

Appendix 1 – Report of the User Testing

1 User Testing in a Reuse Scenario

In order to perform a usability evaluation of the Experience & Observation (E&O) Pattern¹ in an ontology reuse scenario, we conducted a user testing in one setting that involved Master students at Universidad Politécnica de Madrid (UPM). This setting engaged students who had chosen the ‘Intelligent Systems’ subject, which belongs to different Master programmes at UPM, in Autumn 2020.

Students were proposed, as a hands-on project, to reuse the E&O Pattern in the development of an ontology network that describes a particular domain. Students had to develop such an ontology network in groups composed of 4 or 5 students. After developing the ontology, students had to fill a questionnaire. Such a questionnaire² was divided in four main parts: (1) one related to background knowledge and experience, (2) one related to impression about the hands-on project, (3) one regarding the reuse activity performed during the ontology network development, and (4) one related to demographic issues and general comments.

1.1 Participants

The experiment consisted of 58 participants who were mostly Spanish (67.24%). Most of the participants studied a Master of Data Science (69%), while a little less than a quarter of the participants studied a Master of Computer Science (20.7%). Regarding background knowledge, half of the participants (55.2%) had previous experience developing ontologies, while 77.6% of the participants had no previous experience reusing knowledge or ontology patterns.

1.2 Materials

In order to perform the user testing of the E&O Pattern in an ontology reuse scenario, participants were asked to perform an ontology development activity. The ontology to be developed should represent a particular domain. Domains are described using a text that explains a case study. Each case study is complemented with a set of key facts that can be considered notes about the relevant aspects of the specific domain. The ontology development should be performed following the reuse approach [3]. During such an ontology development, participants should reuse at least the following resources:

- the N-Ary Relation Pattern³,

¹ https://github.com/modellingDH/odp_experience

² <https://forms.gle/N73gPUctu2U7s79p8>

³ <https://www.w3.org/TR/swbp-n-aryRelations/>

- the Experience & Observation (E&O) Pattern, and
- the Ontology of Reading Experience⁴.

Details about the activity and the list of available domains are provided in a shared folder⁵.

1.3 Procedure

As already mentioned, our user testing was performed in the context of the ‘Intelligent Systems’ subject at UPM. The general goal of this subject is to provide students with different Artificial Intelligence methods and techniques that can be applied to build intelligent systems. This subject is composed of four units: (1) Neural networks, (2) Reinforcement learning, (3) Ontology engineering, and (4) Natural language processing.

The pedagogical approach we followed in Unit 3 was focused on a mix of theoretical lectures, hands-on lectures and assignments. During theoretical lectures we provided students with knowledge about (a) Knowledge Representation, in which Knowledge Graphs, Knowledge Representation Patterns [1], and Ontology Design Patterns [2] were explained; and (b) Ontologies, in which the focus was ontology definitions as well as methodologies and approaches for building ontologies; in particular, we explained the NeOn Methodology [3] and the reuse approach when developing ontologies. All the knowledge explained in the theoretical lectures⁶ is complemented with suitable and effective examples. In addition to the theoretical lectures, hands-on lectures were given using a combination of collaborative learning and problem-based learning, that encourages active learning of specific topics by solving unit modelling problems. The specific approach during such lectures was (1) to propose simple and unit modelling problems, (2) to devote a period of time to solve the problems working in groups, (3) to present some possible solutions and discuss them among students and teachers. In these lectures, students should solve the modelling problems using only pen and paper. Doing in this way, modelling difficulties can be individually discovered; if problems are solved directly using ontology editors, the difficulties arisen can have different origins such as the editor complexity. In the lectures, we focused more on teaching concepts than on teaching technological skills, since we expect that students at higher education are able to familiarise themselves with ontology modelling tools. Finally, following the problem-based learning strategy, we required students to work in groups on a specific development project. The objective of this hands-on project was to promote students to practice on ontology development using a reuse-based approach. Students had four weeks to work collaboratively in the proposed project. After such a period, students had to deliver a report explaining the work performed and a collection of the

⁴ <https://github.com/eureadit/reading-experience-ontology>

⁵ Appendix to "Experiential Observations: capturing the potential content within evidences of experiences", <https://doi.org/10.21954/ou.rd.14156624>

⁶ Unit 3 includes basic ontology modelling and developing concepts; no ontology language is taught to students.

ontological resources created implemented in OWL. In addition, students were encouraged to fill out a questionnaire to gather their experiences, opinions and suggestions.

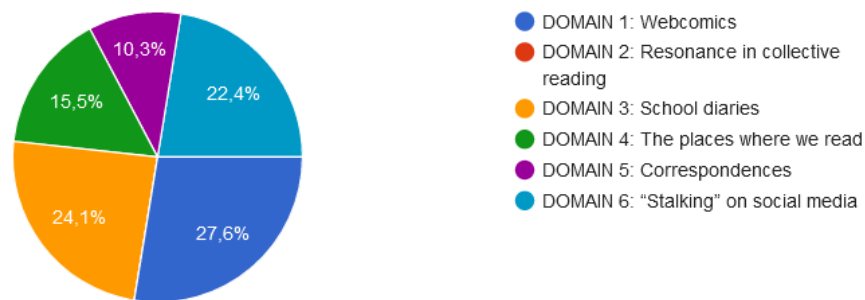
2 Results and Discussion

This section is devoted to present the corresponding data⁷ gathered during our user testing as well as our interpretation and understanding of such data.

The section is organized in three parts: the first one presents the data gathered about the hands-on project, the second one shows the scores provided by the students with respect to the intuitiveness and the usefulness of the pattern, and the last part is devoted to discuss the gathered data.

2.1 Data about the Hands-on Project

Students selected the domain for their ontology development from the provided list, and the distribution of such a selection is shown in the following figure.



We collected opinions and comments from students regarding the hands-on project itself; in particular, with respect to the level of difficulty.

- 46.6% of the students considered the selected domain as difficult to understand.
- 56.9% of the students considered the development of an ontology network as a difficult activity.
- 55.2% of the students considered the reuse of ontology design patterns as a difficult activity.

In addition, students were asked about problems they had while performing the hands-on project. In this regard, students mainly reported issues related with the lack of knowledge and experience in ontology development. They also had some technical

⁷ Data gathered in both settings are available at <https://doi.org/10.21954/ou.rd.14156624>, file "IS-Survey-2020-2021.csv"

problems with the proposed ontology editors (Protégé and WebOWL) and some misunderstandings when using the documentation of the resources to be reused.

2.2 Data about the Reuse of the Experience & Observation (E&O) Pattern

We collected opinions and comments from students regarding the activity of reusing the E&O Pattern; in particular, we were interested on the intuitiveness and the usefulness of the pattern.

- 34.5% of the students considered the E&O Pattern as an intuitive ontology design pattern. Those students who replied that the E&O Pattern is not intuitive provided details about what was missing: (1) the provision of examples of use; (2) a better pattern documentation; and (3) clear descriptions of pattern elements.
- 58.6% of the students considered that the E&O Pattern was useful for modelling part of their selected domain. However, in those cases the pattern was considered not useful the main reasons were (1) the pattern does not apply to the selected domain; and (2) the pattern missed some concepts and relations needed for the selected domain.

In addition, students arose some commonalities between the E&O Pattern and the Ontology of Reading Experience⁸.

2.3 Discussion

The data gathered from the questionnaires and presented in previous sections show advantages and disadvantages of the E&O pattern.

The strength of the pattern is referring to its usefulness for representing knowledge in different case studies and domains such as webcomics, school diaries, and places where we read. In like manner, the E&O pattern is envisaged to be use in the modelling of situations like free-time activities or laboratory experiments.

On the middle, we can consider as an aspect to be improved in the E&O pattern its intuitiveness. This issue is clearly related with the main important weakness of the current version of the E&O pattern, that is, its documentation. We should update the pattern documentation by means of (a) including clear examples of the pattern use and (b) providing detailed descriptions of the different ontology elements in the pattern. Since the knowledge modelled by the pattern is a non-crucial one, the documentation should provide explanations of the key concepts in terms that are understood by non-expert in humanities.

⁸ <https://github.com/eureadit/reading-experience-ontology>

References

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3. M.C. Suárez-Figueroa, A. Gómez-Pérez, E. Motta, A. Gangemi: *Ontology Engineering in a Networked World*. Springer 2012, ISBN 978-3-642-24793-4.