Modeling Ontologies for Individual Artists

A Case Study of a Dutch Ceramic-Glass Sculptor

Daan Raven[1,2], Victor de Boer[2], Erik Esmeijer, Johan Oomen[1]

[1] Netherlands Institute for Sound and Vision, Hilversum, The Netherlands
[2] Vrije Universiteit Amsterdam, Amsterdam, The Netherlands
{ravendaan98@gmail.com, v.de.boer@vu.nl, erik@aie.nl, joomen@beeldengeluid.nl}

There is a long tradition in the Cultural Heritage domain [1,2] of using structured, machine-interoperable knowledge using semantic methods and tools. However, research into developing and using ontologies specific to works of art of individual artists is persistently lacking. Such knowledge graphs would improve access to heritage information by making reasoning and inferencing possible. We present a re-usable method, building on the 'Methontology' method for ontology development [3]. We describe the steps of *specification*, *conceptualization*, *integration*, *implementation* and *evaluation* in a case study concerning ceramic-glass sculptor Barbara Nanning[1]. The ontology specifies activities of the creative and productive processes. Challenges were to model design and production processes in general and particular glass-techniques specifically. We reuse existing vocabularies including those in the *Termennetwerk*[2]. We present the overall method and results, details and intermediary results can be found in [4,5].

Figure 1: Images of the work and process of Nanning. Left: a collaborator is working on the glass object. Middle: two Verre Eglomise works. Right: the artist at work. (images reused with permission by Barbara Nanning)

---

[1] http://www.barbarananning.nl/

[2] provided by Netwerk Digitaal Erfgoed and CLARIAH https://termennetwerk.netwerk-digitaalerfgoed.nl/

Specification. First, purpose and requirements of the ontology were determined through analysis of domain literature and conducting structured and unstructured interviews with the artist resulting in *competency questions*. Focus was restricted to two subdomains: *Verre Églomisé*[3] and *Coloured Shadows*[4]. Verre Églomisé emphasizes primacy of creativity and aesthetics, realized by means of elementary forms produced by straightforward yet specific glass technologies in combination with highly specialized crafts (blowing grinding gilding). Coloured Shadows emphasizes sophistication in variety of high-end glass technologies and crafts required in order to realize creative and aesthetic (artistic) goals. Table 1 lists the eight competency questions.

Table 1: Competency questions used for specification and evaluation

Competency Question
CQ-VE-1: What are two tallest Verre Églomisé artworks?
CQ-VE-2: Describe the equipment used for sandblasting of Verre Églomisé artworks.
CQ-VE-3: Which Verre Églomisé artworks are currently stored in her private collection?
CQ-VE-4: Describe the technique last applied in the creation process of the 'Go with the Flow' artwork; which parties were involved in this technique?
CQ-VE-5: List the links to the digital representations of the Verre Églomisé artworks?
CQ-CS-1: What are the three newest Colored Shadows artworks?
CQ-CS-2: What activities are part of the creation process of the 'Beneath the Water' CS artwork; where have these activities taken place?
CQ-CS-3: What are the materials processed in the creation process of the 'Coral Reef' Colored Shadows artwork and during what activities were these materials processed?

Literature analysis and interviews with the artist were also used to identify key terms and concepts, resulting in 946 terms and definitions

Conceptualization. The identified terms were turned into concepts and hierarchically structured. A total of 794 instances, 121 concepts and 31 relations or attributes were identified. Concepts include *Creation Events*, *Activities*, *Materials*, *Equipment* and *People*.

Integration. To support reuse, we align with external sources, including the aforementioned Termennetwerk and domain ontologies CIDOC-CRM and EDM. In total, 124 alignments to external sources were established. Examples are geographical terms ("Amsterdam"), or concepts such as "Blowing pipe" or "Icepick" linked to WikiData and Getty AAT and indexed in Termmennetwerk.

Implementation. The conceptualization was formalized as an OWL ontology using the Protégé ontology editor[5]. Instances were added to form a *knowledge graph* on the works

---

[3] https://www.barbarananning.nl/nl/project/verre-eglomise/

[4] https://www.barbarananning.nl/project/coloured-shadows/

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

and processes of the artist. This consisted of 794 instances, 121 classes, 19 object properties, 12 data properties and 124 alignments to 7 different sources[6].

Evaluation. Following [6], we validated the ontology by mapping the competency questions to SPARQL queries and analyzing the results. Each question had a straightforward mapping to such a query. For brevity, we reproduce only one such query below, the others can be found in [4]. Responses were correct and complete.

Listing 1: SPARQL query matching competency question CQ-VE-2

```
SELECT DISTINCT ?EquipmentLabel ?EquipmentDescription
WHERE {
    ?Activity rdf:type bn:Sandblasting.
    ?Equipment bn:Used-For ?Activity.
    ?Equipment rdfs:label ?EquipmentLabel.
    ?Equipment rdfs:comment ?EquipmentDescription. }
```
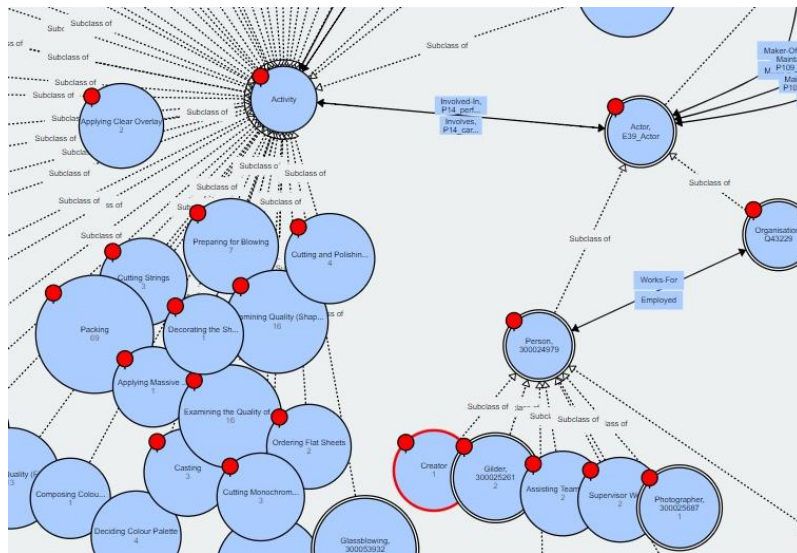

Figure 2: Detail of the WebVOWL visualisation of the ontology, showing processes and actors

We propose a re-usable method for developing an individual artist ontology in a specific case. The method presupposes access to the artist(s) or to detailed resources describing creation and production processes. Concepts defined at the top-levels of the

---

[6] The knowledge graph can be accessed at https://github.com/DRavenNISV/Modeling-Ontologies-for-Individual-Artists and a visualisation is found at ; http://www.visualdata-web.de/webvowl/#iri=https://raw.githubusercontent.com/DRavenNISV/Modeling-Ontologies-for-Individual-Artists/master/BarbaraNanning.owl

ontology (Entity, Thing, Collection, Artwork, Equipment, Material, Period, Event, Creation Event, Actor, Person, Organization, Place, Country, City, Timespan, Representation and Digital Image) and relations (e.g. Processes, Involved-In, Created or Has-Duration) are artist-independent. Future work includes research into the application of the ontology in several information extraction tasks for various end-users as well as investigating to which extent the ontology or design patterns can be applied to other domains, in both the historical and present-day art, craft and design domain.

References

1. Hyvönen, E. (2012). Publishing and using cultural heritage linked data on the semantic web (Vol. 3). Morgan & Claypool Publishers.
2. Dijkshoorn, C., Aroyo, L., Van Ossenbruggen, J., & Schreiber, G. (2018). Modeling cultural heritage data for online publication. *Applied Ontology*, *13*(4), 255–271. https://doi.org/10.3233/AO-180201
3. Fernández, M., Gómez-Pérez, A., & Juristo, N. (1997). METHONTOLOGY: From Ontological Art Towards Ontological Engineering. *AAAI Technical Report SS-97-06*. Retrieved from http://oa.upm.es/5484/
4. Raven, D (2021): Modeling of Ontologies for Individual Artists. figshare. Thesis. https://doi.org/10.6084/m9.figshare.13727779.v1
5. Raven, D. (2021) "D. Raven Supplementary Material - Modeling Ontologies for Individual Artists A Case Study of a Dutch Ceramic-Glass Sculptor". figshare, 23-May-2020.
6. Azzaoui, Kamal, et al. "Scientific competency questions as the basis for semantically enriched open pharmacological space development." Drug Discovery Today 18.17-18 (2013): 843-852.