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Opening up traditional cultural knowledge by means of European infrastructures: the examples of exploreAT! & EGI Engage

El acceso a los conocimientos culturales tradicionales a través de infraestructuras europeas: los ejemplos de explorarAT! & EGI Engage

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ABSTRACT

The rapid development of new digital tools and infrastructures in the last years, and their application to a variety of disciplines has transformed how we store, access and retrieve information. This has also shaped the ways knowledge is presented and reused in diverse cultural contexts. The exploreAT! project builds upon not only Austrian, but also European cultural identity from the aspect of language, in particular dialects. Unlike standard languages, dialects are in times of globalization under considerable threat of diminishing, and this ultimately poses a risk to the intangible record that is language and through which a history of tangible culture is expressed. In this paper we elaborate on the possibilities digital means and the infrastructure and services of the EGI-Engage project in revealing and giving access to unique traditional cultural knowledge contained in a non-standard language resource on the example of the Bavarian dialects in Austria (DBÖ). Digital tools and services allow our heterogeneous corpus of data to be virtually exploited and preserved. The flexibility of the internet allows these data to become not only visible, but searchable and extractable. Through digitization efforts, and the use of European infrastructures the hidden cultural narratives within the data can be uncovered, enriched and shared for the benefit of information and knowledge society.

RESUMEN

El rápido desarrollo de nuevas herramientas e infraestructuras digitales en los últimos años, y su aplicación a una variedad de disciplinas ha transformado la forma en que almacenamos, accedemos y recuperamos la información que tenemos disponible. También ha determinado las formas en que se presenta, utiliza y reutiliza el conocimiento. El proyecto exploreAT! se basa no solo en la identidad cultural austriaca, sino también en la identidad europea desde el punto de vista del lenguaje y en particular de los dialectos. A diferencia de los idiomas estándar, los dialectos se encuentran en tiempos de globalización bajo una amenaza considerable de disminución, y esto, en última instancia, supone un riesgo para el registro intangible que es el lenguaje y mediante el cual se expresa una historia de cultura tangible. En este artículo explicamos las posibilidades que ofrecen los medios digitales, la infraestructura y los servicios del proyecto EGI-Engage para revelar y dar acceso a los conocimientos culturales tradicionales únicos contenidos en un recurso lingüístico no estándar de los dialectos bávaros en Austria (DBÖ). La flexibilidad de internet permite que estos datos no solo sean visibles, sino que también se puedan buscar y extraer. A través de la digitalización y del uso de infraestructuras europeas, las narraciones culturales ocultas dentro de los datos pueden ser descubiertas, enriquecidas y compartidas en beneficio de la sociedad del conocimiento.

KEYWORDS

Digital Humanities, European Infrastructures, Cultural Diversity, Multidisciplinary Collaboration. Cloud Infrastructure.

PALABRAS CLAVE

Humanidades Digitales, infraestructuras europeas, diversidad cultural, colaboración multidisciplinaria, infraestructura en la nube.

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1. INTRODUCTION

In this paper we elaborate on the possibilities digital means and infrastructures offer in revealing and giving access to unique traditional cultural knowledge (UNESCO, 2002) contained in a Humanities data set, namely a non-standard language resource on the example of the Bavarian dialects in Austria [Datenbank der Bairischen Mundarten in Österreich/Database of Bavarian dialects in Austria (DBÖ)] (Wandl-Vogt, 2008) and related dbo@ema [Database of Bavarian Dialects in Austria-electronically mapped] (Wandl-Vogt, 2010), with the original analogue data originating from a time of the early 1900s in the area of the former Austro-Hungarian Monarchy. The DBÖ language resource is explored and exploited in the context of the Digital Humanities project exploreAT! (Wandl-Vogt et al., 2015) and is being embedded into a digital environment for further cultural and linguistic exploration and connectivity to other infrastructures and initiatives (e.g. COST Action IS1305: European Network of e-Lexicography (ENeL). Here, we describe on the example data set of DBÖ dealt with in exploreAT! how cultural knowledge implicitly and explicitly represented in Humanities data can be opened for various approaches and stakeholders and made accessible by making use of European digital infrastructures and their services such as EGI.

This paper thus provides insights into the collaboration between the two projects at a specific moment in time. In what follows we provide a sketch of the computational framework, architecture and infrastructure of the Horizon 2020 project EGI-ENGAGE and one of its community-driven groups-DARIAH-Competence Centre and services developed within it, the SADE (Storing and Accessing DARIAH contents on EGI) use case, and the results of this transdisciplinary collaboration. Finally, a future outlook towards European open science is given from the perspective of digital infrastructures, with possibilities of tools and services to facilitate such processes.

2. HUMANITIES & DIGITAL CONTEXTS: THE EXAMPLE OF THE EXPLOREAT! PROJECT

The rapid development of new digital tools and infrastructures in recent years and their application to a variety of disciplines has transformed how we access information available to us. Computational methods, digital tools and infrastructures, in particular, have allowed to discover and open Humanities data in novel ways. This has also shaped the ways how knowledge in a diverse cultural context is accessed, used and reused. In the case of the Humanities, user-tailored digital tools and services offer a wide range of possibilities, which we describe here on the example of a use case (SADE) arising from the Digital Humanities (DH) project exploreAT! in connection to the EGI-Engage project and related services and infrastructures.

exploreAT!-"exploring Austria's culture through the language glass"[1] (Wandl-Vogt, Kieslinger, O'Connor & Theron, 2015) is a cross-disciplinary Digital Humanities project, implemented at the Austrian Academy of Sciences, Vienna. It brings together expertise from the areas of semantic technologies (ADAPT CENTRE @ Dublin City University, Ireland), visual prototyping (GRIAL-USAL @ Universidad de Salamanca, Spain) and crowd science to give access to and discover cultural knowledge contained within a more than one hundred year old non-standard language resource, which has been made accessible also in a digitized way (DBÖ [*Datenbank der Bairischen Mundarten in Österreich/Database of Bavarian Dialects in Austria*]) (Wandl-Vogt, 2008; 2010). Parts of the database content have also been made available as part of a (currently five volume) dictionary (WBÖ, 1970).

The cohort of the digital collection comprises digitized and original data collection questionnaires and related answers (figure 1) together with excerpts of various vernacular dictionaries and other folklore literature, counting around a total of 3.6 million entries. While the *DBÖ* and *dbo@ema* appear to be primarily resources for linguistic study, they are at the same time a rich source of cultural information on various aspects of Austrian life and traditions (e.g., food, festivities, popular customs, etc.) originating from the time of the multicultural and multilingual Habsburg Monarchy until today.

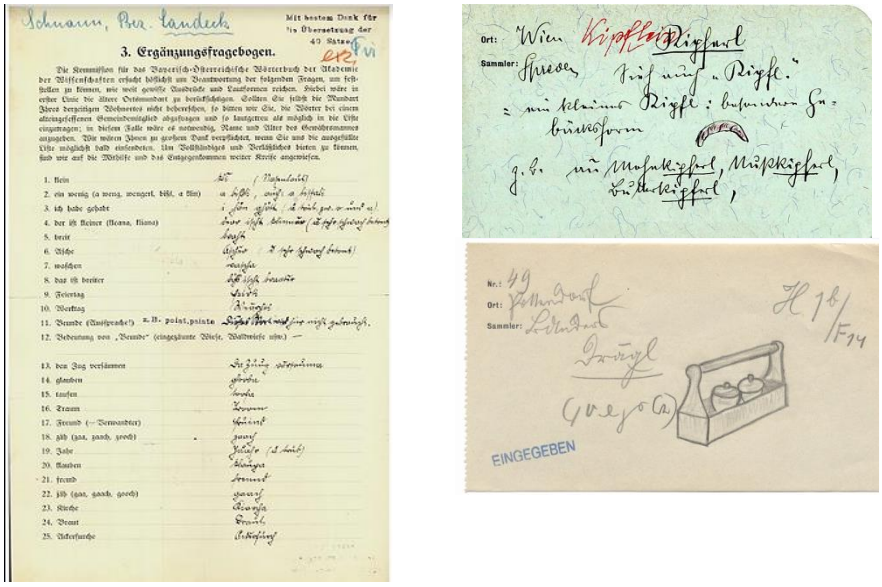

Figure 1. Example of an original data collection questionnaire (left) and answer paper slips (right).

Through complex semantic data models dealing with the cultural content in the original data collection questionnaires and related answers (Abgaz et al., 2018a; Abgaz et al., 2018b), the linking to other data sets and frameworks (LOD) is enabled. At the same time, data exploration by means of visual tools and prototypes (Benito, Dorn, Wandl-Vogt & Theron, 2018) gives access to cultural knowledge contained in a traditional language resource from a visual

[1] See: https://www.oeaw.ac.at/acdh/projects/exploreat/.

perspective, as these tools enable the unlocking of knowledge, patterns and relations and increase the accessibility for and connection to other data sets, disciplines or user groups (Dorn et al., 2018). As an early citizen science project (Finke, 2013), it also embodies a community effort of preserving the primary method of oral communication within the common population at the time (Wiesinger, 2014), captures how Bavarian dialect plays a vital role in day to day Austrian culture, and shines light on the European character and importance of this particular dialect (UNESCO, 2014).

The described digital tools therefore allow our heterogeneous corpus of data to be virtually exploited and preserved (Jones & Ogilvie, 2013; Wandl-Vogt et al., 2015; Schopper et al., 2015). Given the connectivity enabled by the internet, it allows these data to become not only visible, but searchable and extractable. Through the digitization efforts, the hidden cultural narratives within the dictionary corpus can be uncovered (Meecham, 2013; Annoni, 2010).

The exploreAT! project thus builds upon both Austrian as well as European cultural identity, from the aspect of language, in particular dialect. Unlike standard languages, dialects are in times of globalization under considerable threat of diminishing, which ultimately poses a risk to the intangible record that is language and through which a history of tangible culture is expressed. There is thus a pressing need to preserve such information, but at the same time also to bring the valuable cultural information contained within to life by making it accessible and re-usable, also across disciplines. exploreAT! is thus essentially a demonstrator project, serving as an example on how to bring Humanities data into wider digital infrastructures, as will be described by the SADE use-case below, and also by the services[2] EGI-Engage and DARIAH-CC offer researchers across disciplines. By being a part of these wider European research infrastructures, exploreAT! makes use of the digital services and advantages EGI offers in terms of data storage, access, discovery and analysis.

3. COLLABORATIVE RESEARCH: KNOWLEDGE DISCOVERY THROUGH INFRASTRUCTURES AND SERVICES

There is a trend for Digital Humanities projects to draw on widely available infrastructures and services for archiving, accessing and analysing their data. Wider European infrastructures and frameworks, such as DARIAH-EU (DARIAH-EU), CLARIN (CLARIN-ERIC) and CESSDA (CESSDA-ERIC), supported by the European projects such as COST ENeL, EGI ENGAGE (Wandl-Vogt, Barbera, La Rocca, Calanducci, Carrubba, Inserra, Kalman, Sipos, Farkas & Davidovic, 2016), EOSC-hub (EOSC, 2018) and OpenAire-Advanced (OpenAire, 2018) enable our approach to be enriched and connected to related cultural undertakings on not only a European level, but also within a global network. These infrastructures bring to fruition the

[2] See: https://www.egi.eu/services/.

methodological development of the exploreAT! interdisciplinary project (e.g. Open Innovation in Science). Complying with the standards of these frameworks results in optimal interoperability, which benefits and enriches the knowledge of a shared, diverse European culture.

There are, however, only a few Pan-European research initiatives providing access to e-infrastructures that offer user-tailored services and applications. The EGI-Engage project and related DARIAH-CC we describe below are such initiatives. DARIAH-CC in particular aims to widen the usage of the wider European e-infrastructures in the Arts and Humanities research, offering not only services, but also know-how and training.

In order to make the data and the research outcomes visible, searchable and reusable to a wider audience, novel digital technologies, services and platforms are used, some of which developed, maintained and offered by various domain-specific research infrastructures, but also general-service providers such as EOSC-hub and OpenAire, which aim to make the European Open Science Cloud (EOSC, 2017) a reality.

In what follows, the EGI infrastructure and services will be described together with a use case (SADE) from the Humanities that relates to the exploreAT! project.

4. THE EGI INFRASTRUCTURE & DARIAH COMPETENCE CENTER (DARIAH CC)

One of the research efforts that aimed to improve the visibility and accessibility of the culturale knowledge and language diversity in Europe were undertake during the EGI-Engage project (EGI-Engage, 2015). EGI stands for *European Grid Infrastructure* and is a federated e-infrastructure offering advanced computing, storage and application services for research and innovation[3]. The grid initiative spans over 32 countries with over 300 data centres and cloud providers, offering compute power, storage, clouds and applications. In this context, the Horizon 2020 EGI-Engage project aims at accelerating the implementation of Open Science Commons, expanding the capabilities of a European backbone of federated resources, data, services, knowledge & expertise. The project consists of eight competence centres, each covering different research domains, providing infrastructural support, develop tool and services for their target research domains.

One of these competence centres is the DARIAH Competence Centre[4], consisting of a virtual, international group of researchers aiming to broaden the use of advanced research infrastructures and cloud technologies, was established. The main activities of the Centre consisted of making contact with the EGI and DARIAH communities to advise DARIAH members in their infrastructural needs, provide customised e-Infrastructure services for Arts and Humanities, create demonstrator applications for the Arts and Humanities domain to show the capabilities

[3] See: https://marketplace.egi.eu/.
[4] See: https://wiki.egi.eu/wiki/CC-DARIAH.

and possibilities with the use of EGI and raise awareness within the Arts and Humanities scientific community about the benefits of using e-Infrastructure technologies. The centre developed and maintain a large set of general-purpose as well as research-specific services and tools at the level of e-Infrastructures, technologies, apps and services and the community, which are shown in detail in figure 2. At the bottom level, the centre makes access to the underlying EGI Federated Cloud infrastructure, which consists of a large number of computational and storage resources, operated by various data-centre (cloud site) providers within well-established and mature EGI network of resource providers. At the same time, the Centre allows users to use the DARIAH AAI credentials to access the provided resources via the DARIAH Science Gateway[5]. The Centre established the DARIAH Science Gateway, above the underlying resources (figure 2, in the layer *Technologies*), acting as a central point for connecting the end-user applications and services, such as Semantic Search Engine and DBÖ, with the underlying EGI resource (e.g. EGI FedCloud infrastructure[6]). In the technology layer the Gateway support a few different frameworks used by several use-cases and applications, such as gLibrary[7] framework used in the SADE project and DBÖ. From the user perspective, the only interaction is done with the Gateway (figure 2, *apps & services layer*), via the user services and applications web-interfaces (portlets) integrated into the Gateway.

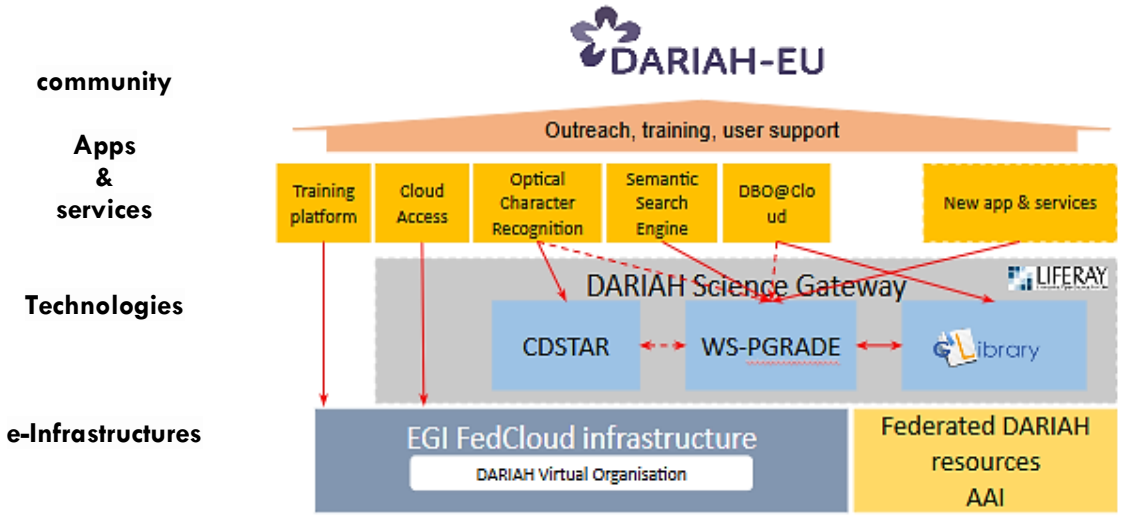

Figure 2. Architecture (software and service stack) of the DARIAH-Competence Centre. Image: CC noDerivatives nonCommercial 4.0.

The Competence Centre thus enables the exploreAT! project to be connected to a wide range of available cultural resources. Via the DARIAH Science Gateway , a web-based online portal, access to the Semantic Search Engine (SSE) is given, which facilitates the connection to a

[5] See: https://dariah-gateway.lpds.sztaki.hu/.
[6] See: https://wiki.egi.eu/wiki/Federated_Cloud_user_support.
[7] See: https://glibrary.ct.infn.it/glibrary_new/index.php.

number of services, including Europeana[8], Cultura Italia[9], PubMed[10], etc. These aggregation services offer valuable points for interlinking cultural and linguistic data.

5. THE SADE USE CASE

The SADE use case (Storing and Accessing DARIAH contents on EGI) serves as an example of collaboration between Humanities and e-Infrastructure providers. It makes specifically use of a DBÖ dataset (questionnaires, as also dealt with in exploreAT!) in the context of the EGI infrastructure. Generally, the overall goal of this use case was to create a digital repository of DARIAH contents using the framework developed by the Italian National Institute of Nuclear Physics (INFN), gLibrary, to create and manage archives of digital assets (data and metadata) on local, grid and cloud storage resources. The digital repository, taking into account the requirements of the DARIAH end-users, is accessible at the DBÖ@Cloud repository[11]. From the DBÖ dataset, more than 20.000 records are accessible via fetch and show (figure 3). The DBÖ dataset more specifically concern the cohort of the former data collection questionnaires, in particular their metadata, but also scans of the original images. For these data, filter options and customization of display are enabled. The metadata comprises several aspects of information contained in the records. In addition, metadata may be removed or added to, annotations added and multimedia resources previewed and downloaded. By taking advantage of the EGI infrastructures and services, these Humanities data has now been made available on the cloud, where previously storage and accessibility to such data had been only given on local drives of the institution. By bringing the data into the EGI infrastructure, wider access, discoverability and re-use possibilities are enabled that go beyond the Humanities community and open the data again to new perspectives and research questions of different disciplines.

Making our Humanities data freely available also for other actors to draw on, facilitates work within a citizen science context, where citizens can be challenged to work with such data in the context of cultural lexicography scenarios. On a wider level, making data available also to other institutes and disciplines offers opportunities for future cooperation and partnerships with institutions on a global level. As far as data security is concerned, mirroring our data on the EGI infrastructures offers higher levels of data security than simply keeping data stored on local drives.

[8] See: https://www.europeana.eu.
[9] See: www.culturaitalia.it/.
[10] See: https://www.ncbi.nlm.nih.gov/pubmed/.
[11] See: https://dariah-gateway.lpds.sztaki.hu/web/guest/dbo-portlet.

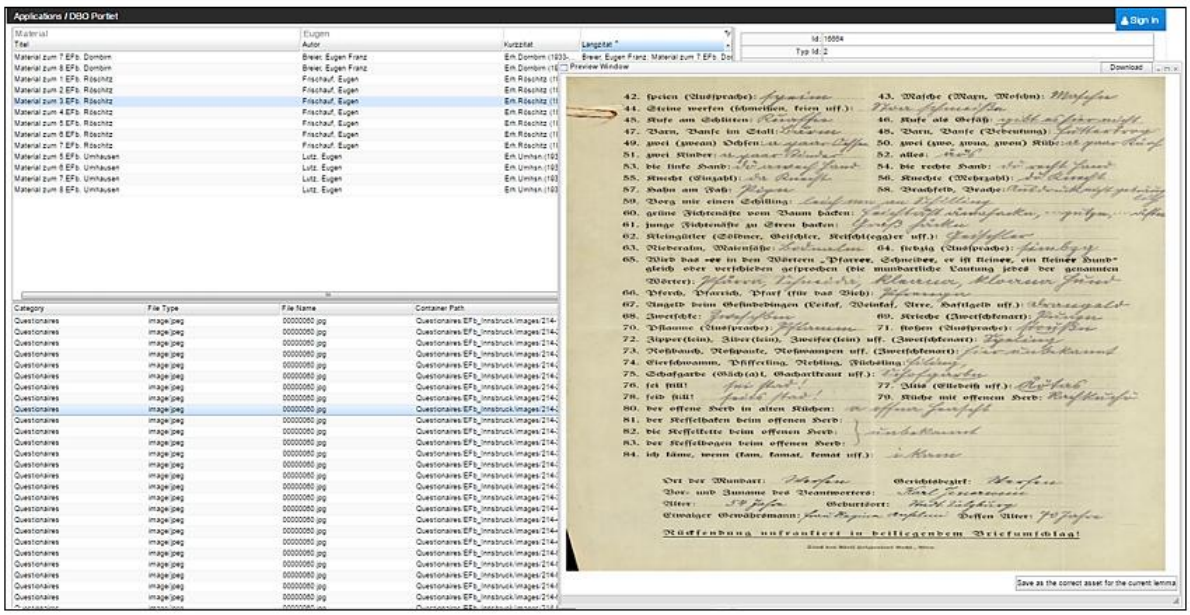

Figure 3. Example of the DBÖ@cloud interface with preview and download of multimedia resources. Image: CC noDerivatives nonCommercial 4.0.

6. FUTURE DIRECTIONS

The work performed during the EGI-Engage project and within the DARIAH Competence centre in bringing the Humanities data into research infrastructures has be continued within the ongoing H2020 EOSC-hub project. The project aims to gather the EGI Federation, EUDAT and Indigo-DataCloud efforts as well as other major research infrastructures to deliver a common, interoperable set of opened research data, services and software. In terms of DARIAH Competence Centre and Digital Humanities, the project will bring further integration of the existing services with the goal to increase interoperability between different data repositories and collection as well as to provide automatic service and software provisioning that will allow users to seamlessly reproduce specific analysis steps on the given data set or to conduct their own analysis.

7. CONCLUSION

This paper has described opportunities of digital infrastructures and services for the Arts and Humanities on the examples of EGI-Engage and exploreAT! The EGI federated e-infrastructure together with the services of the DARIAH-CC offer a valuable ground for Humanities projects and data to make use of digital data storage, access and analysis. Where Digital Humanities projects might underutilize available infrastructures due to a lack of awareness, lack of access or even lack of relevant technical know-how, the project offers comprehensive services facilitating an easy use of its infrastructure and services.

As shown on the example of the SADE use case and the DBÖ@Cloud service, we conclude with relevant learnings from this case study, from several aspects: one aspects concerns

learnings on how to embed a traditional Humanities project with non-standard language data into a multidisciplinary Horizon 2020 workflow. This goes hand in hand with learnings on interdisciplinary collaboration and discussion of actor needs from a meta level, but also on challenges arising from collaboration across various disciplines. Our example has demonstrated the application of knowledge design for a networked Humanities case study, resulting in the unique non-standard language collection becoming accessible and available via cloud services (DBÖ@cloud). In this way, the described infrastructures and services that enable access to, use and re-use of data across disciplines on a wider, global level, opening up resources for the benefit of information and knowledge society.

In conclusion, we can remark that for future endeavours, we wish to direct our efforts towards upscaling to exploit the data and infrastructure deeper within the exploreAT! framework under the new concept of "cultural lexicography development" as well as within the open innovation research infrastructure movement.

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