Zeitschrift für digitale Geisteswissenschaften

Beitrag aus:
Zeitschrift für digitale Geisteswissenschaften

Titel:
Knowledge for Men and Machines. The De Jonge Wiki as an Example of a Scientific Research Database

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DOI des Artikels:
10.17175/2023_007

Nachweis im OPAC der Herzog August Bibliothek:
1851331751

Erstveröffentlichung:
21.09.2023

Letzte Überprüfung aller Verweise:
25.08.2023

Format:
PDF ohne Paginierung, Lesefassung

GND-Verschlagwortung:
Denkmalpflege | Schloss | Semantisches Datenmodell | Virtuelle Forschungsumgebung | Wiki |

Empfohlene Zitierweise:
Frieder Leipold / Max Kristen / Krista de Jonge: Knowledge for Men and Machines. The De Jonge Wiki as an Example of a Scientific Research Database. In: Zeitschrift für digitale Geisteswissenschaften 8 (2023). 21.09.2023. HTML / XML / PDF. DOI: 10.17175/2023_007

Änderungen in Version 1.1 (14.05.2024):
Rephrased paragraph 7. One correction in paragraph 14 and 40 (formerly 38). Expanded paragraph 18 into three paragraphs. Added one example in paragraph 21 (formerly 19).

Frieder Leipold, Max Kristen, Krista de Jonge

Knowledge for Men and Machines. The De Jonge Wiki as an Example of a Scientific Research Database

Abstracts

The De Jonge Wiki is a digital, scientific research database on the building history of Arenberg Castle in Heverlee, Belgium. As a prototype it is intended to show how information on complex structures can be presented according to today's state of the art. The aim is to work according to international quality standards as well as making the information easily accessible to users. For this purpose, both MediaWiki and Wikibase were used as software. In this way, a user interface was created that is visually and functionally reminiscent of Wikipedia and can therefore be intuitively understood by users without prior knowledge while the corresponding semantic data is stored in a database in the background.

Das De Jonge Wiki ist eine digitale, wissenschaftliche Forschungsdatenbank zur Baugeschichte des Kasteels van Arenberg in Heverlee in Belgien. Als Prototyp soll sie zeigen, wie Informationen über komplexe Strukturen gemäß dem aktuellen Stand der Technik präsentiert werden können. Das Ziel besteht darin, nach internationalen Qualitätsstandards zu arbeiten und gleichzeitig die Informationen für Benutzer*innen leicht zugänglich zu machen. Zu diesem Zweck wurden sowohl MediaWiki als auch Wikibase als Software verwendet. Auf diese Weise wurde ein Interface erstellt, das optisch und funktional an Wikipedia erinnert und damit von Nutzer*innen ohne Vorwissen intuitiv verstanden werden kann, während die dazugehörigen semantischen Daten in einer Datenbank im Hintergrund gespeichert werden.

1. Introduction

In order to classify the considerations underlying the De Jonge Wiki, a look far back into history can illustrate the mechanisms associated with data carriers. Around the middle of the 6th century BC Croesus, the King of Lydia, minted his heraldic animals on standardized gold and silver blanks (Figure 1). This procedure initiated the era of coins as a currency. However, Croesus had not only created a means of payment, but also a data carrier, which contained information on the wealth or the geographic range of influence of a certain regime.

Fig. 1: Stater of Croesus, around 550 BC (16 mm, 10.76 g), minted in Sardis. [Photograph: Classical Numismatic Group, Inc. http://www.cngcoins.com. CC BY-SA 3.0]

Especially for archaeologists, coins are an ideal supplier of information. They enable the dating of an excavation layer, give evidence of trading connections and the political and economic conditions of a certain period. However, these data carriers used for thousands of years are increasingly disappearing from everyday use in the living presence. With digital payment methods, there is hardly any use for coins anymore. A millennia old cultural practice seems to approach its end.[1]

However, payment transactions are only one field in which currently the exchange of information runs almost only digitally. As comfortable as the new, electronic forms of communication are for humankind living today, it remains unclear how information of our era will be usable in the long term. To interpret the cuneiform on a clay tablet, the hieroglyphs on a stone stele or the ancient Hebrew on a scroll, one must only know the respective writing system to be able to read it. But when it comes to reading a digital document one must not only provide the electronic hardware but also the matching software to simply make a text visible at all.

The transmission of our current knowledge to future generations is thus inseparably linked with electronic technology – and thus with the risk of being lost. The development of digital media shows how real and inherent this danger is. Who can run a floppy disk or a VHS video cassette today? With every transfer of data to a new medium, parts of information get lost. Around 400 AD a similar media change seems to have been one of the causes of the so-called ›loss of books in late antiquity‹ when bound codices of parchment replaced scrolls of papyrus. Thereafter 1,400 years had to pass until modern libraries had again comparable stocks as they are recorded for ancient libraries.

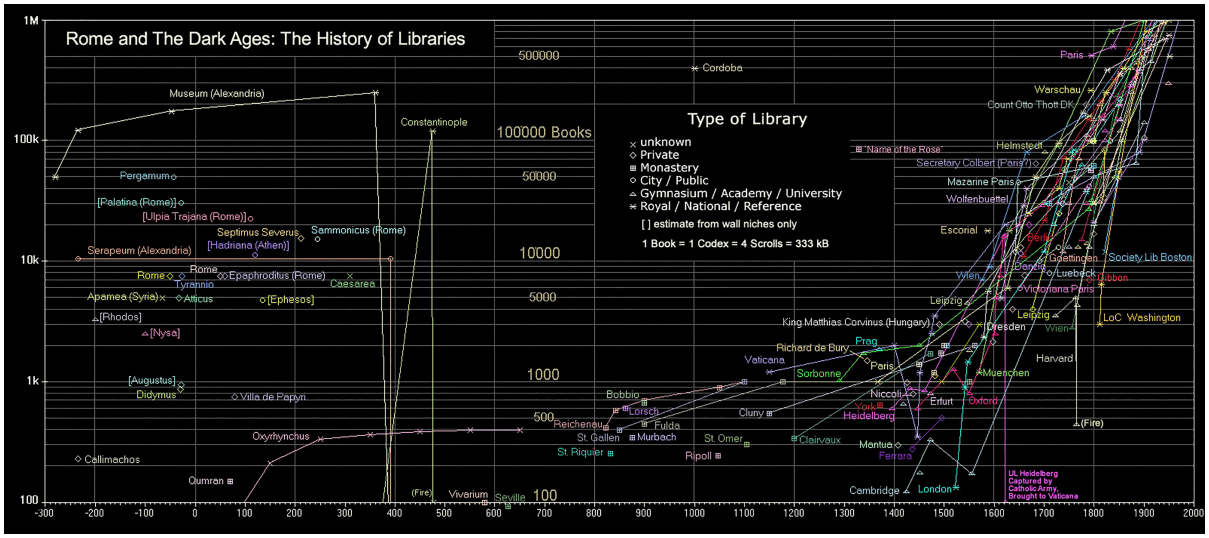

Fig. 2: Rome and the ›dark centuries‹, the history of libraries in the period of 300 BC until 2000 AD. [Chart: Bibhistor, CC BY-SA 3.0]

In the case of digitally stored data, there is another threat of loss that results from the programs with which the data is stored. Specialized software can often only be used with fixed-term licenses. If users do not have the corresponding license (anymore), the data is unreadable to them. The same applies to the further development of software. Due to the progress and development of programs, it is possible that data records cannot be opened only a few years or updates after they have been saved. Datasets that are not worked with, maintained, used or changed, are in danger of becoming lifeless mummies in digital sarcophagi, of which it is uncertain whether they can ever be recovered again.

In this regard, the very technical progress and digital development to store data generates gigantic centrifugal forces and corrosive powers that threaten the continued existence and further usability of records. Since these relationships are inherent to the system, it is important to look for ways to prepare information in such a way so that it can react as flexibly to these developments as possible and remain accessible for as many users as possible.

Recognizing the inherent challenges, the De Jonge Wiki was developed as a prototype to organize and present data based on specific criteria. This project opted for an online database accessible to the public at no cost, using English as the primary language to facilitate broader user engagement. The platform was built using the open-source software MediaWiki, combined

[1] In Belgium, cent amounts are rounded to 5-cent multiples in retail since December 2019, so that one- and two-cent pieces are virtually no longer in circulation.

with its powerful extension Wikibase, both of which are products of the Wikimedia Foundation. This choice provides several benefits: the software and its functions are well-tested, stable, and supported by the extensive daily engagement of millions of users across various Wiki communities.

MediaWiki software has a routine update path with only a few disruptive changes. In addition, there are a number of ways to export to a wide variety of formats, which is beneficial to the integrity and extensive use of the data. Furthermore, there is the potential for communication and automated alignment with similarly designed databases. Another important aspect is that other organizations that are interested can adopt and adapt the data management structure used here for their own projects.

Since April 2021, the De Jonge Wiki has been developed as part of a cooperation of the EU-funded PALAMUSTO project (Grant Agreement ID: 861426) with the Institute of Computer Science, Teaching and Research Unit for Programming and Modeling Languages of the Ludwig-Maximilians University of Munich (LMU) and the Raymond Lemaire International Center for Conservation (RLICC) of KU Leuven with support from the Institute of Technology Recruitment (ITZ) of the Karlsruhe Institute of Technology (KIT) and is still progressing.

2. Discussion

2.1 Building History of Arenberg Castle

Arenberg Castle in Heverlee (Figure 3) was a fitting choice for a case study because it is both well studied and of a manageable scale. The first mention of a castle in Heverlee dates back to 1371, although a fortified building can be assumed to have existed for centuries before that. The donjon of which we know from pictorial representations seems to have been built in the first half of the 15th century under Raas van Graven or Antoine I de Croÿ.[2] The decisive expansion into a representative hunting lodge happened under William de Croÿ, probably between 1505 and 1520, when the southern wing with the two corner towers and significant parts of the western wing were built. The most important pictorial and written sources for the early history of the castle were created under the reign of Charles III de Croÿ around 1600.[3]

[2] In May 2023, archaeological excavations uncovered the remains of the fortifications around the donjon (cf. Smitz 2023).
[3] Cf. De Jonge et al. 2002; De Jonge 2004.

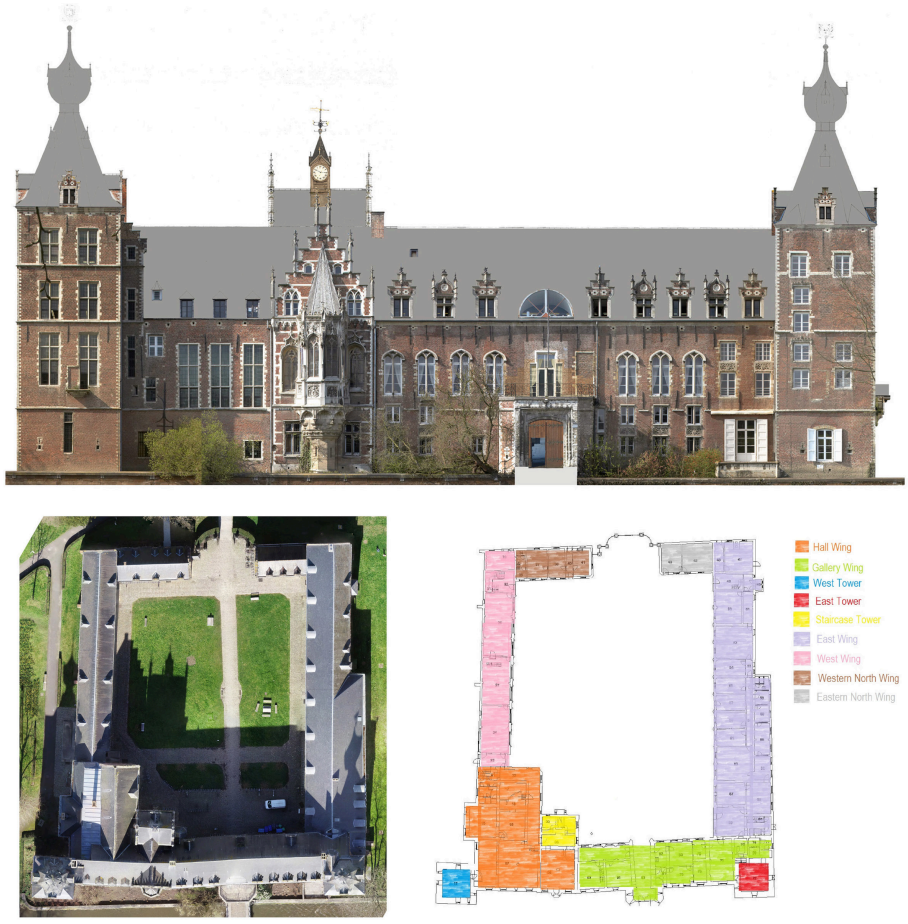

Fig. 3: South facade of Arenberg Castle, above [image: KU Leuven / Koufopoulos et al. 2021]; aerial view of the main building, left [image: KU Leuven / Koufopoulos et al. 2021]; floor plan of the ground floor with color labeling of different structural units, right. [Image: atlas plan, KU Leuven, Technical Services]

In the late 18th century, a new building replaced the burned-down parts of the west wing, the east wing was built in two campaigns and the already existing rooms were redivided in the style of Baroque and Classicism and some mezzanines were installed.[4] In the late 19th century, the castle underwent further extensions and additions in the neo-Gothic style by the architects Joseph Claes, Joris Helleputte, Alexis Raskin and Jules Picquet.[5]

After the castle was handed over to the University of Leuven, further transformations by Emile Goethals in 1925 continued to follow the neo-Gothic style. Between 1958 and 1971, Raymond Lemaire's restoration work attempted to recreate the state of the first phase of construction. As the last major interventions in the building structure, further additions in a post-modern look were designed between 1973 and 1998 by Paul Van Aerschot.[6]

For more than 25 years, professors, lecturers, and students of architecture or the Master in Conservation of Monuments and Sites program at KU Leuven have been studying the architectural history of the palace. In projects such as the ArchDoc program on documenting findings of building archaeology, over 20 experts and staff members have collected rich experience over the years, which has been documented in various forms, some only in analogue form, some already in digital form. Pooling this knowledge and making an overview of the collected information available online is the task that the De Jonge Wiki aims to serve. As one of the honorary professors, Krista De Jonge led the various research projects over the entire period mentioned. On the initiative of the researchers of the Wiki project, she therefore agreed to the usage of her name for the database.

[4] Cf. Vlaardingerbroek 2004.
[5] Cf. Bries 1991.
[6] Cf. Koufopoulos et al. 2021.

2.2 MediaWiki and Wikibase

The documentation of the architectural history of Arenberg Castle builds on the findings and insights made by Jan Lutteroth and Frieder Leipold under the direction of Stephan Hoppe within the interdisciplinary cooperation project *Kulturliegenschaften 4.0*.[7] In this project, a digital, semantic research database was created for the building history of Schloss Weikersheim in Baden-Württemberg, Germany.[8] This database was set up as a WissKI database following the ontology of CIDOC CRM. The digital infrastructure for this project was provided under the direction of Piotr Kuroczyński and Peggy Große at Mainz University of Applied Sciences.[9]

While the Weikersheim database was thus created with a software that has been developed for academic research, the database on the building history of Arenberg Castle was created with Wiki software. By doing so, two basic requirements were to be fulfilled above all others. The first requirement was the modelling of the data according to international standards, so that the records are machine-interpretable. For this, the software Wikibase was used, which also forms the basis for the semantic database Wikidata. However, such collections of data sheets that are linked together according to the principle of knowledge graphs are difficult to grasp for human users without prior knowledge and education.[10] They contain the danger to appear like reference deserts without a human touch and can have a repulsive effect – especially for researchers from the humanities.

Because of this, the second main concern of the project was to strive for a user interface based on Wikipedia, so that users will be spared the anxiety threshold of the new and unknown. Instead they should be able to move in an environment where design and functions are known to them from their daily use of Wikipedia. To achieve this goal, it was obvious to use MediaWiki, the same software with which Wikipedia is operated. In addition, it also offers all opportunities for joint editing and documentation of editorial changes that are offered by Wikipedia as well. It can thus be used as a *Virtual Research Environment* (*VRE*)[11] for the exchange between the different researchers involved. First projects with students also showed that the infrastructure of the De Jonge Wiki is particularly well suited for *Peer Assisted Learning* (*PAL*) in academic education, where students support each other with their respective skills in mastering a task. Another advantage of using an established software ecosystem is the variety of additional tools and functionalities, for example the accessibility for users with disabilities and their tools such as screen readers.

An additional benefit of using Wikimedia Foundation software is the possibility of linking to other platforms besides Wikidata and Wikipedia, such as Wikimedia Commons. In this media repository, free-to-use images, sound documents and videos as well as other media such as 3D objects can be published. In digital infrastructures, which are based on Wikibase or MediaWiki as software, these media can be integrated as preview images by simple linking, while hosting and all related activities are taken over and provided by Wikimedia Commons. This not only has the advantage that the hosting is outsourced, but also that the media in question can also be found in an environment used by a wider public.

Due to the limited capability of Wikimedia Commons to display 3D objects,[12] three alternative methods for embedding 3D files via iframes were evaluated. The first method, using Sketchfab, was technically straightforward but does not comply with the *FAIR/O* principles. FAIR/O principles advocate for data to be Findable, Accessible, Interoperable, and Reusable/Open, aiming for broader and more effective sharing of digital resources, which is not fully supported by commercial software like Sketchfab. Consequently, this solution can only serve as a temporary fix.

For future digital 3D model integrations, the use of the Kompakkt platform is planned. Kompakkt, developed by the Department of Digital Humanities at the Faculty of Arts and Humanities of the University of Cologne, extends the e-learning software ILIAS and aligns with FAIR/O principles. Another alternative is Semantic Kompakkt[13], an advancement within the NFDI4Culture initiative, which offers a free, open-source toolchain for viewing and enriching 3D model data. Like the De Jonge Wiki, Semantic Kompakkt utilizes Wikibase for processing structural data.

[7] This initiative was financed by the Baden-Württemberg Ministry of Finance as part of the first digital agenda for Baden-Württemberg (digital@bw 2018/19) and is intended to develop innovative approaches to cultural heritage. The partner directly involved in this case was the administration of the State Palaces of Baden-Württemberg, which is also a cooperation partner within the PALAMUSTO project.
[8] Cf. Virtuelle Rekonstruktion 2023.
[9] On semantic databases for the documentation of 3D reconstructions see: Lutteroth / Hoppe 2018; Kuroczyński et al. 2015.
[10] Cf. Baru 2021.
[11] Cf. Carusi / Reimer 2010.
[12] Mainly a lack of usable 3D file formats with textures, see Task T246901 at Wikimedia Phabricator.
[13] Cf. Semantic Kompakkt 2023.

However, experiments carried out in collaboration with Lozana Rossenova from the Technische Informationsbibliothek (TIB) in Hanover indicated that integrating Semantic Kompakkt into the logic of Wikibase records from the start of the De Jonge Wiki project would have been more advantageous. The best-case scenario would have been to use a single Wikibase to power both applications, in order to avoid any issues from federating the two data sets. Despite this, both Kompakkt and Semantic Kompakkt present promising options for future projects.

2.3 Data Structure

Basically, it can be said that there are several options when creating a scientific research database. On the one hand, there is the *Relational Database Management System* (*RDBMS*), in which entities are assigned different properties, in the style of different columns in tables. On the other hand, there are graph databases in which information is stored as knowledge graphs, that means as different entities that can be linked to one another by properties. One possible concept for such graph databases are *Labeled Property Graphs* (*LPG*), which means that the connection between certain entities is expressed in main properties which are attached to a node and additional simple key–value pairs: »Lauren Bacall (date of birth: 16.09.1924; place of birth: The Bronx) was married to Humphrey Bogart«. In contrast, information in *Resource Description Framework* (*RDF*) graphs is expressed in so-called semantic triples consisting of Subject–Predicate–Object: »Lauren Bacall was married to Humphrey Bogart; Lauren Bacall was born on 16.09.1924; Lauren Bacall was born in the Bronx;« or »Prinsenzaal is accessible from the Hertogenzaal« in Arenberg Castle. This means that all entities are interconnected by a particular property, thus forming a semantic triple. The Wikibase division of the De Jonge Wiki is such an RDF database.

The structure of a castle is particularly suitable for a clearly defined and structured database with a hierarchy or taxonomy. In this case, the entire complex of the castle with its topography and all associated architectural facilities is defined as the highest level. The initials AC for Arenberg Castle as part of their name mark all elements that are components of this complex. The main buildings of the castle are referred to by the initials MC for Main Castle. This Main Castle is in turn divided into the various wings and construction volumes, each defined by initials, such as for example EW for the East Wing. These wings again consist of different floors as well as facades and roofs, such as the first floor expressed as 1F. At the lowest level are the individual rooms designated by the currently used room numbers. The entire name of letter pairs thus refers to the position of the room in question (Figure 4) like coordinates, as it were. In a way, this approach corresponds to the traditional room books[14] used in older architectural research and can provide the information given there in a more flexible and digitally networked manner.

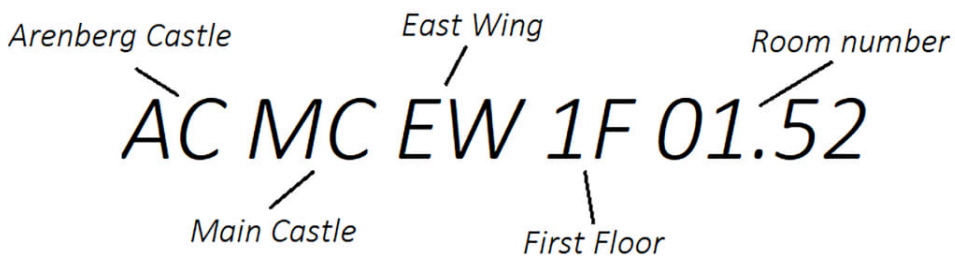

Fig. 4: Structure of the room designations in the De Jonge Wiki. [Chart: Frieder Leipold 2021]

For each such architectural unit an entry was created in the De Jonge Wiki both as a MediaWiki file and as a connected Wikibase file. In the MediaWiki entry, the information is published as text and images in the style of Wikipedia and – if possible – gives an overview of the findings to the respective building history. In the Wikibase entry, however, statistical information is stored in the form of RDF knowledge graphs.

These relationships are modelled according to a defining system, a so-called ontology, as for example CIDOC CRM (Comité International pour la Documentation Conceptual Reference Model). In a database, an ontology forms the intended frame of reference, which is then filled with the contents of the respective data records. The Wikibase datasheets of the De Jonge Wiki are based on the ontology on which also Wikidata is based. This decision was made, on the one hand, because this type of

[14] Cf. e. g. Bayerische Schlösserverwaltung (ed.) 2021.

data modelling is applied by an influential and internationally accepted structure as Wikidata and, on the other hand, because this ontology is not a rigid and hierarchical taxonomy, such as CIDOC CRM, but flat and flexible and can be adapted to the requirements of the respective records. This makes it easily possible to integrate new insights and research approaches seamlessly into existing data.

Due to the aim that users should be able to make data entries in the De Jonge Wiki with as short a training as possible, the structure was deliberately kept as simple as possible. There are only three page categories in the frontend (Figure 5), namely:

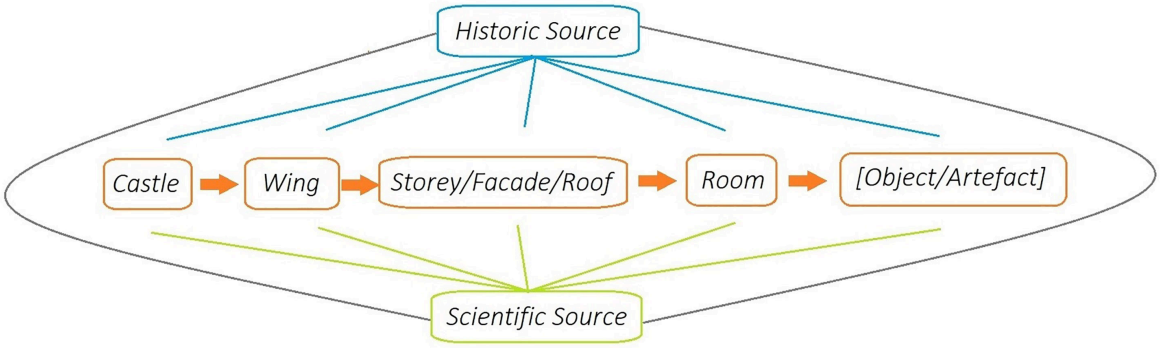

Fig. 5: Structural logic of the page categories. [Chart: Frieder Leipold 2021]

As already discussed, the architectural structures represent the basic units. In their Wikibase data sheets, statistical information such as length, width, maximum height and area are given, but also to which next higher category the architectural structure belongs (Property:P34 ›part of‹). In addition, it is indicated through which other rooms the room in question can be entered in the current situation (Property:P16 ›Accessible from‹).

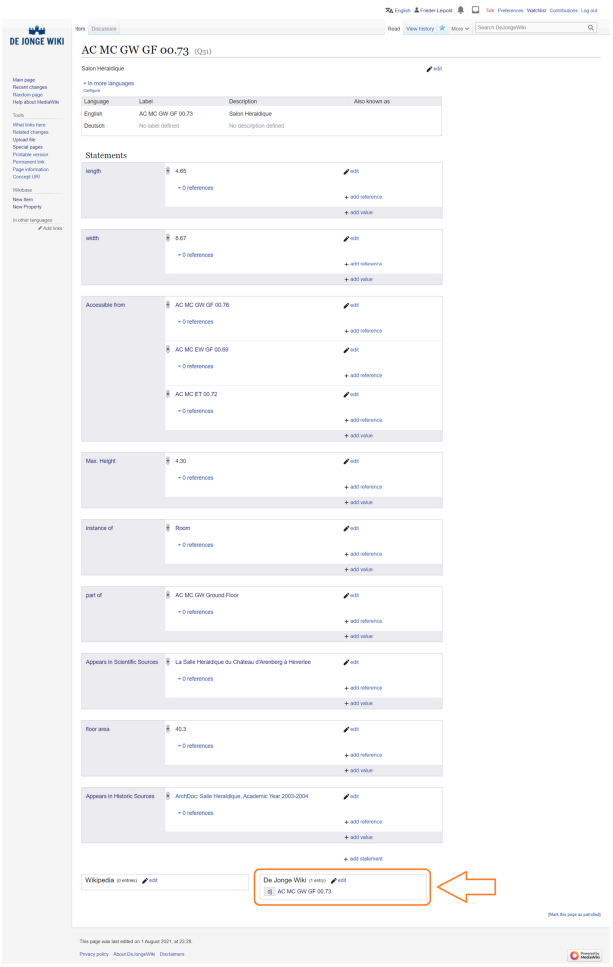

Fig. 6: Example of a data sheet in the Wikibase database. [Screenshot De Jonge Wiki]

All of this information is indicated on the frontend using a template and can be seen as an info box at the top right there. To get to the frontend, you simply have to click on the link in the data sheet at the bottom right. Conversely, to get from the frontend to the corresponding data sheet, there is the ›De Jonge Wiki item‹ function in the left-hand column, which takes users to the Wikibase data sheet.

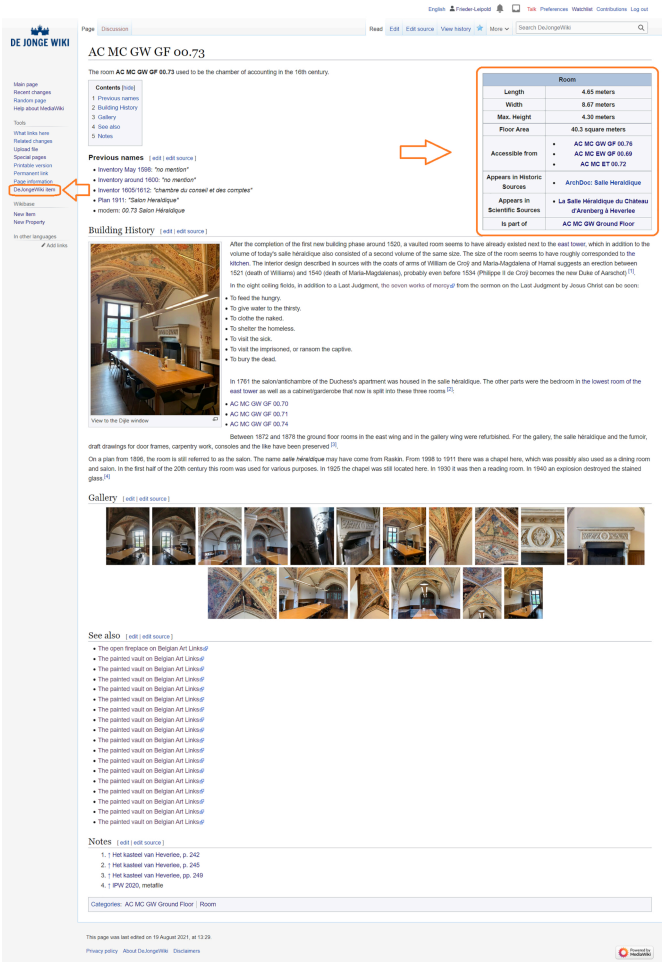

Fig. 7: Example of a front-end article for a room. [Screenshot De Jonge Wiki]

Other important information given in the data sheet are references to scientific and historical sources where information about the architectural structure in question can be found. The cells with these references are linked directly to the entries on the relevant articles in the info box. These links are generated automatically by entering the titles of the articles in the Wikibase data sheet. However, the article pages of this source material are only visible in the frontend to users who are logged in. The reason for this access restriction is the fact that content in this category is specially affected by copyright and data protection law. Some of the research projects listed here were part of student education and are treated as personal data.

Further information and previous research results can be discussed in the text sections in the pages on the historical sources. In the case of written archival material, the scan of a page and both the transcription and a translation proposal can be displayed next to one another in a list.

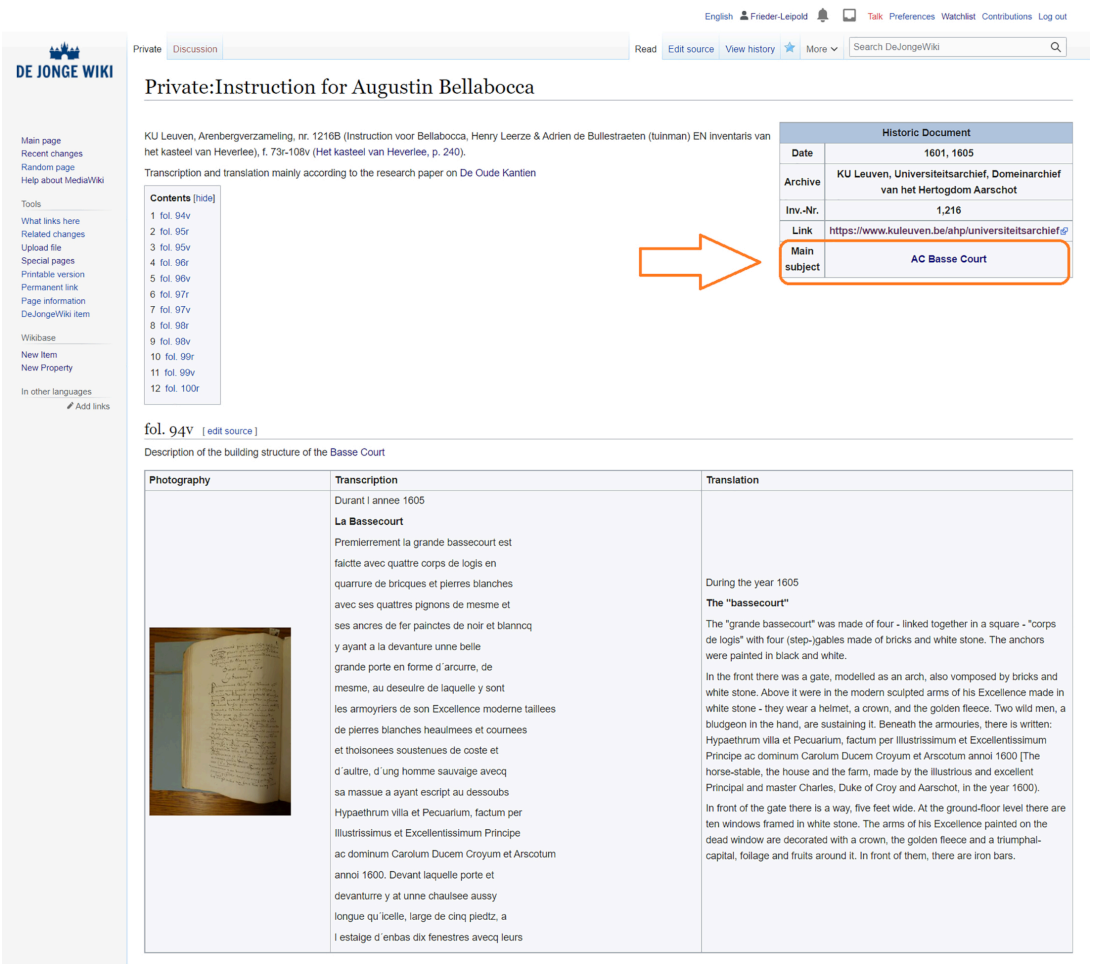

Fig. 8: Example of a front-end article on a historical source. [Screenshot De Jonge Wiki]

In the case of scientific sources, on the other hand, usually only editorial information such as authors, year and place of publication or number of pages is given (Figure 9). Historical sources and scientific sources can also be linked directly to one another when the historical one is one of the main subjects of the scientific one (Property:P28 ›Main subject‹). In this way, one obtains a clear listing of all investigations that have already been carried out on a specific part of the architecture.

Thus, the De Jonge Wiki tries to prepare diverse research data according to the FAIR/O principles: Findable, Accessible, Interoperable, and Reusable with the help of free Open license software. By adopting the digital infrastructure developed as a prototype, other scientific projects or cultural organizations can prepare their data effectively and valuable and make it publicly accessible in a user-friendly way.

Fig. 9: Example of a front-end article on a scientific source. [Screenshot De Jonge Wiki]

2.4 Open Questions and Challenges

Fortunately, when the basic considerations were implemented in a functioning database, all of the intended aspects could be set up without major problems. When the data was entered by student research assistants, it was found that the structure can be understood intuitively after a short briefing. This made it possible that the student research assistants could follow the underlying logic intuitively and suggest and implement their own additions in order to optimize the database. In practice, however, there were also some challenges that could not be optimally met within a very limited time and budget framework.

Even at the beginning of the implementation, it became clear that the web space, which was kindly provided by KU Leuven, did not enable an easy way to use the Docker version of Wikibase. This is mainly due to the fact that the University is primarily interested in protecting its own research achievements from access by third parties. A classic virtual machine (VM) service operation as an execution environment for Docker or other container systems was classified as too vulnerable in regard to data security. Therefore some practical additional services such as the ›Query Service‹ are not yet available at the De Jonge Wiki. This would have offered a simple, user-friendly possibility to design queries in the SPARQL scripting language via the dataset in Wikibase, as well as the graphic representation of these search results. In addition, overview pages cannot simply be generated in this way, for example a list of all items that are identified as rooms (Property:P2 ›instance of‹; Item:Q257 ›Room‹). In order to still be able to have a classification, the articles in the frontend must be tagged and marked in accordance with the categories in Wikibase. This requires a double administration, which may eventually result in inconsistent information.

The fact that Docker cannot be used also means that software updates have to be installed manually with more effort, which is why a certain amount of expert knowledge is required in dealing with MediaWiki software. However, administrators often have experience in using these solutions, especially at universities which provide wikis to support teaching, and should therefore be able to cope with this challenge. The De Jonge Wiki is in the process of moving to an environment in summer 2023 where Docker and SPARQL queries can be used and where the data will be backed up on a local server for improved security.

Another unavoidable issue is that the datasets are not perfectly uniform because of the human factor, as several employees work on the same datasets in different daily conditions. These inconsistencies would also have been easier to identify and fix if certain Wikidata approaches had been integrated into the project; among other things, the query service, but also restrictions on property fields or shape expressions would have been valid approaches to reduce these problems, but have not yet been implemented.[15]

In addition, once created, data types of properties cannot be changed afterwards. Inventory numbers that are created as a numeric data type cannot be converted into a textual data field afterwards. Also the search function for both namespaces of the wiki has not yet been completely standardized and only works in a case-sensitive manner.

[15] Cf. Extension: WikibaseQualityConstraints 2023; Extension: EntitySchema 2023.

It should also be emphasized that the software of the Wikimedia Foundation is designed for Creative Commons-licensed content, that is for content that can, in principle, also be shared. Data to which this does not apply, for reasons of copyright or personal rights, can only be made accessible to a limited extent as an article in a private area. However, this is only a protection for article pages. With the sites of individual files such as the images uploaded in the wiki, this function does not exist.

3. Synopsis

With the De Jonge Wiki, for the first time a user-friendly frontend based on MediaWiki was linked with a semantic database based on Wikibase with the help of a simple template, as was previously only implemented for the exchange between Wikipedia and Wikidata. When working with students, it became clear that these structures could be understood quickly and that it was possible to deal with them independently after a short introduction phase. The infrastructure tested in this project therefore has the potential to be used by organizations such as museums as an up-to-date tool for inventorying and documenting measures following the FAIR/O principles.

Using MediaWiki and Wikibase as software results in two further advantages. On the one hand, it is popular, long-lasting software that can be used free of charge and does not require licensing. One has to be aware however that the term ›long-lived‹ is very relative in the world of modern data sciences, since this kind of wiki system itself has only been in existence for a little over 20 years.[16] On the other hand, the data records created in Wikibase can be read automatically and integrated into other databases. In this context, it must be noted that the De Jonge Wiki will only be searchable together with other Wikibase databases in common SPARQL queries after the forthcoming move to a new hosting. However, this is due to the hosting in the digital infrastructure of KU Leuven and can easily be avoided in the case of any similar projects.

The De Jonge Wiki is already proving to be a welcome opportunity to convey content. In the academic year 2021/2022, the data was used by the RLICC at KU Leuven for the training of master's students in the modules ›Analysis, Registration and Documentation Techniques: ArchDOC‹ (H00W6A), ›Building Archeology: Integrated Project Work‹ (H01X8A) and ›Integrated Project Work 3‹ (H00X2A). In addition, as part of the Master of Digital Humanities training at KU Leuven, a collaboration with Prof. Andrew Vande Moere from the research group ›Research[x]Design‹ (RxD) took place in the study year 2021/2022, which deals with digital designs to convey and develop Arenberg Castle. Within this project, the master students used the De Jonge Wiki for their research.[17] At the LMU in Munich, the De Jonge Wiki served as central example in the seminar ›Renaissance-Architektur digital. Aktuelle Forschungen und ihre Unterstützung durch semantische Datenbanken‹ (09523) during the winter semester 2021/2022 by Prof. Stephan Hoppe. There, students edited their own content in the database.[18] With Frieder Leipold and Max Kristen as members, the De Jonge Wiki is meanwhile also represented at the international Wikibase Stakeholder Group.

With the De Jonge Wiki, a database was created that can be used intuitively to move freely in a virtual castle and get detailed information on the building history. Another requirement was the possibility to save data records in the background in a semantic database that meets current international standards. These tasks have been accomplished convincingly.

Organizations or projects that are interested in the De Jonge Wiki as a prototype for scientific databases can find detailed information on the extensions and skins used in the online reference list WikiApiary. More information on the structure and logic of modeling the data can be found on the De Jonge Wiki help page. Further collaborations will show whether the prototype tested here could be used for similar databases as their digital infrastructure.

[16] Cf. History of Wikis 2023.
[17] Cf. Prof. Andrew Vande Moere 2023.
[18] Cf. Renaissance-Architektur digital 2023.

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