

Testing the Effectiveness of Narrative Archetypes for Archive Exploration

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Abstract

In this paper, we propose the use of narrative archetypes for supporting the creation of effective exploratory search tools for archives. For example, a path can be created through items that display characters of the same story, or the same story events. By embedding the archetypes in a semantic system for archive navigation, we tested their effectiveness with users, and collected the users' preferences about the use of the system. Participants belonged to two different groups: professional users (editors, journalists, etc.) and casual users. A small focus group was conducted with professional users. The results show a good acceptance of the approach, with higher scores by professional users.

Introduction

Semantically annotated archives enable the design and implementation of exploratory environments where the audience creates personalized paths in the archive, thus overcoming the limitations of keyword based access. According to (Hall 2014), tools for *exploratory search* (Marchionini 2006) are needed in order to meet the needs of the widened audience of digital cultural heritage collections. The effectiveness of exploratory search tools largely depends on the capability of the conceptual model they embed to establish connections over the items in the archive, thus generating exploration paths that are meaningful to the users. Examples of significant, commonsense relations are exemplified by the historical or geographical relations employed respectively in (van den Akker et al. 2012) and (Hyvönen et al. 2009) to connect the items in an archive.

In this paper, we propose an approach that exploits the notion of narrative archetype for guiding the user navigation through a cultural heritage archive, and we test its effectiveness through experiments conducted with users. Narrative archetypes, such as “the journey” or “the hero”, represent relevant crossroads of Western culture (Highet 1949; Thompson 1955) that underpin different artifacts and expressions despite their sparseness in ages and locations,

linking Hollywood movies as well as 19th century novels. Our notion of archetype partly draws also from Warburg's *Bilderatlas* (Warburg 2008; Bruhn 2000), a pictorial atlas where each table illustrates an iconographical archetype (e.g., the relations between between gods and mankind) through characters, symbols and situations mainly extracted from classical mythology. Here, we test the use of archetypes as a compass in the exploration of archives, leveraging their capability of accommodating heterogeneous objects in a unifying conceptual framework: think for example of the Knossos Palace in Crete and the cathedral of Reims in France, which share the same reference to the archetype of the “labyrinth”. The same archetype may also be reflected in a mannerist Italian painting representing Ariadne in the act of giving the ball of red thread to Theseus, or in an Attic vase from ancient Greece representing Theseus and the Minotaur.¹

In order to test the appropriateness of narrative archetypes for archive navigation, we designed and executed a pilot experiment with users by embedding a set of archetypes in a semantic architecture for archive exploration. The users were requested to execute navigation and search tasks in the archive, with the goal of testing the capability of the archetypes to guide them towards the sought results and to encourage exploration.

This paper is structured as follows: after reviewing the related work, we describe the semantic architecture of the exploratory environment where archetypes have been embedded. Then, we illustrate the design and execution of the experiment, discussing their results. Conclusion ends the paper.

Related Work

In the last decade, the use of ontologies for the access to cultural heritage collections has been investigated by several projects, paving the way to the so-called “digital hermeneutics” (van den Akker et al. 2012), namely, the use of semantic models to provide an interpretation layer for digital collections. A pioneering contribution was given by

¹<https://en.wikipedia.org/wiki/Ariadne>

the Finnish CultureSampo project (Hyvönen et al. 2009; 2015). In CultureSampo, a folkloric saga, called Kalevala, is employed as a “red thread” for the presentation of cultural objects, while a set of domain ontologies provide the infrastructure against which they can be explored, tracking the relations over them.

A number of projects have resorted to narrative models as the infrastructure for the navigation of archives, with descriptions of the narrative concepts that range from simple event schemata to full-fledged story ontologies. The Agora project (van den Akker et al. 2012) frames the exploration of a digital collection into historically relevant episodes, supported by a semantic account of the notion of event (Van Hage et al. 2011). For example, the user can choose a historical episode (e.g., “German occupation of Poland in the Second World War”) and navigate among the cultural objects related to this event by historical and geographical relations. (Oomen and Aroyo 2011) propose the use of linked open data as a framework for crowdsourcing cultural metadata and transcriptions from trusted user communities. In their view, this approach opens the way to a novel type of co-curation of galleries, libraries, archives and museums (collectively termed GLAMs).

A story ontology is the backbone of the Bletchley Park Text system (Mulholland and Collins 2002), a semantic system designed with the goal of supporting guided visits with mobile devices. Designed with the notion of the “guided visit” in mind, this system encompasses an ontology of story, formalized in the Story Fountain project (Mulholland, Collins, and Zdrahal 2004). More recently, the Decypher EU project has leveraged stories to address the curatorial side of cultural heritage dissemination (Mulholland, Wolff, and Collins 2012). In Decipher, a story ontology is the basis of a system that supports the creation of story-based collections by museum curators. (Mulholland, Wolff, and Collins 2012) describes two case studies of the use of the system by museum curators to design new exhibition paths.

Despite the research conducted by the projects mentioned above, the capability of a conceptual model to overcome the paradigm of keyword based search has not been tested in a systematic way. A notable exception is provided by the CHIP project (Wang et al. 2008), which relies on the semantic annotation of the artworks, tested on the collections of the Rijksmuseum in Amsterdam: however, in this case, the object of the evaluation consisted in recommendations provided by the system about the museum artworks, assessed through user ratings, and did not involve narrative concepts. In this paper, we propose a testing methodology which tries to overcome this gap by leveraging intrinsic capability of the exploratory environment to generate narrative paths through the archive.

Exploratory environment

The system we employed for the experiments, called Labyrinth², relies on an ontology of narrative archetypes., the Archetype Ontology, to represent the relations over the items in the archive (Damiano and Lieto 2013). Designed

²<http://www.di.unito.it/~rossana/labyrinth/index.html>

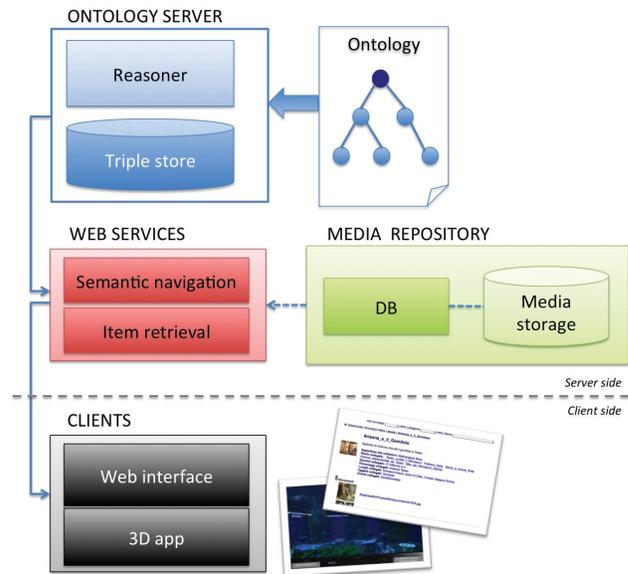


Figure 1: System architecture

for cultural heritage archives and repositories (Damiano et al. 2016), the core of the system is provided by a semantic engine, which queries the ontology in response to the user actions. When the user selects an item, the semantic engine queries the ontology to retrieve its relations with the other items and returns this information to the client, which creates the description of the selected item on the fly. The implemented system includes both the web-based interface employed in this work and a 3D standalone application for exploring the archive (Damiano and Lombardo 2016). A detailed description of the architecture is described in (Damiano et al. 2016). The description of the ontology can be found in (Damiano and Lieto 2013).

The architecture of the system encompasses four main modules (see Fig. 1):

- the **Ontology Server** stores the ontology and provides the reasoning services that allow the system to establish the relations over the items in the archive (for example, inferring the relation between an artifact and an archetype given the characters displayed in the artifact).
- the **Media Repository** stores the media objects which constitute the digital equivalents of the items in the archive (cultural artifacts such as texts, images, etc.); a relational database stores their metadata, which provide the link to the conceptual model in the ontology;
- a set of **Web Services** implement the APIs specific to each client. Written in Java, the APIs are called by the clients to respond to the actions of the user, and return the data in XML/Json format.
- the **Exploratory Environments** support the exploration of the archive on the client side, by realizing different types of user environments, including 3D standalone applications, hyper-textual interfaces, and others.



Figure 2: System interface (in Italian).

In order to test the effectiveness of the narrative archetypes for archive navigation, the architecture described above was populated with a prototype repository of cultural object (see Section “Testing search and navigation”). The archetypes in the ontology share the same set of basic elements types, namely *stories*, *characters*, *events*, *locations*, *epochs* and *objects*. For each element type, e.g., the story, the ontology encodes a set of specific elements (stories such as the Myth of the Minotaur or the story of Ariadne), often connected by other element types like characters (such as Ariadne and Theseus) and events (such as Ariadne giving the thread to Theseus). Also, archetype elements can be grouped into sets sharing some feature, such as the “mythological stories” or the “departing heroes”. The ontology included a set of archetypes, namely the “hero”, the “journey” and “the labyrinth”, chosen for their pervasiveness across ages and artifacts.

The exploratory search environment, implemented as a web interface (see Fig. 2), embeds the exploratory search into a top-down navigation approach. After selecting an archetype, the system allows the user to choose an element type (story, character, etc.), then a specific element (a given story of character), filtering the items in the archive according to their relation with chosen element. The user can either further refine the current element (i.e., by selecting a specific story or character), or select an artifact and navigate the repository item by item, following the relations encoded in the ontology.

The structure of the interface includes the breadcrumbs describing the user navigation in the conceptual model (top of Figure 2), and a large central box that contains information about the current element (which points to a set of artifacts) or artifact, expressed in terms of their relation with the archetype. So, the box contains the link to other archetype elements, referred to as related stories, events, characters, object, locations and ages (in bold in Figure 2). For example, the story called “Mith of the Minotaur” is related with its characters (Theseus, Ariadne and the

Minotaur), with its location (the Knossos palace in Crete, Greece), with the objects mentioned in it (the red thread given to Theseus by Ariadne and the dagger used by him to kill the Minotaur), but also with more specific episodes of the same story, such as the giving of the thread, or with related stories that precede or follow it, such as the myth of Icarus and the story of Theseus and Ariadne. A set of menus, located above the breadcrumbs, allow the user to change her/his choice with respect to each step of the breadcrumbs, providing a shortcuts to other elements or artifacts. Below the central box, the user can find the list of the artifacts that are related with the currently selected element.

To illustrate the archetype-based the exploration, consider the example in Figure 3. The navigation starts from a story, the Myth of the Minotaur (1, story, top left), then continues with an action contained in the story (bottom left), i.e., the killing of the Minotaur (2, action), focusing on an artifact that represents it (a modern painting, 3, middle of the figure); then, the user moves to a story episode (a smaller story, Theseus kills the Minotaur) that contains the killing action (4, story, top right), and finally to the character of Theseus (5, character, bottom right).

Experiment Design

Given the conceptual nature of the archive exploration, the assessment of their effectiveness for exploratory search could not rely on existing standards (such as (Scherer and Craddock 2002)), since most literature on the usability is geared on clearly defined, measurable tasks for which well known procedures and benchmarks exist. Our experimental methodology, tailored to the cultural heritage domain, relies on the paradigm of user studies (Rubin and Chisnell 2008), with specifically designed tasks assigned to the users to assess the system’s capability to support the users in their achievement.

In order to avoid arbitrariness in the design of the user tasks, the tasks were collected from the paths through the archive generated by the system given the ontology of narrative archetypes. Tasks belonged to two different types: *navigation* and *search*.

Navigation tasks consisted in finding a path between two given artifacts; some belonged to the same archetype element (e.g. the story); some others belonged to different, but related, elements, such as character and location. The goal of this type of task is to assess if the conceptual model of the archetype, superimposed on the archive through the semantic layer, is actually effective for letting the user find a path between two elements that are not trivially connected.

Navigation tasks belong to three types:

- *Closed-ended navigation*: finding a path between given start and target artifacts, related with the same archetype element or to different elements. For example, given the archetype of the Labyrinth, the start artifact may be the Knossos Palace, related with the Myth of the Minotaur (a story) and the target object may be the representation of the dagger on a Greek amphora (an object): the non trivial link is the killing of the Minotaur by Theseus with a dagger, portrayed on the target artifact.



Figure 3: An archetype-driven navigation path in the archive (in Italian).

- *Open-ended navigation:* finding a path between any artifact chosen by the user in the given start element and any artifact (chosen by the user as well) in the target element (the target and start element can be different or same). This type of task may be also formulated as follows: navigate from any artifact related with the character element type to any artifact related with the story element type.
- *Open-ended navigation to an artifact:* finding a path to any artifact related with an archetype element type characterized by specific features. This type of navigation is allowed by the system interface (see Fig. 2), where, once a given archetype element type has been selected (e.g., story), the related artifacts can be further refined by restricting the focus on a specific element type (e.g., the “mythological stories”). An example of this task may be expressed as “navigating from the story element type to any artifact connected with the mythological story type”.

Search tasks aimed at testing the assumption that the articulation of the archetype into elements can actually drive the search in the archive in an intuitive way. Search tasks either concerned a specific item, or a set of items with given characteristics, expressed in terms of an archetype element type; differently from the navigation tasks, for search tasks no starting point is provided. All search tasks included two steps:

1. *Artifact search:* finding an artifact based on its relation with the given archetype elements. For example, the ar-

tifact may be described as related with a given character, such a Theseus or Ariadne, or a given object, such as a pair of glasses.

2. *Related artifact search:* finding one or more artifacts that share some characteristics with the artifact found at step 1: for example, being related with the same story (the Myth of the Minotaur) or location.

In order to gain insight on the role played by the archetype in the execution of the navigation tasks, we asked the user to answer a set of control questions about each navigation task. The control questions were expressed as assertions; the user was requested to express her/his agreement with *true* or *false*. Control questions belonged to different types, and were submitted to the users according to the following ratio:

- One assertion was meant to be false, but included a keyword that the user was likely to come across during the execution of the task (for example, the “glasses” for a task involving the character of Harry Potter); this question was aimed at detecting misconceptions induced by the navigation.
- One assertion was meant to be true, and concerned the commonsense knowledge assumed by the archetype definition in the ontology (for example, the relation between the thread and the character of Ariadne); this type of questions was aimed at assessing the assumption that the knowledge about the archetype is actually shared with the users prior to the task.

- Two assertions concerned a non trivial links between the start and target artifacts (for example, Harry Potter and William of Baskerville both wearing glasses); this type of question was aimed at assessing the acquisition of new information about the artifacts as an effect of the navigation.

The following task is example of the open-ended navigation task type:

1. Select the archetype of the labyrinth,
then the Story element;
2. Find the Myth of the Minotaur,
then the character of Theseus;
3. Select an artifact related with Theseus;
4. Find the character of Ariadne
and select an artifact related with Ariadne.

The instructions were formatted as a sequence of steps. The first part of the task (step 1) serves the function of guiding the user into the archetype. Step 2 requires the user to select a specific archetype element (a story type), then move to a different element (the character). Notice that the story of Theseus and the story of Ariadne, albeit part of a larger story, are not the same story. Steps 3 and 4 ask the user to move from the start (“an artifact related with Theseus”) to the target (“an artifact related with Ariadne”). Notice that, not matter how the user completes the task, some autonomous navigation steps are required, due to the open nature of the narrative based navigation: for example, from the character of Theseus back to the story of Theseus and to the larger story (the Myth of the Minotaur), than to the story of Ariadne; or from the character of Theseus, to his action of receiving the thread, then to the character of Ariadne – who is a participant to the same action. Some artifacts related with the character of Theseus may be directly connected to the character of Ariadne through the slot “Related characters”, thus reducing to 2 the minimal number of navigation steps.

The following questions can be submitted to the user to test the role of the archetype in the navigation (the user was requested to answer *true* or *false*):

- a. Ariadne is a character of the Myth of the Minotaur (true).
- b. Ariadne kills the Minotaur with Theseus (false).
- c. The character of Theseus is related with the red thread (true).
- d. The Myth of the Minotaur takes place in Knossos, Crete (true).

Question *a* is aimed at testing whether the story–character relation embedded in the archetype is known to the user at all; question *b* is aimed at excluding a possible misunderstanding induced by the navigation (the action of killing is done by Theseus, but this character has other connections with Ariadne); questions *c* and *d* address the connections between the archetype elements (and the related artifacts) that emerge from the possible navigation paths.

Testing search and navigation

Two experiment sessions were conducted, one with a group of professionals working in the field of cultural heritage and publishing, and one with general users with different professional backgrounds and education.

Participants. The first group (Group 1) was composed of 5 professional users (3 women and 2 men, aged 24–62); 2 journalists, 1 publishing manager and curator, 2 editors. The second group (Group 2) included 7 users, aged 25–60, 3 women and 4 men. They were students (1), employees (3), teachers (1), housewives (1) and retired persons (1).

Material. The tasks were conducted on the web interface of the system. The system contained 38 stories, 40 characters, 30 actions, 39 locations, 19 objects and 40 epochs, distributed over three archetypes: “journey”, “labyrinth”, and “hero”. The repository, contributed by a local publishing company, contained 51 media objects, including text, images and videos.

Questionnaire. The questionnaire was divided into two parts: the first part included task-specific control questions; the second part included general questions about the system and was the same for all users. The first part of the questionnaire contained 4 questions expressed through a 5-point Likert scale (liking of the system, ease of use, usefulness, archetype elements) and 3 multiple-option questions (use scenarios and similar applications). The second part of the questionnaire includes the control questions for each of the navigation tasks assigned to the user.

Procedure. Before taking part in the experiment, each participant received a short text with a general description of the system and instructions about the experiment, then was invited to familiarize with the system for a short time (up to 10 minutes). Each user was assigned three different tasks (on a total amount of 12 tasks, of which 6 navigation tasks and 6 search tasks). Tasks were assigned trying to minimize repetitions, according to a ratio of 2 navigation tasks and 1 search task for each user). The users executed the task on the online systems on a desktop computer; they were observed by an experimenter, instructed not to interfere with the execution of the tasks. The experimenters (3 researchers in computer science and HCI) were given written instructions about the facts to observe during the task execution, including the (successful or unsuccessful) accomplishment of the tasks, the paths chosen by the user, and the use of menus, links and breadcrumbs.

Results

The results collected in the experiments are not limited to the simple collection of data about the users’ capability to achieve the correct execution of the tasks, but need to be interpreted in the light of the conceptual model of the narrative archetypes. In the following, we provide the data on task completion, and discuss the observations performed during the task execution and their relevance for the archetype-based navigation.

Task execution

Most users were able to successfully complete the tasks, but with differences between the group of professional users and the group of casual users. Professional users were able to execute 12 tasks out of 15 (3 tasks were only partially executed); a single user was able to complete only 1 task out of the 3 assigned tasks, thus failing to complete 2 tasks. Casual

users were able to execute 19 tasks out of 20, with only one user failing to successfully execute one of the tasks, which was only partially executed. As for the type of tasks that were not successful, 3 were navigation tasks, and 1 was a search task: however, consider that the ratio was 2:1 between navigation and search tasks.

Some interesting insights, however, came from the the variations to the expected path performed by the users:

- **Longer paths:** in some cases, the users did not follow the shortest path to the target artifact, visiting more elements or artifacts than strictly needed by the task. For example, in one case the user navigated from a story to an object and finally to the target character (in particular, from the Story of Harry Potter to the Magical Wand and eventually to the Character of Harry Potter) although a shorter path was available from the story straight to the character.
- **Backtracking.** In some cases, the users were not able to find a path to the current element/artifact and went back to the previous step of the navigation; this occurred not by clicking the “back” button of the browser (which was inhibited) but by using the link to an element displayed in the description of the element/artifact. For example, in one case the user was not able to find a link from an artifact (“Hercules kills the Lion of Nemea”) to the other killing events, which would include the target artifact (“The killing of Marat”) in their related documents; instead, the user went back to the character, Hercules, then to the killing element, and eventually to the target artifact.
- **Menu-based navigation:** some users did not rely on the links over artifacts and elements available in the description of each artifact or element, but instead used the menus posited in the top area of the interface for accessing directly other archetypes and elements (see Fig. 2). For example, in one case, given the request to move from a character’ element to an object element (in order to navigate from the character of William of Baskerville to Harry Potter’s glasses), the user sought for the object element type in the menu of the archetype elements, instead of using the links to the related characters and objects in the description of the William of Baskerville.

Control questions revealed that the users are substantially aligned with the knowledge about the archetype subsumed in the system, since they answered correctly to almost all questions concerning the archetype, with no significant differences in the two groups (95% in the group of professional users and 90% in the group of the casual users). The two groups show similar (but less encouraging) results also for the questions that concern the connections over the artifacts involved in the tasks (75% vs. 80%). The assertions that were meant to be false received a higher rate of wrong answers (so, “true” instead of “false”) from the professional users than the casual users (50% vs. 10%); however, this is in line with the lower performance of the professional users with tasks.

Acceptance and use scenarios

Tables 1 to 3 synthesize the results of the user preferences collected through the questionnaires (in the group of casual

Table 1: Average values for the questions about the system, on a 5 point Likert scale

Question	Group 1	Group 2
liking	4	3
ease	3.6	2.75
usefulness	4	3.25
elements	3, 4	3

Table 2: Use scenarios

Scenario	Group 1	Group 2
information search	4	4
entertainment	2	1
cultural enrichment	4	2
design of cultural products	4	1
editing of learning resources	3	1
teaching	3	1

users, 2 of them did not fill in the questionnaire).

Table 1 illustrates the preferences expressed by the users concerning the system in general (liking of the system), its ease of use, its usefulness and the understandability of the archetype elements. As it can be seen from the table, the professional users gave higher scores to all aspects of the system. In a consistent way across the two groups, the liking of the systems and its usefulness received the highest evaluation (respectively, 4 and 3 and 3 and 3.5 in the two groups); professional users gave the lowest score to the understandability of the archetype elements (3.4, 3 for the casual users), while casual users gave the lowest score to the ease of use (2.75, 3.6 for the professional users). All scores can be considered satisfactory, although the size of the sample obviously limits the relevance of this result.

Concerning the use scenarios envisaged by the users (multiple choice, see Table 2), the results show that the professional users selected more scenarios than casual users: the professional users selected overall 20 scenarios, with an average of 4 each, while the casual users selected only 10 scenarios, with an average of 2 each. In particular, the most frequently selected scenarios by the professional users were the information search (selected by 4 users), the cultural enrichment (4 users), and the editing of cultural resources (4 users), so we can say that the large majority of the professional users agreed on these scenarios. On the contrary, casual users selected most the information search (selected by 4 users), followed by the personal cultural enrichment (selected by 2 users). Teaching and editing of learning resources were selected each by 3 users in the professional group, but by only 1 user in the other group.

Finally, concerning the question about the application types that the users perceived as more similar to the system being tested (multiple choice, see Table 3, also in this case the professional users tended to select more options than the casual users (16 vs. 6). The options selected by most users in the first group were the encyclopedia, the online archive and the website. The most selected option by the casual users

Table 3: Similar environments

Scenario	Group 1	Group 2
encyclopedia	4	1
website	4	1
online course	1	0
online archive	4	4
online game	0	0
tabletop game	0	0
quiz game	0	0

was the online archive.

Focus group

After the experiment, the professional users took part in a focus group (Krueger and Casey 2014), aimed at obtaining insights about the use of such system as part of their professional work practices.

As suggested also by the preferences collected through the questionnaire, professional users were highly interested in the proposed environment. In particular, they pointed out their interest in the system as a source of inspiration for the design of editorial and cultural products, mentioning various examples that ranged from the design of book series to the design of single books (e.g., photo-books), and exhibitions on a specific subject. Online courses were pointed out as the main example of an application of the system for teaching.

An observation that emerged from the discussion was the possibility of using the system for superimposing a structure onto the repositories of media objects (pictures, articles, etc.) collected as a by-product during the editing of cultural products, as a way to explore them later in a re-use perspective. Interestingly enough, all examples provided by the professional users belonged to traditional media, from publishing to journalism and curating; online digital products were mentioned only as a derivative equivalent of the traditional media. This suggests that the use of exploratory environments can actually overcome the old vs. new media distinction.

When discussing their familiarity with the archetypes embedded in the system, the users declared a good level of familiarity with them, and appreciated their use to connect different resources including Hollywood movies and archaeological finds. None of the users declared that he/she was uneasy with the technology that supports the environment; notwithstanding the difficulties experienced by some of them in the execution of the tasks, all the participants in the focus group asserted they would use the system if available.

Discussion and conclusion

In this paper, we described the evaluation conducted with two small groups of real users (casual users and professional users) to assess the effectiveness of a system for archive exploration that relies on a narrative approach. The system superimposes on the items in the archive an “abstraction layer” (Chen et al. 2005) composed of a set of narrative archetypes (encoded in an ontology of narrative archetypes), such as the

“labyrinth” or the “journey” and leverages the narrative relations stored in the archetypes to support the exploration of the archive by the users.

The evaluation, conducted on the web-based interface of the implemented system, shows a good acceptance of the narrative-based exploration of the archive by the users, pointing to its suitability to the design of thematic paths for the access to cultural archives and repositories. Notwithstanding the heterogeneity of the items in the archive, both groups of users (professional and casual users) were able to accomplish most navigation and search tasks; also, both groups gave a positive evaluation of the system in the questionnaire.

Small, but significant, differences emerged between the two groups. These differences may be relevant for the implications of the narrative-based approaches to archive exploration for the creative tasks typically implied by the cultural and creative industry. Regarding the acceptance and use of the systems, the professional users manifested a higher level of acceptance and inclination to use the system than the group of casual users. Also, they pointed out a larger set of scenarios for using the system, and suggested a larger set of tools in order to improve the system. This is partly in contrast with the execution of the search and navigation tasks, where casual users had better results than the professional users.

To conclude, the results found in the experiment suggest that the integration of semantic models in the access of archive not only can engage the general audience, but can be an effective tool for fostering creative processes such as publishing and curation, opening new perspectives for the exploitation of narrative technologies.

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