

Semantic Music Quiz

Authors: *Karl-Erik Stoerzel, Carolin Wollny*

1. Introduction

While brainstorming about ideas which domain to choose for our project work, we thought of an engaging way to display and interact with information which is relevant to a user and ideally, to be an example which can be interesting for many people who will see this application (at least within the Next Generation Web course). Finally, we decided to dive into the music domain and came up with the idea to build a quiz website.

This quiz application was designed and developed to connect music ontologies and create up-to-date questions with current data to learn about different artists, genres, albums, etc. or to test the user's knowledge on the latter. These first simple, personalized quizzes and their generated questions are formulated according to one's favorite music genres to learn more about the background of it.

We defined the scope of the concept to, on one hand, explore and apply the learnings of the lectures and labs of the Semantic Web and on the other hand, to have a little fun and understandable idea for a first approach, where the focus lies on User Experience Design and a good usability.

Starting with a few selectable users with predefined favorite genres, where one quiz is dedicated to each of them, this approach is designed to be the first proof of concept. There are five users and five quizzes in general planned for now. Furthermore, if one quiz is chosen to be played for several times, the questions will be different ones according to the randomly chosen attributes of the connected ontologies.

In the future, this concept can be expanded, e.g., with users who register themselves, go through an onboarding process to get to know their characteristics and connection to diverse music genres, artists, albums, history, etc. and to suggest several personalized quizzes which suit their interests.

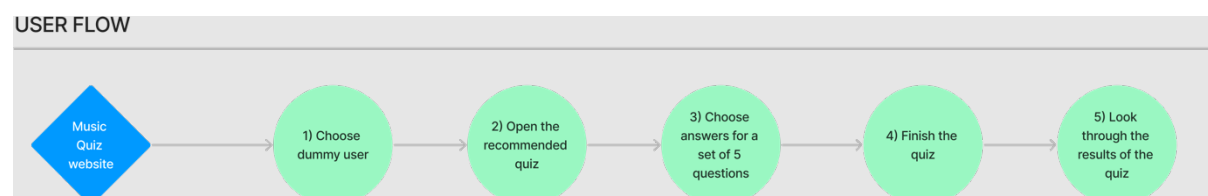


Figure 1 User flow of the Semantic Music Quiz application

The user flow (Figure 1 User flow of the Semantic Music Quiz application) and low-fidelity wireframes (example screen see Figure 2 Example wireframe of the Semantic Music Quiz concept, made in Figma) were created to get an idea for the first approach of the project. It can be accessed in detail through the following link. This concept was used as an orientation for the implementation of the ontologies and frontend interface.

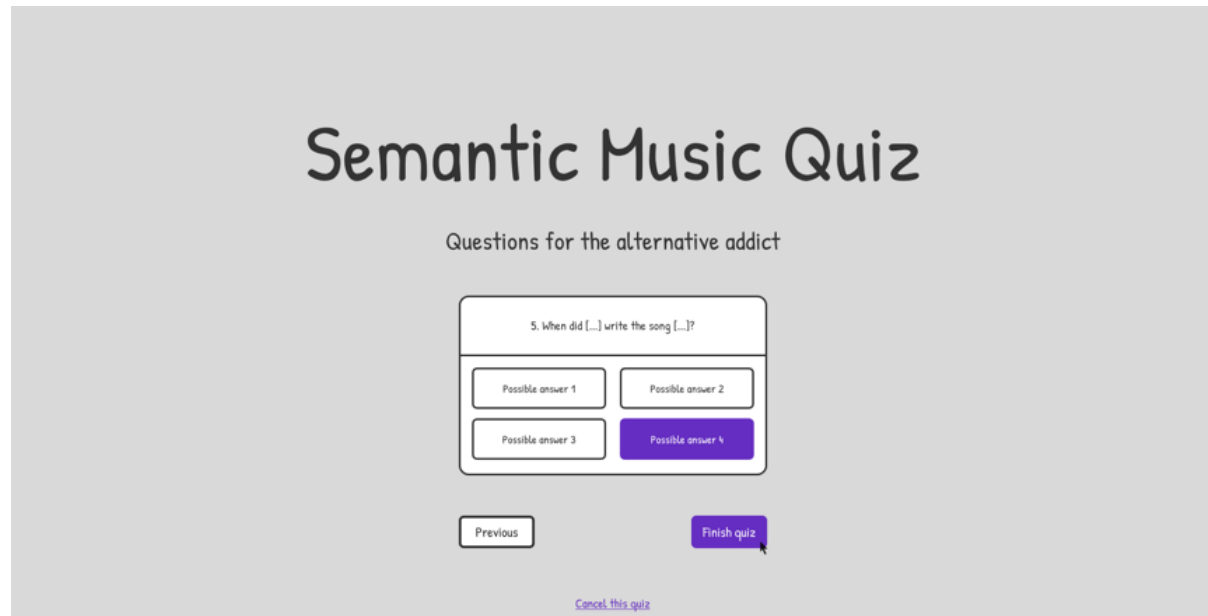


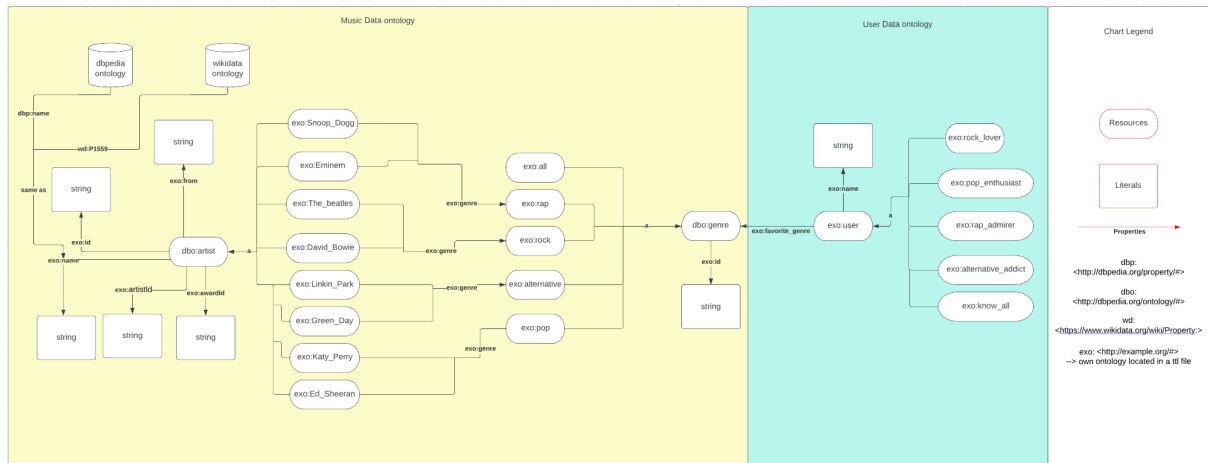
Figure 2 Example wireframe of the Semantic Music Quiz concept, made in Figma

https://www.figma.com/file/FV5TSiqQ88paoQpinCFBtu/2022_NGW_project-concept_KS_CW_Group-6?node-id=0%3A1&t=llUnvwEqGO7JtigB-1

2. User Profile Ontology

To keep it simple and at the same time meaningful for the first prototype, we decided to dedicate just one attribute to each of the five users which can be selected in the beginning of the process of the application. Therefore, the user ontology has no hierarchies and provides just the information about the favorite genre of the user. By the selection of this user and the connected genre, the questions of the quiz are generated. We used the user profile ontology model of the work from Skillen, Chen, L., Nugent, C. D., Donnelly, M. P., Burns, W., & Solheim, I. (n.d.) as an orientation to consider what is best for the purpose of this project.

Here, the competency questions are not many because of the purposely chosen flat hierarchy. This is also the reason why we did not consider using existing ontologies as a reference but to test at first our datasets with at least complex users.



<https://imgur.com/rzX9psF>

However, for an expansion of the user's attributes in the future, we imagine it to be possible and useful to reuse existing ontologies and therefore (general) example competency questions like these could be possible to ask:

- Which rock artist was active during the same time where the user was a child?
- Which albums where the most popular in the 90s in the United States?
- What do artist X and artist Y have in common?
- Which alternative artists have 4 children?
- What is the name of this band (showing an album image)?
- Etc.

3. Datasets

For our 5Star linked open data we used the websites DBpedia and Wikidata. We combined different ontologies of music artists from those and customized them according to the user profiles. This means, we decided on five genres (one for each user) and dedicated two artists to each (except to the "Know-it-all-genre", where every artist is allocated). Here it was important to find out about the shared properties of each artist per genre within the ontologies to be able to reuse pre-formulated questions which are finally displayed in each quiz.

In the following you can see the chosen genres and artist ontologies:

1. rock
 - a. https://dbpedia.org/page/The_Beatles, <https://www.wikidata.org/wiki/Q1299>
 - b. https://dbpedia.org/page/David_Bowie, <https://www.wikidata.org/wiki/Q5383>
2. pop
 - a. https://dbpedia.org/page/Ed_Sheeran, <https://www.wikidata.org/wiki/Q47447>
 - b. https://dbpedia.org/page/Katy_Perry, <https://www.wikidata.org/wiki/Q42493>
3. rap
 - a. <https://dbpedia.org/page/Eminem>, <https://www.wikidata.org/wiki/Q5608>
 - b. https://dbpedia.org/page/Snoop_Dogg, <https://www.wikidata.org/wiki/Q6096>
4. alternative
 - a. https://dbpedia.org/page/Green_Day, <https://www.wikidata.org/wiki/Q47871>

- b. https://dbpedia.org/page/Linkin_Park, <https://www.wikidata.org/wiki/Q261>
5. all
- a. See all above

```

1 <?xml version="1.0" encoding="utf-8" ?>
2 <rdf:RDF xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
3   xmlns:ns0="http://example.org/#">
4
5   <rdf:Description rdf:about="http://example.org/#rock">
6     <rdf:type rdf:resource="http://dbpedia.org/ontology/#genre"/>
7     <ns0:id>rock</ns0:id>
8   </rdf:Description>
9
10  <ns0:user rdf:about="http://example.org/#rock_lover">
11    <ns0:name>Rock Lover</ns0:name>
12    <ns0:favorite_genre rdf:resource="http://example.org/#rock"/>
13  </ns0:user>
14
15  <rdf:Description rdf:about="http://example.org/#The_Beatles">
16    <rdf:type rdf:resource="http://dbpedia.org/ontology/#artist"/>
17    <ns0:id>The_Beatles</ns0:id>
18    <ns0:name>The Beatles</ns0:name>
19    <ns0:artistsId>Q1299</ns0:artistsId>
20    <ns0:awardId>P166</ns0:awardId>
21    <ns0:from>P495</ns0:from>
22    <ns0:genre rdf:resource="http://example.org/#rock"/>
23  </rdf:Description>
24
25  <rdf:Description rdf:about="http://example.org/#David_Bowie">
26    <rdf:type rdf:resource="http://dbpedia.org/ontology/#artist"/>
27    <ns0:id>David_Bowie</ns0:id>
28    <ns0:name>David Bowie</ns0:name>
29    <ns0:artistsId>Q5383</ns0:artistsId>
30    <ns0:awardId>P166</ns0:awardId>
31    <ns0:from>P27</ns0:from>
32    <ns0:genre rdf:resource="http://example.org/#rock"/>
33  </rdf:Description>
34

```

In the own .rdf file, the 4 resources for the 4 genres were created plus one genre which includes all the other ones. Also 5 users, each one with a different favorite genre property connects those to the created genre resources. The last creation are then the artists, which have a name, an “artistId” as well as and an “award”, a “from” property and an associated genre. 8 of those artists were created, two for each genre except the one that includes all other genres.

https://github.com/ImCookiieZ/ngw_project/blob/master/storage/resources.ttl

4. Results

According to the user flow and interactive concept of the quiz which were described in the introduction, the first real application was successfully built.

To open the application and try out the quiz you need to install node and npm on your computer, after that please click on the following github-link. There you can download the zip to the project. After unzipping, type “npm install” on a command-line inside the folder, this will install everything needed to run the code. Start the app with “node index.js” and see it on your browser at <http://localhost:3000>. We wish you a lot of fun while trying it out (not only) according to your favorite genre! 😊

https://github.com/ImCookiieZ/ngw_project

5. Lessons Learned

Karl

—

This project introduces into the topic of semantic web and how to build a website using the open-source data of ontologies. This gave me the ability to enhance programming skills as well as learning SPARQL for querying. Especially the programming skills for front-end server-side developing, had to be acquired since I had no previous knowledge about that. Also creating an own turtle file and reading it within the code is something new. This gives me the possibility to not only use open API’s to collect data if I need them but also brings me the ability to acquire data connected to its context which will increase the usage of those a lot. The only limitations the semantic web has is that it is not complete as well as not 100% uniformly. Not all artists in DBpedia are from the type “artist”, also the property describing where the artist is from differs, this makes it hard to collect data.

Carolín

The topic and project in general gave interesting insights about other ways to connect, display and use data from all over the globe in a way which accesses information better than with conventional methods. It is exciting to see that our idea worked out and it is an inspiration for further projects. Though, with our limited experience it is a bit clumsy to identify and connect the required ontologies for our goals, e.g., combining several artists for a specific genre and finding out if the same attributes are filled out in all selected ontologies or not. In the end, it was a refreshing course to explore new fields and if the interest for this course for future master students is still there, the focus on UXD can be deeper implemented to benefit the concept of the program even more. Thank you for your work. 😊

6. References

Fröhner, M. (2022, August 9). *Home*. DBpedia Association. <https://www.dbpedia.org/>

Skillen, Chen, L., Nugent, C. D., Donnelly, M. P., Burns, W., & Solheim, I. (n.d.). Ontological User Profile Modeling for Context-Aware Application Personalization. In *Ubiquitous Computing and Ambient Intelligence* (pp. 261–268). Springer Berlin Heidelberg. https://doi.org/10.1007/978-3-642-35377-2_36

Wikidata. (n.d.). https://www.wikidata.org/wiki/Wikidata:Main_Page