,” VRA Core Schemas and Documentation, VRA Core, last modified April 5, 2007, <https://www.loc.gov/standards/vracore/schemas.html>.

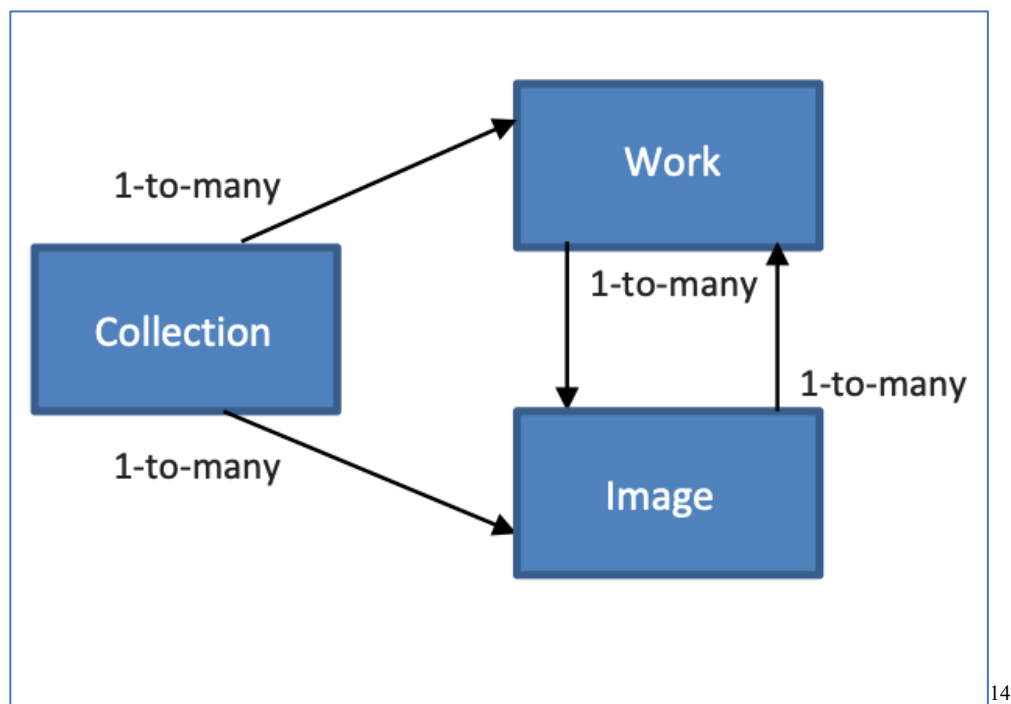
¹¹ VRA Core, “VRA Core 4.0 Element Description and Tagging Examples.”

¹² Ibid

¹³ Ibid

Data Model: The Collection, Work, and Image are the three main entities in the VRA Core 4.0 data model. The Work record serves as the primary subject of description in VRA Core and can subsequently be linked to one or more photos using the Relation element. By the same token, a single photograph can be related to multiple pieces of art, such as when a documentary photo of an exhibition shows a variety of pieces. Multiple works or picture records may be combined into one collection record. Figure 1a below conceptualizes the VRA Core 4.0 data model.

Figure 1a.



Elements: An element in VRA Core 4.0 is a unit of metadata and the equivalent of a field in a database.¹⁴ Elements include:

- Work, Image, or Collection: a choice of one of three elements. Work, Image, or Collection, defines a VRA 4.0 record as describing a Work (a built or created object), a Collection (an aggregate of such objects), or an Image (a visual surrogate of such objects.)¹⁶

¹⁴ VRA Core, "VRA Core 4.0 Introduction."

¹⁵ VRA Core, "VRA Core 4.0 Element Description and Tagging Examples."

¹⁶ Ibid

- Agent: The names, appellations, or other identifiers assigned to an individual, group, or corporate body that has contributed to the design, creation, production, manufacture, or alteration of the work or image.¹⁷
- CulturalContext: The name of the culture, people, or adjectival form of a country name from which a Work, Image, or Collection originates, or the cultural context with which the Work, Image, or Collection has been associated.¹⁸
- Date: Date or range of dates associated with the creation, design, production, presentation, performance, construction, or alteration, etc. of the Work or Image.¹⁹
- Description: A free-text note about the Work, Image, or Collection, including comments, description, or interpretation, that gives additional information not recorded in other categories.²⁰
- Inscription: All marks or written words added to the object at the time of production or in its subsequent history, including signatures, dates, dedications, texts, and colophons, as well as marks, such as the stamps of silversmiths, publishers, or printers.²¹
- Location: The geographic location and/or name of the repository, building, site, or other entity whose boundaries include the Work or Image.²²
- Material: The substance of which the image or record is composed.²³
- Measurement: The physical size, shape, scale, dimensions, or format of the Work or Image.²⁴
- Relations: Terms or phrases describing the identity of the related work and the relationship between the work being cataloged and the related Work or Image.²⁵
- Rights: Information about the copyright status and the rights holder for the record.²⁶
- Source: A reference to the source of the information recorded about the record.²⁷
- StateEdition: The identifying number and/or name assigned to the state or edition of a work that exists in more than one form and placement of that work in the context of prior or later issuances of multiples of the same work.²⁸
- StylePeriod: A defined style, historical period, group, school, dynasty, movement, etc. whose characteristics are represented in the Work or Image.²⁹
- Subject: Terms or phrases that describe, identify, or interpret the record and what it depicts or expresses.³⁰

17 VRA Core, "VRA Core 4.0 Element Description and Tagging Examples."

18 Ibid

19 Ibid

20 Ibid

21 Ibid

22 Ibid

23 Ibid

24 Ibid

25 Ibid

26 Ibid

27 Ibid

28 Ibid

29 Ibid

30 Ibid

- Technique: the production or manufacturing processes, techniques, and methods incorporated in the fabrication or alteration of the Work or Image.³¹
- TextRef: Contains the name of a related textual reference and any type of unique identifier that text assigns to a Work or Collection that is independent of any repository.³²
- Title: The title or identifying phrase given to the record.³³
- Worktype: Identifies the specific type of Work, Image, or Collection being described in the record.³⁴

Project Methods and Goals

Before analyzing the frequency and usage of the 19 VRA Core elements, project goals were created to define the parameters of the analysis. Three repositories: the Cleveland Museum of Art (CMA), the University of Chicago's Art History Department Image Collection on Luna database (Luna), and the Art Gallery of Ontario housed on ARTstor (AGO), were chosen. From each repository, 20 records were selected and analyzed at random; the total number of records equaled 60. Goals were implemented to identify inconsistencies and patterns in the application of VRA Core's elements and locally created elements. Researchers interpreted the accuracy, consistency, and correctness of data values and input to understand barriers or possibilities of interoperability.

Project Questions:

Questions posed at the start of the research process asked about the frequency of element usage. Were elements unused? Was the data accurate and complete? Did any repository use similar controlled vocabulary or local vocabulary? Were data elements and values used consistently, correctly, and accurately throughout? And were there any apparent barriers to interoperability?

³¹ VRA Core, "VRA Core 4.0 Element Description and Tagging Examples."

³² Ibid

³³ Ibid

³⁴ Ibid

CMA Mapping:

Analyzing the first repository, users viewed various unlisted, unspecified VRA elements in each digital record on the database. Researchers inferred as to the elements listed for about 50% of the digital record. Elements such as title, measurement, technique agent, date, textref, stylePeriod, culturalContext, and subject were not explicitly provided throughout data records. With this explicit lack of elements, researchers mapped CMA data values to corresponding VRA elements. See Figure 1.

Figure 1. CMA Mapping

Display Labels	VRA Elements
No data value listed	Title
Type of artwork	Work Type
No data value listed	Measurement
Medium	Material
Support	Material
Location	Location
Department	Location
Description	Description
Credit Line	Source
Gift of	Source
Provenance	Source
Citation	Rights
Related Content	Relation
No data value listed	Technique
No data value listed	Agent
No data value listed	Date
No data value listed	Textref
No data value listed	StylePeriod
No data value listed	CulturalContext
No data value listed	Subject
Inscription	Inscription
	stateEdition
Collection	Work, Image, or Collection
Contact US	Local element
Video	Local element
Did You Know?	Local element
Download And Share	Local element
Exhibition History	Local element

Luna and AGO Mapping:

Compared with CMA, Luna and AGO's mappings provided explicitly listed elements. Mapping was needed due to the various unmapped and local elements within both repositories. See Figures 2 and 3. Within Luna elements such as title, subject, and location were written according to VRA standards. Variations and ambiguity throughout terms existed, for example, the VRA element title was mapped from the locally created element extended title, and culture was mapped to the VRA element culturalContext. Ambiguity existed within Luna's VRA element agent. Agent was instead called creator and alternate creator name, however, both terms were used interchangeably. There were an additional two local elements on the Luna database: collection name and course instructor.

AGO's mapping was similar. VRA elements like subject, material, measurement, and date, did not need to be mapped because display labels were written according to VRA standards. Ambiguity remained the same as in Luna's mapping; creator was mapped to agent. The title element had two listed display elements: title and file name. Researchers determined that despite the ambiguity of the title element users had no trouble deciphering a given element. Variations for textref occurred three times throughout the study. Display elements mapped to VRA standard textref were accession number, SSID, and ID number. Additionally, there was only one local element on the AGO database: report error.

Figure 2. Luna Mapping

Display Elements	VRA Elements
Title	Title
Extended Title	Title
Creator	Agent
Alternate Creator Name	Agent
Subject	Subject
Material	Material
Measurement	Measurement
Work Type	Work Type
Image Classification Term	Work Type

Culture	culturalContext
Date	Date
Image ID	Textref
Couse Number	Textref
Local Call Number	Textref
Image Source	Source
Work Description Source	Source
Image Rights	Rights
	Inscription
	Relation
Style or Period	Style/Period
	Technique
Location	Location
Work Description	Description
Collection Name	Work, Image, or Collection
	stateEdition
Course Instructor	Local element

Figure 3. AGO Mapping

Display Elements (AGO)	VRA Elements
Title	Title
File Name	Title
Creator	Agent
Subject	Subject
Material	Material
Measurement	Measurement
Work Type	Work Type
	culturalContext
Date	Date
ID Number	Textref
Accession Number	Textref
SSID	Textref
Source	Source
Rights	Rights
License	Rights

	Inscription
	Relation
	Style/Period
	Technique
Collection	Work, Image, or Collection
No provided	stateEdition
Repository	Location
Report Error	Local element

Metadata Usage Examination

Overall Usage: The metadata records for the Cleveland Museum of Art, The University of Chicago's Art History Image Collection on the Luna database, and the Art Gallery of Ontario on ARTstor, all used various VRA elements in addition to locally created elements. Database records were chosen randomly to include visual works of art such as paintings, mural, and similar works of visual art. Through analysis of data usage, research showed overall fluctuations throughout institutions. Overall, the data showed descriptive elements such as Work, Image, or Collection, worktype, title, agent, date, location, source, and textref were most populated and used almost 100% of the time. While elements like technique, inscription, stateEdition, subject, relation, and description were least used, with a frequency from 0-45% of the time. One element was unused across all institutions: stateEdition. See Figure 4.

Figure 4. Overall Usage Table

Element Name	CMA Usage Percentage	CMA Total n = 20	Luna Usage Percentage	Luna Total n = 20	AGO Usage Percentage	AGO Total n = 20	Total Percentage	Total Usage
Work, Image, or Collection	100%	20	100%	20	100%	20	100%	3 out of 3
Agent	100%	20	100%	20	100%	20	100%	3 out of 3
Date	100%	20	100%	20	100%	20	100%	3 out of 3
Location	100%	20	100%	20	100%	20	100%	3 out of 3
Worktype	100%	20	100%	20	100%	20	100%	3 out of 3
Title	100%	20	100%	20	100%	20	100%	3 out of 3
Measurements	100%	20	5%	1	100%	20	68%	3 out of 3
Material	100%	20	5%	1	100%	20	68%	3 out of 3
Technique	15%	3	-	-	-	-	5%	1 out of 3
Textref	100%	20	100%	20	100%	20	100%	3 out of 3
StylePeriod	95%	19	100%	20	-	-	65%	2 out of 3
CulturalContext	100%	20	100%	20	-	-	67%	2 out of 3
Subject	-	-	100%	20	15%	3	38%	2 out of 3
Source	100%	20	95%	19	100%	20	98%	3 out of 3
Relation	65%	13	-	-	-	-	22%	1 out of 3
Rights	100%	20	-	-	100%	20	67%	2 out of 3
Inscription	65%	13	-	-	-	-	22%	1 out of 3
StateEdition	-	-	-	-	-	-	-	0 out of 3
Description	100%	20	35%	7	-	-	45%	2 out of 3

The Cleveland Museum of Arts VRA Usage: As the data showed, the CMA employed the widest use of VRA elements, with 17 total. There were only three unpopulated/lesser populated elements: technique, subject, and stateEdition. Technique was used at a frequency of only 5%. The elements subject and stateEdition were not used. Additional elements such as relation and inscription were lower on the usage scale, at a frequency of 65%. All other elements used were within the 95-100% range.

University of Chicago's Art History Image Collection on Luna database's VRA Usage: Luna used 14 VRA elements. Unpopulated and lesser populated elements included measurement,

material, technique, relation, inscription, and stateEdition. The element stateEdition was not used. Additional elements like technique, styleperiod, culturalContext, relation, inscription, and stateEdition were unused on the Luna database. The elements measurement and material both had a usage rate of 5%, while the description usage rate was around 35%. All additional elements from the Luna's database were used at a frequency of 95-100%.

The Art Gallery of Ontario's VRA Usage: AGO used 14 VRA elements. The most populated elements occurred at a 100% frequency rate. The element stateEdition was not used. Unpopulated elements include technique, culturalContext, relation, description, stylePeriod, inscription, with a 0% frequency usage. The only lesser populated element was subject with 15% usage.

Additional Usage Examination

Controlled Vocabularies: Controlled vocabulary was a beneficial study in addition to the VRA schema because it allowed the translation of vocabulary, consistency, and provided an aid for browsing and ease of retrieval. Subject headings and controlled vocabulary were analyzed through a small sample across 3 repositories. Analyzed records included: 1 record from CMA, 1 record from Luna, and 3 records from AGO.

Figure 5. Subject Headings and Controlled Vocabulary Data Set.

Record Name	Subject Values	Controlled Vocab Used	Repository	Repository Subject Usage %
<i>Vase of Flowers</i>	<i>Not applicable*</i>	TGM 1, AAT, and Uncontrolled	CMA	0%
<i>Seeds of Our Culture, detail of President Obama and Family Panel</i>	Mural painting and decoration Woodlawn (Chicago Ill.)	LCSH	Luna	100%

	South Side (Chicago, IL.)			
<i>Family Painting, No 1: In Labour</i>	Synthetism painting	Uncontrolled	AGO	15%
<i>Jeune Femme Couchée</i>	Bulgarian art	LCSH	AGO	15%
<i>Portrait of a Woman</i>	pastels 18 th century 18 th century portrait	LCSH	AGO	15%

* CMA did not use the subject elements throughout the 20 analyzed records.

CMA Controlled Vocabulary Usage: Using Figure 5., researchers noted that out of the 20 digitized paintings, the usage of the subject element was at a rate of 0%. There were no explicit elements listed as the subject of the art. With this understanding, additional analyzed elements were used to locate and determine controlled or uncontrolled vocabulary. Examining the painting *Vase of Flowers*, revealed no prescribed subject headings or the subject element.³⁵ Researchers had to analyze various elements such as ‘medium,’ ‘type of artwork,’ ‘department,’ and ‘physical location’ in the repository to determine controlled and uncontrolled vocabulary usage. ‘Medium’ was listed as oil on canvas, while ‘type of artwork’ was listed as painting. The painting ‘department’ was listed as Modern European Painting and Sculpture and was ‘located’ in the impressionism and post-impressionism wing of the museum. A search of vocabulary-generating databases found subject terms across various databases. Using the Library of Congress’s Thesaurus for Graphic Materials (TGM 1)³⁶, users found the subject terms painting and oil painting. The term oil on fabric did not appear in any controlled vocabulary databases. The closest result to oil on fabric was the term oil painting in the TGM 1. Because the term oil painting did not appear in any search, researchers believed was a locally created element. For the ‘department’ element research found the terms modern European, painting, and sculpture in both the TGM 1³⁷ and the Art & Architecture Thesaurus (AAT)³⁸. Additionally, researchers found the terms impressionism and post-impressionism, listed under the element sculpture in the AAT.

³⁵ Odilon Redon, *Vase of Flowers*. 1905. Oil on canvas. 90.8 x 10.2 cm, Cleveland Museum of Art, Cleveland, <https://www.clevelandart.org/art/1935.233>.

³⁶ “Search This Collection,” Thesaurus for Graphic Materials, Accessed May 20th 2023, <https://www.loc.gov/pictures/collection/tgm/>.

³⁷ Thesaurus for Graphic Materials, “Search This Collection.”

³⁸ “Search the AAT,” Art & Architecture® Online, The Getty Research Institute, accessed May 21st, 2023, <https://www.getty.edu/research/tools/vocabularies/aat/>.

From this understanding, research determined that the Cleveland Museum of Art used both controlled, AAT and TGM 1, and uncontrolled, keyword vocabulary.

Luna Controlled Vocabulary Usage: Using Figure 5. researchers understood that out of the twenty photographed murals, the usage of the subject element was at a rate of 100%. To understand the subject elements used throughout the University of Chicago's database, researchers analyzed the mural *Seeds of Our Culture, detail of President Obama and Family panel*.³⁹ This database entry employed the use of various subject terms. This specific mural had three tags: mural painting and decoration, Woodlawn (Chicago, Ill.), and South Side (Chicago, IL). Performing a quick search of controlled vocabulary-generating websites revealed terms on the subject heading website Library of Congress Authorities.⁴⁰ From this understanding, researchers concluded that The University of Chicago's Art History digital database employed the LCSH vocabulary scheme and no uncontrolled vocabulary.

AGO Controlled Vocabulary Usage: Using the Excel spreadsheet dataset, researchers viewed that out of the twenty digitized paintings, the usage of the subject element was at a rate of 15%. Only three out of the twenty paintings contained written subject tags. To understand the listed subject terms, researchers analyzed the three paintings utilizing the subject element. The first painting, *Family Painting, No 1: In Labour*, contained one subject tagged: synthetism painting.⁴¹ The second painting, *Jeune Femme Couchée*, additionally used one subject tagged: Bulgarian art.⁴² The last painting *Portrait of a Woman*, used two tagged subject headings: pastels 18th century and 18th century portrait.⁴³ Performing a search of controlled vocabulary sites revealed that most subject headings describing the artwork of the Ontario Gallery were found in the Library of Congress Authorities website.⁴⁴ However, the subject tag, 'syntheticism painting', did not appear in the LCSH database and instead was an uncontrolled vocabulary. The likely

39 Arlena Turner Crawford and Rahmaan Barnes. *Sees of Our Culture, detail of President Obama and Family*. 2017, the Visual Resource Center, Chicago, <https://luna.lib.uchicago.edu/luna/servlet/detail/UCHICAGO~12~12~6~1309652:Seeds-of-Our-Culture.-detail-of-Pre?qvq=lc:uofclibmgr2~9~9,UCHICAGO~19~19,uofclibmgr2~3~3,UCHICAGO~12~12,uofclibmgr2~10~10,UCHICAGO~6~6,UCHICAGO~18~18,UCHICAGO~17~17,UCHICAGO~3~3,uofclibmgr2~4~4,UCHICAGO~20~20,uofclibmgr2~5~5,UCHICAGO~2~2,UCHICAGO~15~15,uofclibmgr2~7~7&mi=5&trs=20819>.

40 Authority Headings Search," Library of Congress Authorities, accessed May 21st, 2023, <https://authorities.loc.gov/cgi-bin/Pwebrecon.cgi?DB=local&PAGE=First>.

41 Greg, Curnoe, *Family Painting No 1: Labour*. 1966. Oil, synthetic paint, unidentified plastic, screws and finishing washers on plywood, framed with acrylic. 123.5 x 123.5 cm. The Art Gallery of Ontario, Ontario. https://library.artstor.org/#/asset/AAGOIG_10313895733;prevRouteTS=1683167446980.

42 Jules, Pascin, *Jeune Femme Couchée*, 1920, Painting, 73 x 91.4 cm, Art Gallery of Ontario, Ontario, https://library.artstor.org/#/asset/AAGOIG_10313895866;prevRouteTS=1683167210998.

43 Rosalba, Carriera, *Portrait of a Woman*, Early 18th century, Pastel on blue laid paper, 31 x 25 cm, Art Gallery of Ontario, Ontario, https://library.artstor.org/#/asset/AAGOIG_10313895702;prevRouteTS=1683297226512.

44 Library of Congress Authorities, "Authority Headings Search."

reason this repository used uncontrolled vocabulary could be due to the repository's need to create local tags when controlled terms do not fit the museum's subject heading qualifications. Research identified that both controlled, LCSH, and uncontrolled, local terms, were used to describe the subject element for the Art Gallery of Ontario.

Subject Headings: Overall, each repository used its qualifications to determine the usage of controlled or uncontrolled vocabularies for subject headings. Whenever repositories use the same controlled vocabularies to describe the subject element, chances of consistency and interoperability greatly increase, making use more likely throughout each repository. And although uncontrolled vocabularies do not appear widely throughout databases, there are benefits to including these locally created subject terms because they are valuable to the community for which they are created. By using both controlled and uncontrolled vocabulary in the repository, users are more likely to find the subjects they seek.

Metadata Quality:

Upon evaluating the three repositories, researchers found that none of the repositories employed local metadata creation guidelines, despite the usage of local elements throughout records. Therefore, during the remainder of the analysis, the metadata standard guidelines for VRA Core were employed. Throughout the research process, the analysis found that each institution, for the most part, followed the VRA Core's guidelines dictated for element creation. But with the implementation of the VRA standards came the use of localized elements in separate from the original 19 standards. Understanding the difference between the use of local elements versus standardized elements was an important concept that allowed researchers to evaluate discrepancies in the completeness, accuracy, and consistency of data value and input. Twenty digital records were analyzed across three repositories. But for this analysis, researchers sampled 4 records from each repository, the total number of records being 12 (when n=12.)

From each institution, four records were chosen through a random selection process. The digital artworks selected from the Cleveland Museum of Art's digital database included: *Portrait of Isabella Brant*,⁴⁵ *Utopia*,⁴⁶ *Abstract Painting (750-1)*,⁴⁷ and *Villas at Trouville*.⁴⁸ The four

45 Peter Paul Rubens, *Portrait of Isabella Brant*, C. 1620-25, Oil on wood, 83 x 73.5 x 9 cm, Cleveland Museum of Art, Cleveland, <https://www.clevelandart.org/art/1947.207>.

46 René Magritte, Watercolor and gouache, 32.1 x 41.8 cm, Cleveland Museum of Art, Cleveland, <https://www.clevelandart.org/art/1992.275>.

47 Gerhard, Richter, *Abstract Painting (750-1)*, 1991, Oil on canvas, 260 x 200 x 3.5 cm, Cleveland Museum of Art, Cleveland, <https://www.clevelandart.org/art/1995.74>.

48 Gustave Caillebotte, *Villas at Trouville*, 1884, oil on canvas, 66 x 81.3 cm, Cleveland Museum of Art, Cleveland, <https://www.clevelandart.org/art/2020.105>.

digital items selected from the University of Chicago's Luna Database included: *La Crucifixion de Don Pedro Albizu Campos*,⁴⁹ *University Alley/Rip-off*,⁵⁰ *Builders of the Cultural Present*,⁵¹ and *Dr. King Mural*.⁵² The digital art selected from the Art Gallery of Ontario's ARTstor database included: *Falaises à Etrétat*,⁵³ *Two Women on a Wharf*,⁵⁴ *Vétheuil en été*,⁵⁵ and *The Rain Clouds, Paris*.⁵⁶

Analyzing the first repository, researchers immediately viewed that in each record digitally housed in The Cleveland Museum of Art's database, there were numerous unlisted and unspecified VRA elements. Researchers inferred as to which elements were represented for about 50% of the digital record. Elements such as title, measurement, technique, agent, date, textref, style/period, culturalContext, and subject were not explicitly provided in digital records throughout the repository. With this explicit lack of elements, researchers mapped data values with the corresponding VRA elements. With this understanding, researchers then began the process of comparing records, paying special attention to the completeness of data elements.

49 Jose Bermudez, Mario Galan, and Hector Rosario, *La Crucifixion de Don Pedro Albizu Campos*, 1971, The Visual Resource Center, Chicago,

<https://luna.lib.uchicago.edu/luna/servlet/detail/uofclibmgr2~10~10~119579~122369:La-Crucifixion-de-Don-Pedro-Albizu-?qvq=w4s:/what%2FPublic%2Bart%2F:lc:uofclibmgr2~7~7,uofclibmgr2~10~10,UCHICAGO~18~18,uofclibmgr2~4~4,UCHICAGO~6~6,UCHICAGO~2~2,UCHICAGO~19~19,uofclibmgr2~9~9,UCHICAGO~12~12,UCHICAGO~17~17,uofclibmgr2~5~5,UCHICAGO~20~20,uofclibmgr2~3~3,UCHICAGO~15~15,UCHICAGO~3~3&mi=21&trs=1136>.

50 Mitchell Caton, *Universal Alley / Rip-off*, 1970-1974, The Visual Resource Center, Chicago,

<https://luna.lib.uchicago.edu/luna/servlet/detail/uofclibmgr2~10~10~119475~122339:Universal-Alley--Rip-off?qvq=w4s:/what%2FPublic%2Bart%2F:lc:uofclibmgr2~9~9,uofclibmgr2~7~7,uofclibmgr2~3~3,UCHICAGO~3~3,UCHICAGO~20~20,UCHICAGO~19~19,UCHICAGO~6~6,uofclibmgr2~4~4,UCHICAGO~15~15,UCHICAGO~17~17,uofclibmgr2~10~10,UCHICAGO~18~18,uofclibmgr2~5~5,UCHICAGO~2~2,UCHICAGO~12~12&mi=55&trs=1136>.

51 Mitchell Caton and Calvin Jones, *Builders of the Cultural Present*, 1981, The Visual Resource Center, Chicago,

<https://luna.lib.uchicago.edu/luna/servlet/detail/uofclibmgr2~10~10~120622~122616:Builders-of-the-Cultural-Present?qvq=w4s:/what%2FPublic%2Bart%2F:lc:uofclibmgr2~9~9,uofclibmgr2~7~7,uofclibmgr2~3~3,UCHICAGO~3~3,UCHICAGO~20~20,UCHICAGO~19~19,UCHICAGO~6~6,uofclibmgr2~4~4,UCHICAGO~15~15,UCHICAGO~17~17,uofclibmgr2~10~10,UCHICAGO~18~18,uofclibmgr2~5~5,UCHICAGO~2~2,UCHICAGO~12~12&mi=85&trs=1136>.

52 Public Art Workshop. *Dr. King Mural*. 1972. The Visual Resource Center, Chicago. <https://luna.lib.uchicago.edu/luna/servlet/detail/uofclibmgr2~10~10~120650~1231743:Dr--King-Mural?qvq=w4s:/what%2FPublic%2Bart%2F:lc:UCHICAGO~3~3,UCHICAGO~17~17,UCHICAGO~18~18,UCHICAGO~2~2,UCHICAGO~20~20,uofclibmgr2~4~4,UCHICAGO~15~15,UCHICAGO~12~12,UCHICAGO~19~19,UCHICAGO~6~6,uofclibmgr2~5~5,uofclibmgr2~7~7,uofclibmgr2~10~10,uofclibmgr2~3~3,uofclibmgr2~9~9&mi=123&trs=1136>.

<https://luna.lib.uchicago.edu/luna/servlet/detail/uofclibmgr2~10~10~120650~1231743:Dr--King-Mural?qvq=w4s:/what%2FPublic%2Bart%2F:lc:UCHICAGO~3~3,UCHICAGO~17~17,UCHICAGO~18~18,UCHICAGO~2~2,UCHICAGO~20~20,uofclibmgr2~4~4,UCHICAGO~15~15,UCHICAGO~12~12,UCHICAGO~19~19,UCHICAGO~6~6,uofclibmgr2~5~5,uofclibmgr2~7~7,uofclibmgr2~10~10,uofclibmgr2~3~3,uofclibmgr2~9~9&mi=123&trs=1136>.

53 Eugène Louis Boudin, *Falaises à Etrétat*, 1894, painting, 31.8 x 44.8 cm, Art Gallery of Ontario, Ontario,

https://library.artstor.org/#/asset/AAGOIG_10313895943;prevRouteTS=1683167369291.

54 Willem de Kooning, *Two Women on a Wharf*, 1949, oil, enamel, graphite, and collage on wove paper, 62.1 x 62.4 cm, Art Gallery of Ontario, Ontario,

https://library.artstor.org/#/asset/AAGOIG_10313895926;prevRouteTS=1683296408432.

55 Claude Monet, *Vétheuil en été [Vétheuil in Summer]*, 1879, painting, 67.7 x 90.5 cm, Art Gallery of Ontario, Ontario,

https://library.artstor.org/#/asset/AAGOIG_10313895893;prevRouteTS=1683296834193.

56 Robert Henri, *The Rain Clouds, Paris*, 1899, oil on canvas, 82.2 x 98.8 x 5.7 cm, Art Gallery of Ontario, Ontario,

https://library.artstor.org/#/asset/AAGOIG_10313895801;prevRouteTS=1683297385839.

Completeness: Throughout each repository, elements like title, date, and agent, were used consistently 100% of the time. Discrepancies arose when viewing various elements such as subject, inscription, material, technique, culture, relation, description, stylePeriod, measurement, and rights. Analyzing all 12 documents, researchers noticed a major disparity in elements like subject and inscription. For example, viewing the twelve data records, researchers found that the element inscription was only used for 50% of the data records chosen from the CMA, neither Luna nor AGO implemented inscription throughout their eight data records. The element subject was additionally interesting because of the lack of its implementation. Even though subject is an important element that allows users access to similar records through linked data, the element was only ever explicitly used in Luna's digital records which occurred 100% of the time. Additional issues arose when researchers interpreted all twelve records for elements like measurement, rights, and material. While Luna's database was consistent for most of its implementation of VRA, elements like measurement, rights, and material, failed to meet the same standard. This point was understood because all three elements were recorded 100% of the time for both CMA and AGO; Luna used the material and measurement records only 25% and did not have any recorded data for the rights element.

In addition to these inconsistencies, it was necessary to interpret some of the locally added elements unique to each institution. For example, CMA's local elements included sections on videos about the painting, an artist biography, the exhibition's history, and a Contact Us section for users. Local elements for Luna included the course instructor, local call number, and collection name. AGO included local elements that allowed users to report errors and search file names. Through understanding both the consistency of element usage and locally created elements, researchers noticed significant variations in the completeness of data elements for the analyzed digital records.

Accuracy: Examining the accuracy of data values and input presented researchers with other issues in determining the interoperability of the three repositories. Accuracy was examined throughout the 12 data records to locate discrepancies in standard abbreviations. Upon reviewing the various data records, research showed there was a divergence in the standard abbreviations of the word circa. In Luna, circa was abbreviated 'ca.' while in CMA the word was abbreviated to 'c.' An additional element where standard abbreviations diverged from the norm was CMA's

abbreviation of collections. Throughout all eight item records for Luna and AGO, the full identifier for the collection element was spelled out, whereas, at CMA the collection element was abbreviated. For example, on AGO, the collection name given for one of the records was listed as ‘Art Gallery of Ontario’, while the data value given for the CMA’s collection element was abbreviated and written as ‘Mod Euro – Paintings 1800-1960.’ This inconsistency of standardized abbreviations demonstrated problems with semantic interoperability.

Consistency: The final element analyzed in this study was the consistency of data values and inputs throughout all repositories. Consistency was analyzed first by viewing any possible variations in spelling, punctuation, and order. Researchers initially evaluated the order of the elements throughout each record, which proved a significant difference throughout the repositories. For example, every repository’s first listed data element was different; CMA used the title element while Luna used collection and AGO used the creator element first. Punctuation was an additional area of discrepancy. Researchers found that punctuation did not occur very frequently throughout each repository. The lack of punctuation was understood through an analysis of various elements in each repository. Researchers found that punctuation was used sparingly and not frequently enough throughout the repositories. Spelling was an additional element where each repository diverged. Because the same phrase used in both the CMA and AGO was not standardized, while the material element’s data value was listed as ‘oil on canvas,’ the spellings were not the same; CMA capitalized ‘Oil’ while AGO did not.

Conclusion:

The purpose of this research was to test the effectiveness of VRA Core 4.0 metadata schema for interoperability throughout the three repositories. The project goals and methods included evaluating the frequency of usage of VRA elements through 60 data records, defining inconsistencies and consistencies, unused elements, and issues with accuracy, completeness, and the possibility of interoperability. Within each repository, 20 data records were analyzed and mapped to VRA standards; controlled and local vocabularies were interpreted across each repository. Overall frequency research showed that descriptive elements like Work, Image, or

Collection, worktype, title, agent, date, location, etc. were used almost 100% of the time. Lesser used elements included technique, inscription, stateEdition, etc., and were only used from 0-45% of the time. Select elements throughout repositories were unused like stateEdition, while inscription, relation, technique, etc., were unused at Luna, and AGO. Accuracy was examined through standard abbreviations; research determined issues with frequency and usage. Additionally, variations in consistency and completeness occurred throughout repositories. Frequency research revealed a myriad of issues exist preventing widespread interoperability. But with the aid of this research, these institutions have a jumping-off point from which to start their review process.

Bibliography:

ARTSTOR. "Art Gallery of Ontario." Accessed May 15, 2023.

<https://www.artstor.org/collection/art-gallery-ontario/>.

Bermudez, Jose, Galan, Mario, and Rosario, Hector. *La Crucifixion de Don Pedro Albizu*

Campos. 1971. The Visual Resource Center, Chicago.

<https://luna.lib.uchicago.edu/luna/servlet/detail/uofclibmgr2~10~10~119579~122369:La-Crucifixion-de-Don-Pedro-Albizu-?qvq=w4s:/what%2FPublic%2Bart%2F;lc:uofclibmgr2~7~7,uofclibmgr2~10~10,UCHICAGO~18~18,uofclibmgr2~4~4,UCHICAGO~6~6,UCHICAGO~2~2,UCHICAGO~19~19,uofclibmgr2~9~9,UCHICAGO~12~12,UCHICAGO~17~17,uofclibmgr2~5~5,UCHICAGO~20~20,uofclibmgr2~3~3,UCHICAGO~15~15,UCHICAGO~3~3&mi=21&trs=1136>.

Boudin, Eugène Louis, *Falises à Etréat*. 1894. Painting. 31.8 x 44.8 cm. Art Gallery of Ontario, Ontario.

https://library.artstor.org/#/asset/AAGOIG_10313895943;prevRouteTS=1683167369291.

Caillebotte, Gustave. *Villas at Trouville*. 1884. Oil on canvas. 66 x 81.3 cm. Cleveland Museum of Art, Cleveland. <https://www.clevelandart.org/art/2020.105>.

Carriera, Rosalba. *Portrait of a Woman*. Early 18th century. Pastel on blue laid paper. 31 x 25 cm. Art Gallery of Ontario, Ontario.

https://library.artstor.org/#/asset/AAGOIG_10313895702;prevRouteTS=1683297226512.

Caton, Mitchell. *Universal Alley / Rip-off*. 1970-1974. The Visual Resource Center, Chicago.

<https://luna.lib.uchicago.edu/luna/servlet/detail/uofclibmgr2~10~10~119475~122339:Universal-Alley---Rip-off?qvq=w4s:/what%2FPublic%2Bart%2F;lc:uofclibmgr2~9~9,uofclibmgr2~7~7,uofclibmgr2~3~3,UCHICAGO~3~3,UCHICAGO~20~20,UCHICAGO~19~19,UCHICAGO~6~6,uofclibmgr2~4~4,UCHICAGO~15~15,UCHICAGO~17~17,uofclibmgr2~10~10,UCHICAGO~18~18,uofclibmgr2~5~5,UCHICAGO~2~2,UCHICAGO~12~12&mi=55&trs=1136>.

Caton, Mitchell and Jones, Calvin. *Builders of the Cultural Present*. 1981. The Visual Resource Center, Chicago.

<https://luna.lib.uchicago.edu/luna/servlet/detail/uofclibmgr2~10~10~120622~122616:Builders-of-the-Cultural-Present?qvq=w4s:/what%2FPublic%2Bart%2F;lc:uofclibmgr2~9~9,uofclibmgr2~7~7,uofclibmgr2~3~3,UCHICAGO~3~3,UCHICAGO~20~20,UCHICAGO~19~19,UCHICAGO~6~6,uofclibmgr2~4~4,UCHICAGO~15~15,UCHICAGO~17~17,uofclibmgr2~10~10,UCHICAGO~18~18,uofclibmgr2~5~5,UCHICAGO~2~2,UCHICAGO~12~12&mi=85&trs=1136>.

ClevelandArt. "General Museum Fact Sheet." Accessed June 10, 2023.

<https://www.clevelandart.org/sites/default/files/documents/other/General%20Museum%20Fact%20Sheet%202014.pdf>.

Crawford, Arlena Turner, and Barnes, Rahmaan. *Seeds of Our Culture, detail of President Obama and Family*. 2017. The Visual Resource Center, Chicago.

<https://luna.lib.uchicago.edu/luna/servlet/detail/UCHICAGO~12~12~6~1309652:Seeds-of-Our-Culture,-detail-of-President-Obama-and-Family?qvq=lc:uofclibmgr2~9~9,UCHICAGO~19~19,uofclibmgr2~3~3,UCHICAGO~12~12,uofclibmgr2~10~10,UCHICAGO~6~6,UCHICAGO~18~18,UCHICAGO~17~17,UCHICAGO~3~3,uofclibmgr2~4~4,UCHICAGO~20~20,uofclibmgr2~5~5,UCHICAGO~2~2,UCHICAGO~15~15,uofclibmgr2~7~7&mi=5&trs=20819>.

Curnoe, Greg. *Family Painting No 1: Labour*. 1966. Oil, synthetic paint, unidentified plastic, screws and finishing washers on plywood, framed with acrylic. 123.5 x 123.5 cm. The Art Gallery of Ontario, Ontario.

https://library.artstor.org/#/asset/AAGOIG_10313895733;prevRouteTS=1683167446980.

de Kooning, Willem. *Two Women on a Wharf*. 1949. Oil, enamel, graphite, and collage on wove paper. 62.1 x 62.4 cm. Art Gallery of Ontario, Ontario.

https://library.artstor.org/#/asset/AAGOIG_10313895926;prevRouteTS=1683296408432.

Henri, Robert. *The Rain Clouds, Paris*. 1899. Oil on canvas. 82.2 x 98.8 x 5.7 cm. Art Gallery of Ontario, Ontario.

https://library.artstor.org/#/asset/AAGOIG_10313895801;prevRouteTS=1683297385839.

Library of Congress Authorities. "Authority Headings Search." Accessed May 21st, 2023.
<https://authorities.loc.gov/cgi-bin/Pwebrecon.cgi?DB=local&PAGE=First>.

Magritte, René. *Utopia*. 1945. Watercolor and gouache. 32.1 x 41.8 cm. Cleveland Museum of Art, Cleveland. <https://www.clevelandart.org/art/1992.275>.

METS. "METS: An Overview & Tutorial." Accessed June 5, 2023.
https://www.loc.gov/standards/mets/METSOverview.v3_en.html.

Monet, Claude. *Vétheuil en été [Vétheuil in Summer]*. 1879. Painting. 67.7 x 90.5 cm. Art Gallery of Ontario, Ontario.
https://library.artstor.org/#/asset/AAGOIG_10313895893;prevRouteTS=1683296834193.

Pascin, Jules. *Jeune Femme Couchee*. 1920. Painting. 73 x 91.4 cm. Art Gallery of Ontario, Ontario.
https://library.artstor.org/#/asset/AAGOIG_10313895866;prevRouteTS=1683167210998.

Public Art Workshop. *Dr. King Mural*. 1972. The Visual Resource Center, Chicago.
<https://luna.lib.uchicago.edu/luna/servlet/detail/uofclibmgr2~10~10~120650~1231743:Dr--King-Mural?qvq=w4s:/what%2FPublic%2Bart%2F;lc:UCHICAGO~3~3,UCHICAGO~17~17,UCHICAGO~18~18,UCHICAGO~2~2,UCHICAGO~20~20,uofclibmgr2~4~4,UCHICAGO~15~15,UCHICAGO~12~12,UCHICAGO~19~19,UCHICAGO~6~6,uofclibmgr2~5~5,uofclibmgr2~7~7,uofclibmgr2~10~10,uofclibmgr2~3~3,uofclibmgr2~9~9&mi=123&trs=1136>.

Redon, Odilon. *Vase of Flowers*. 1905. Oil on canvas. 90.8 x 10.2 cm. Cleveland Museum of Art, Cleveland. <https://www.clevelandart.org/art/1935.233>.

Richter, Gerhard. *Abstract Painting (750-1)*. 1991. Oil on canvas. 260 x 200 x 3.5 cm. Cleveland Museum of Art, Cleveland. <https://www.clevelandart.org/art/1995.74>.

Rubens, Peter Paul. *Portrait of Isabella Brant*. C. 1620-25. Oil on wood. 83 x 73.5 x 9 cm. Cleveland Museum of Art, Cleveland. <https://www.clevelandart.org/art/1947.207>.

The Getty Research Institute. "Search the AAT." Art & Architecture® Online. Accessed May 21st, 2023. <https://www.getty.edu/research/tools/vocabularies/aat/>.

Thesaurus For Graphic Materials. "Search This Collection." Accessed May 20th, 2023.
<https://www.loc.gov/pictures/collection/tgm/>.

The Visual Resources Center. "Luna." Collections. Accessed June 5, 2023.

<https://vrc.uchicago.edu/collections/luna>.

VRA Core. "VRA Core 4.0 Element Description and Tagging Examples." VRA Core Schemas and Documentation. Last modified April 5, 2007.

<https://www.loc.gov/standards/vracore/schemas.html>.

VRA Core. "VRA Core 4.0 Introduction." VRA Core Schemas and Documentation. Last modified October 28, 2014. <https://www.loc.gov/standards/vracore/schemas.html>.

Appendix 1: Database URLs

Cleveland Museum of Art: <https://www.clevelandart.org/art/collection/search>

University of Chicago's Art History Image Collection on Luna database:

<https://luna.lib.uchicago.edu/luna/servlet/view/all>

The Art Gallery of Ontario on ARTstor: <https://library.artstor.org/#/category/1035284832>

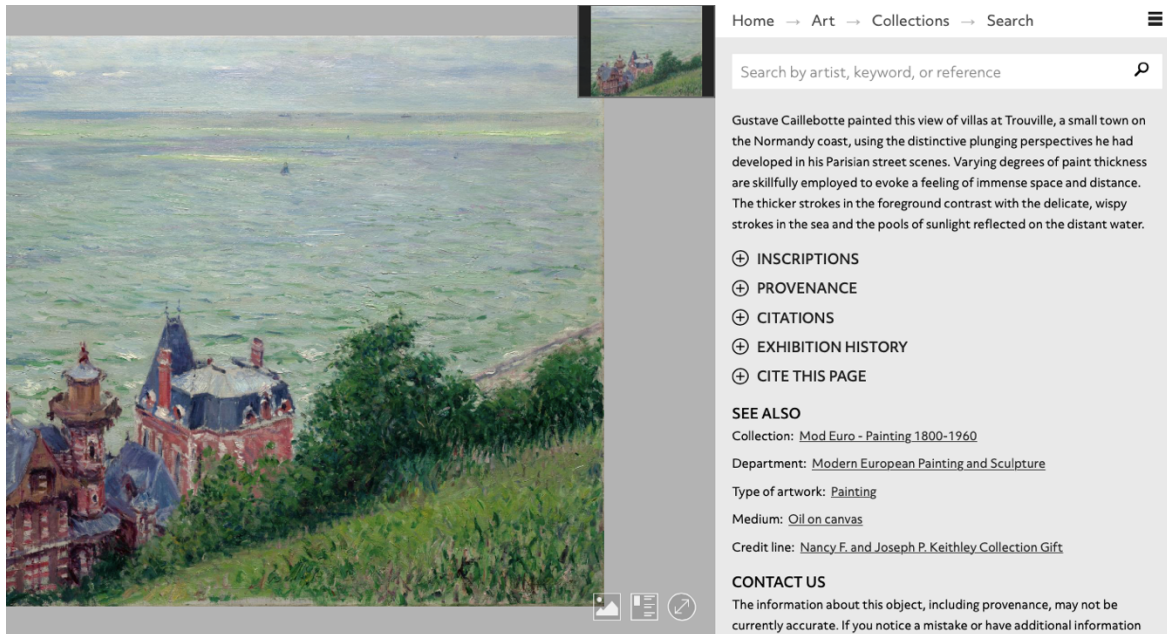
Appendix 2: Repository Selection:

The process was as follows: I selected the Cleveland Museum of Arts because of its use of the VRA Core function as provided by the project guidelines. For the next repository I emailed the Philadelphia Museum of Art, and they pointed me to the University of Chicago's Art History Image Collection on the Luna database. The last repository was chosen from a list found on the same project guidelines as before; I randomly chose the Art Gallery of Ontario from a cursory search of public collections available on the ARTstor database.

Appendix 3: Data Collection and Selection Note

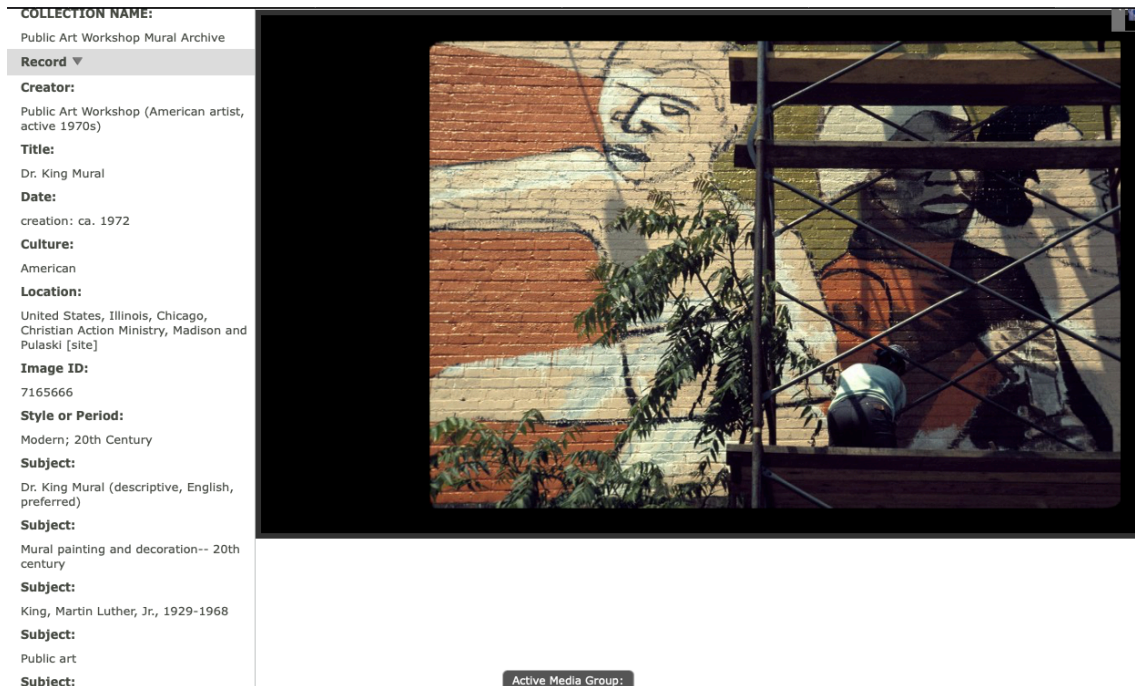
Attached is the raw data for the project. I began writing the data through individual input on the Excel spreadsheet. I created 3 spreadsheets for VRA usage, 3 for VRA mapping, a spreadsheet summarizing the usage percentages across the three repositories, and an overall usage spreadsheet with element names, descriptions, percentages, and the total number of repositories out of 3 where the select data element was used. Data was selected at random across each repository through a cursory scroll.

Appendix 4: Sample Metadata Records



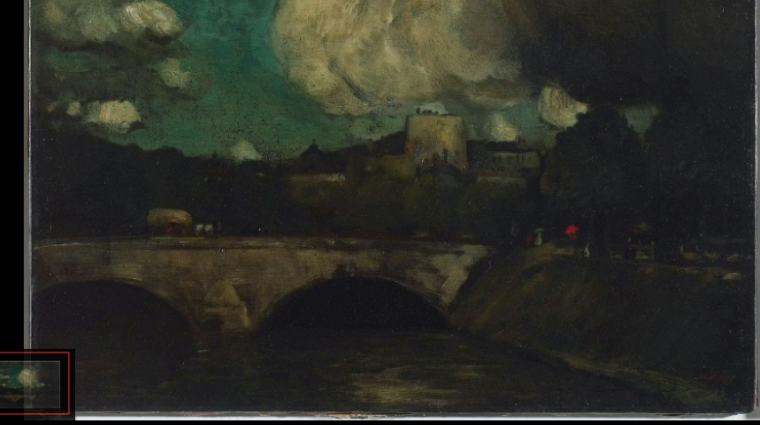
Cleveland Museum of Art sample metadata record *Villas at Trouville*. Find the digital record here: [link](#)

Note: the above screenshot does not represent the full record



University of Chicago's Art History Image Collection on Luna database sample metadata record of *Dr. King Mural*. Find the digital record here: [link](#)

Note: the above screenshot does not represent the full record



[this viewer with your keyboard](#)

Creator
[Robert Henri \(American, 1865-1929\)](#)

Title
The Rain Clouds, Paris

Work Type
Painting

Date
c. 1899

Material
oil on canvas

Measurements
Frame: 82.2 x 98.8 x 5.7 cm (32 3/8 x 38 7/8 x 2 1/4 in.)
Overall: 65.6 x 81.7 cm (25 13/16 x 32 3/16 in.)

Repository
Art Gallery of Ontario
Anonymous Gift, 1991

Accession Number
91/463

Collection
[Art Gallery of Ontario](#)

ID Number
43724

Source
Image and original data provided by the Art Gallery of Ontario
<http://www.ago.net/>

Rights
Image © Art Gallery of Ontario

The Art Gallery of Ontario on ARTstor sample metadata record *The Rain Clouds, Paris*.

Find the digital record here: [link](#)

Note: the above screenshot does not represent the full record