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EHRI Innovation Report (Final)

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Abstract (for dissemination)	EHRI plays an important role in enabling innovation in Holocaust research and archives. This deliverable discusses the relevant developments and challenges surrounding innovation and creates and demonstrates the efficacy of the EHRI Innovation Roadmap, setting out EHRI's plans to continue to foster an innovative environment in the field of Holocaust Studies.
Management Summary	n/a

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2   Introduction

Since the inception of the European Holocaust Research Infrastructure (EHRI) in 2010, EHRI has played an important role in enabling innovation in the domain of Holocaust research documentation and beyond through its own outputs (including EHRI Resources), by establishing cross-disciplinary networks of experts and by reaching out to commercial players in the cultural and digital industries. EHRI has always sought to foster a culture of cooperation between diverse stakeholders and infrastructures and has already demonstrated great successes in addressing the fragmentation of sources and expertise by building a single-point-of-access to metadata.

Innovative approaches and methods have been developed through EHRI-1 (2010-2015) and EHRI-2 (2015-2019) and are continuing to be developed through multiple work packages (WPs) in EHRI-3 (2020-2025). The development and implementation of new ideas and technologies is an essential requisite of organisational success, and this is as relevant to business as it is to Research Infrastructures (RIs). It can be tempting to try to formalise the innovation process, but that is a dangerous road to travel as it often stifles the spontaneity necessary to create innovation. Instead, it is important to create an environment where collaboration and, therefore, innovation can occur organically.[1] Evidence suggests that innovation is usually built off the back of a history of innovation within an organisation, meaning EHRI already has a strong foundation on which to continue to build in the future. Studies have shown that, 'rather than being the result of continuous efforts, most innovations were developed as a response to discrete events, history-specific problems and new technological opportunities'.[2] Thus, the aim of this Innovation Report is to provide a framework for EHRI to continue to foster the collaboration necessary to create future innovation opportunities. This deliverable will offer an overview of EHRI's executed and planned innovation activities as well as create and demonstrate the efficacy of the EHRI Innovation Roadmap.

3   Areas of innovation focus

The development of EHRI's innovation strategy focuses on a minimum of 3 core themes, centred around issues which include (but are not limited to):

3.1   Open science and open data

By focusing on the challenges faced by cultural heritage institutions and researchers to improve the use and re-use of the data assets they hold and generate, EHRI will help develop and implement best practice including ways to open research data to a larger audience.

3.2   Encouraging methodological innovation

The digital transformation of Holocaust research and archives is fully underway and offers both Holocaust archivists and researchers unique opportunities to innovate their working practices to generate new insights and to enhance access to sources. However, experience

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[1] For example, see Rob Cross, "Organic Innovation: What It Is and Why It Matters", June 19, 2017, Available online: https://www.linkedin.com/pulse/organic-innovation-what-why-matters-rob-cross/

[2] An example being Josef Taalbi, "What drives innovation? Evidence from economic history', *Research Policy*, vol. 46, no. 8 (2017), 1437-1453.

within EHRI suggests that uptake of innovative (digital) methods among Holocaust archives and researchers is uneven. To prevent the development of a digital divide between western, and central and eastern Europe EHRI has an important role to play to both monitor and inspire cutting-edge developments, and to embed such developments more widely in the field by reaching out to researchers and collection specialists working in institutions with limited access to funds and expertise. EHRI's organisation of activities in countries such as Czechia, Slovakia, Romania and Ukraine are just one example of how EHRI is investing in combatting the digital divide.

3.3 Outreach to industry

During EHRI-2 (2015-2019) and EHRI-PP (2019-2023), EHRI invested significant efforts to engage with those innovators in the wider cultural and digital industries that play a role in the curation, preservation and dissemination of Holocaust-related sources and knowledge.[3] In EHRI-3 and beyond, we will ensure that EHRI continues to support innovation in Holocaust research and documentation among its partner institutions including the promotion of graph technology, supporting multilingualism, developing new data integration techniques and enhancing commercial applications. At the same time, EHRI continues to benefit from services, products and insights gained in commercial settings, including within the archival, heritage and digital humanities industries.

4 Definition of innovation

Innovation can best be described as combining 'a degree of newness of a change and a degree of usefulness or success in application of something new'.[4] Throughout all three iterations of EHRI thus far, EHRI has worked to combine these elements of innovation to create new tools for EHRI stakeholders and the wider research, archival and heritage communities, as well as to innovate in areas of interdisciplinary work and paradigm shifts as part of the human side of innovation. These areas will continue to form EHRI's focus as it moves forward into becoming a permanent Research Infrastructure (RI).

As part of EHRI's focus on innovation, it has also formed links with non-academic institutions, i.e. archival institutions, heritage organisations, and the creative industries.[5] The encouragement of the development of innovation links between academic organisations and industry involves cooperation, partnership and coordination and can also be characterised by 'a 'cultural divide' between partners in terms of goals, perspectives, motives and routines', making such partnerships 'highly multifaceted'.[6] This cultural divide is also manifested in linguistic challenges faced in terms of interpretation and differing use of language in technical descriptions. The challenge of managing the 'cultural divide' between academia and non-academic institutions is ever present in EHRI's development of innovative methods and

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[3] For example, see EHRI-PP Deliverable 6.6 'Updated scientific case and research priorities', February 2023.

[4] Ove Grandstrand and Marcus Holgersson, "Innovation ecosystems: A conceptual review and a new definition", *Technovation* 90-91 (2020), p. 2

[5] 'The Creative & Cultural Industries ecosystem includes: architecture, archives, libraries, museums, arts and crafts, audio-visual (including film, television, and multimedia), videogames and immersive experiences, tangible and intangible cultural heritage, design (including fashion design), festivals, music, literature, performing arts, books and publishing, radio and visual arts.' https://pact-for-skills.ec.europa.eu/about/industrial-ecosystems-and-partnerships/creative-and-cultural-industries_en

[6] Sigrid Rajalo and Maaja Vadi, "University-industry innovation collaboration: Reconceptualization", *Technovation* 62-63 (2017), p. 43.

techniques which must be balanced to create future innovative progress and to help smaller, less well funded organisations learn and develop with the help of better funded, larger institutions.

5 Challenges and opportunities

The 'cultural divide' that sometimes exists between industry and research is just one of the many challenges EHRI has to negotiate and manage as part of its innovation strategy. Even while EHRI innovates with digital methods and tools, the so-called 'digital divide' continues to make its presence felt in terms of geographic location, type of institution, and skill development. The cost of digitisation is a major hurdle for institutions, particularly those of small or medium size. Different levels of digital capability and maturity exist within EHRI Partners and in the broader archival and education sectors, and there is no 'one size fits all' solution. This is why EHRI continues to develop resources for all levels of users, from novices in the digital realm to those with experience of running large and well-funded projects. Archives themselves also do not always give priority to archival work in the digital realm. In response, EHRI needs to clearly explain benefits to archives, use its expert networks to introduce and highlight best practice and methods, and demonstrate online, well-developed examples of how EHRI innovation is already changing the landscape of Holocaust studies.

There are also institutional barriers to overcome. EHRI currently operates across 17 countries that have different policies on how data can be shared and stored. The complexities of GDPR and other legal barriers concerning sharing and accessing personal data sometimes makes Collection Holding Institutions (CHIs) unwilling to share information. In order to combat this, it is essential for EHRI to advocate for the benefits of partnership and to develop international networks that can enhance archival work.

Political agendas continue to potentially challenge the development of EHRI. In some countries, there is hesitancy to publicly commit to Holocaust research for political reasons, making the potential for innovation even more difficult. Therefore, EHRI Partners in countries actively engaged with the development of Holocaust research need to offer support and advocate for those in countries with more challenging political agendas.

6 EHRI users and stakeholders

It is also important to remember that EHRI's key stakeholders must be involved.[7] To be successful, EHRI's innovation strategy should be driven by the needs of its core user communities and embedded in the wider European research and innovation landscape. Only this will ensure that the strategy:

- focuses on developing new services and tools that advance archival, cultural heritage and research practice in Holocaust studies; and
- promotes the sustainability of EHRI as a European infrastructure that provides seamless access to all relevant sources and expertise from across Europe and beyond.

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[7] A full breakdown of EHRI stakeholders can be found in EHRI-3 Dissemination Plans.

In a user survey undertaken as part of EHRI-PP,[8] the vast majority of users who took part in the survey identified themselves as working in universities, archives, libraries, museums, research centres and memorial sites. EHRI's challenge is to answer to the demands of its users and the academic market. A significant part of EHRI's innovation must consist of refreshing methodologies and intellectual stimulation.[9]

7 Innovation in EHRI-1 (2010-2015) and EHRI-2 (2015-2019)

EHRI's aim has been to provide sustainable open access to Holocaust sources. Its innovations have helped to discover previously hidden sources, increase access to these sources, enriched research conducted using these sources, and amplified the impact of research findings. In doing so, some of EHRI's key innovations are discussed below.

One of the largest areas of innovation that has taken place in EHRI so far is the design, creation, implementation and continued development of the EHRI Portal, launched in 2015.[10] Rather than relying here on more established solutions such as relational databases or semantic web environments, EHRI was a forerunner in the implementation of using *graph databases*. This technical approach was taken to create an environment 'both flexible enough to allow for the integration of heterogeneous material and that is sufficiently social to allow researchers to discover and analyse their material and make new connections'.[11] As part of this work of connecting individuals and institutions, EHRI supports CHIs in standardising their descriptions and using sustainable methods to publish and share their data and metadata. Moreover, the structure of finding aids and ICA's ISAD(G) are better represented in a graph structure, also facilitating the linking between collections, copies & where archives have been scattered. Taking this approach, EHRI has been rewarded with 'a rich flexibility and ability in working with the very heterogeneous data that we are dealing with in Holocaust research'.[12] The EHRI Portal enables a flexible approach to ingesting material from both large and small CHIs, whilst professionalising the identification, description and information on sources related to the Holocaust. In EHRI-2, the Portal development also involved an industry partnership with Ontotext, who collaborated with EHRI on semantic text analysis and researcher tools using various Digital Historiography approaches.[13]

EHRI's scholarly approach has been a vital driving force behind a paradigm shift in transcending national boundaries in Holocaust research. Taking the 'bigger picture' approach enabled the creation of a roadmap for international Holocaust research, assisted by the digital tools developed in EHRI. The trans-national interweaving of Holocaust research and collection holding institutions has fostered an environment of inter-institutional cooperation previously only conducted on a local level. This has enabled the development of resources, training, tools, and examples of best practice that apply to a much broader audience across Europe, Israel, the USA and globally.

Furthermore, in addition to the EHRI Portal, a number of other digital resources were created and launched during EHRI-1 and EHRI-2, including the EHRI Online Course,[14] EHRI

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[8] EHRI-PP D5.1 User Needs Analysis, May 2021.

[9] See also EHRI-PP D6.2 Foresight Study 2, December 2021.

[10] https://portal.ehri-project.eu/

[11] Tobias Blanke, Michael Bryant and Mark Hedges, "Back to our Data – Experiments with NoSQL Technologies in the Humanities", *IEEE International Conference on Big Data* (2013), p. 17.
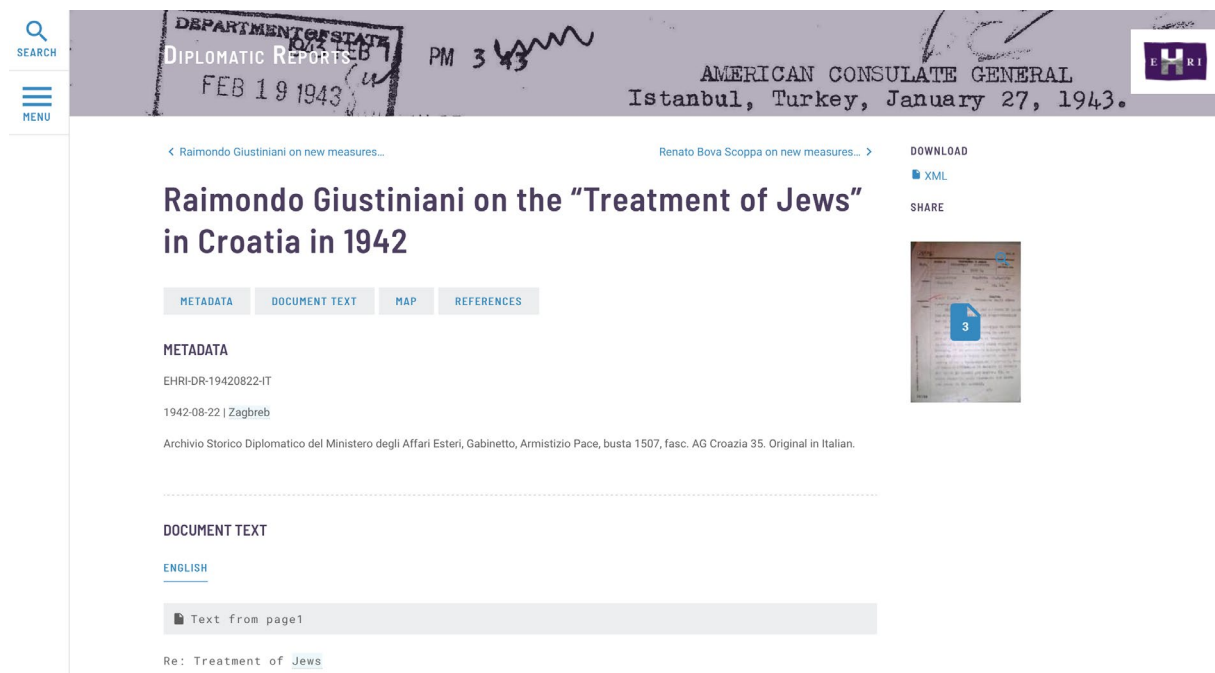
[12] Ibid., p. 20.

[13] https://www.ontotext.com/company/news/ehri-project-midterm-review/

[14] https://training.ehri-project.eu/

Document Blog,[15] EHRI Online Editions,[16] EHRI Digital Tools Guides,[17] the multilingual thesaurus,[18] and authority lists of Camps[19] and Ghettos.[20]

In 2015, the first five course units of the EHRI Online Course were published, with a bilingual (German and English) unit added in 2017, and a further analytics course added in 2019. These courses were based on state-of-the-art research and expert knowledge, including links to primary source material.

The EHRI Document Blog was launched in 2016 and is a space to share ideas about Holocaust-related archival documents and their presentation and interpretation using digital tools. This is an innovative platform for promoting Holocaust research and digital methodologies, providing a trusted experimental space to investigate new ways to combine new methodologies with Holocaust research and to engage with wider and more diverse audiences.

The first EHRI Online Edition was launched in 2018. A key goal of the EHRI Online Editions platform is to develop annotated online editions of documents as a new way of presenting digital archival content. The editions are empowered by new EHRI tools for digital editing and use the EHRI vocabularies and descriptions to generate contextual information displayed to users. These freely accessible online editions enable new readings of, and broader access to these research sources. They are searchable and filtered for specific thematic or spatial interests at any time and are contextualised through interactive maps.

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[15] https://blog.ehri-project.eu/

[16] https://begrenzte-flucht.ehri-project.eu/; https://early-testimony.ehri-project.eu/; https://diplomatic-reports.ehri-project.eu/

[17] https://github.com/EHRI/ehri-data-analysis-tools

[18] https://portal.ehri-project.eu/vocabularies/ehri_terms

[19] https://portal.ehri-project.eu/vocabularies/ehri_camps

[20] https://portal.ehri-project.eu/vocabularies/ehri_ghettos
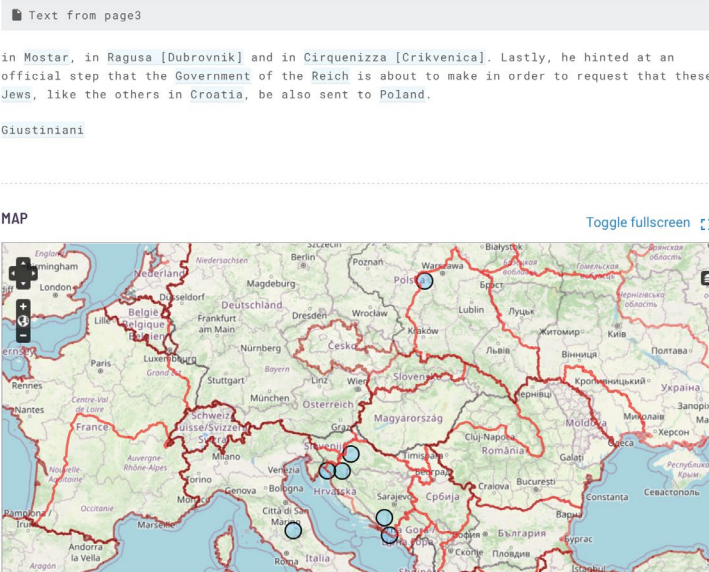
Figure 1 - Screenshots from EHRI Online Edition Diplomatic Reports

Finally, the EHRI Digital Tools Guides were developed in 2018 to introduce researchers to new and emerging tools that can be used in Holocaust studies. In conversation with researchers working in Holocaust and refugee studies through events organised by EHRI, it became apparent that many researchers have an interest in learning more about digital tools and methods that they heard discussed at EHRI events but they were not sure how to learn more about them. These EHRI guides offer inspiration to researchers to encourage them to experiment with using digital tools as part of their research and to learn new skills.

8 Innovation in EHRI-3 (2020-2025)

The EHRI Portal, the source of so much innovation within the EHRI projects, has continued to be developed within EHRI-3 with the delivery of the Portal's metadata as Linked Open Data to explore the benefits this model can provide in terms of decentralised data access and integration with the wider Semantic Web.[21] This is the first step towards delivering Holocaust metadata to the Semantic Web and ultimately making the field more interconnected. Much work has also been undertaken and is being developed on multilabel subject classification using AI.[22] EHRI is also a participant (via NIOD) in a project proposal called GRAPHIA that brings together RIs from across the SSH and industrial partners to develop and implement innovative graph and AI-based solutions to heterogeneous SSH data.[23]

The resources developed in previous iterations of EHRI have continued to be developed. Improvements have been made to existing resources and new content has been added to all EHRI digital resources. To cement the EHRI Document Blog's position as a peer-reviewed, innovative, respected resource, Digital Object Identifiers (DOIs) a form of persistent identifier (PID) will be added to the blog posts upon publication. Additionally, EHRI's educational seminars inspire the next generation of Holocaust researchers and local activists via methodological innovation.

In EHRI-3 there is a strong emphasis on engaging with what EHRI calls *micro-archives*.[24] Techniques previously developed to connect with larger archives, who have structures in place to deal with metadata, cannot be directly replicated with micro-archives, which may consist of only one individual owning a collection of Holocaust-related material. The development by WP11 of new methods of approaching such archives and developing ways of cataloguing their material will set the standard for best practice for other RIs and institutions when engaging with small collections not housed in traditional archives. This has led to workshops in the UK, Serbia, The Netherlands, Austria and Israel to engage with new archives and micro-archives to extend knowledge of best practice of archival science.

WP10 is exploring new ways to present geospatial data and alternative ways to interpret the predominantly textual metadata held in the EHRI Portal. Datasets are being collected within EHRI, and software such as GeoNode is being used to explore presentation methods.[25] This forms part of EHRI's enrichment of EHRI Portal resources and the creation of multilingual products. Furthermore, EHRI is working towards developing long-term access technologies for Holocaust archives and is introducing scholars and archivists to new methods in research through practical engagement. One such innovation during EHRI-3 has been the launch of the EHRI Geospatial Repository[26] which contains a huge variety of data on Holocaust-related places and spaces, from detailing country boundaries as they changed during the Second

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[21] Herminio García-González, Mike Bryant. The Holocaust Archival Material Knowledge Graph. *ISWC 2023: The 22nd International Semantic Web Conference*, Nov 2023, Athens, Greece. pp.362-379, ⟨10.1007/978-3-031-47243-5_20⟩. ⟨hal-04300073⟩

[22] Maria Dermentzi, Michael Bryant, Fabio Rovigo, & Herminio García-González, "Multilingual Automated Subject Indexing: A comparative study of LLMs vs alternative approaches in the context of the EHRI project." DH Benelux Conference 2024.

[23] The proposal is responding to the call: 'HORIZON-INFRA-2024-TECH-01 — Next generation of scientific instrumentation, tools, methods, and advanced digital solutions for RIs'
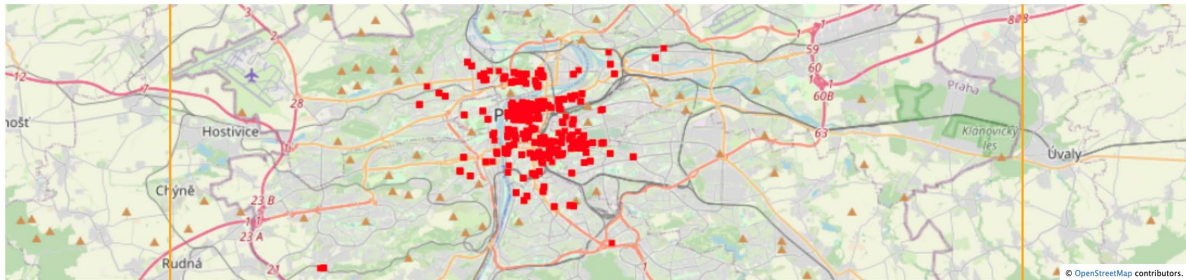
[24] https://www.ehri-project.eu/call-ehri-looking-micro-archives

[25] https://geodata.ehri-project.eu

[26] https://geodata.ehri-project.eu/geonetwork/srv/eng/catalog.search#/home

World War to showing the locations of Stolpersteine in Prague. This a dynamic and growing resource.

Discover data

API
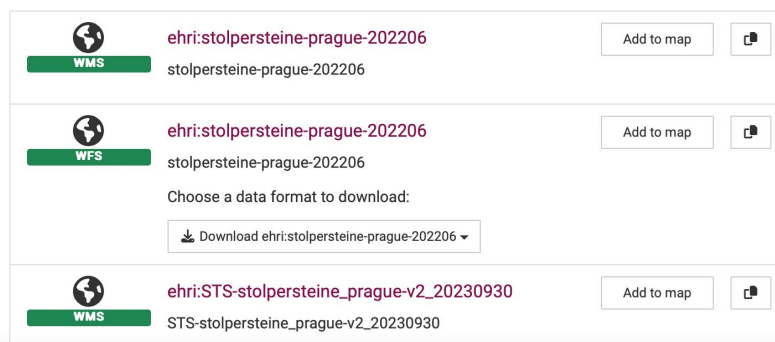
Figure 2 - Screenshot of one of the datasets in the EHRI Geospatial Repository

EHRI continues to innovatively link research and archival communities globally, creating international inter-disciplinary networks, particularly by assisting countries with less established resources. During the most resent stage of the project EHRI focuses on integrating regional communities in four countries – Poland, Slovakia, Romania and Italy, working with a network of archive and library leaders and Holocaust researchers, to create a common language and cross-disciplinary discourse on the challenges of working with Holocaust documentation.

EHRI aims to develop an international community of experts through WP4 in preserving, mapping, cataloguing and curating Holocaust collections and linked data as well as integrating regional communities and new research communities. During EHRI-3 two Experts groups were formed – for experts in Holocaust photography and one for Reference services specialists. When the latter one includes representatives of various institutions and organizations, the former one brings together also independent researchers and specialists in the field of the Holocaust audio-visual materials.

Finding new ways to link technology and research is at the heart of EHRI-3, and it has become clear that many emerging technologies have the potential to greatly benefit EHRI Partners and beyond. EHRI-3 has run online workshops through WP12 on crowdsourcing and the International Image Interoperability Framework (IIIF).[27] Workshops such as these are designed to bring together a diverse group of professionals from outside EHRI who have

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[27] https://iiif.io

used these techniques in a research context, thus inspiring EHRI Partners to incorporate these methods into their research plans. Three in-person hands-on events were organised in partnership with CLARIN-ERIC, the Common Language Resources and Technology Infrastructure,[28] to explore themes of mutual interest to both RIs. In the first event, held in London in May 2023, innovations in Automatic Speech Recognition (ASR) were explored using examples from both RIs and industry. A follow-on workshop, held in Prague in March 2024, focused on working with textual sources and Automatic Text Recognition (ATR), again including examples from projects within both RIs as well as crossover projects with industry partners. The third workshop took place as part of the LREC-COLING conference in May 2024 in Turin on "Holocaust Testimonies as Language Resources". Additionally, a project application has been submitted to the OSCARS[29] as a direct result of these workshops, focusing on Holocaust testimony as open research data.

Linked to some of the work on ATR, data from the EHRI Online Editions has been combined into a dataset suitable for training ATR models aimed at automatically acquiring digital text from physical documents. Work has also been undertaken on Document Layout Annotation (DLA) and using object detection models and Text Encoding Initiative (TEI), and this has led to the creation of a dedicated EHRI application that offers the possibility of a centralised interface for future Holocaust related Online Editions. This is an ongoing development. The Online Editions continue to be developed, with 3 new editions released in 2023.

As part of engaging new audiences, EHRI continues to explore new methods of communication, including the creation of an EHRI Podcast, currently recording its third season that will showcase the holdings of micro-archives, and it is considering ways in which EHRI can support and amplify existing excellence in Holocaust education through the work of WP3, WP2, and WP5, as well as in close cooperation with key external stakeholders such as DARIAH Campus,[30] Centropa[31] and the International Holocaust Remembrance Alliance (IHRA).[32] The launch of the Massive Open Online Course on Coursera[33] in 2024, for example, is one way of reaching new audiences globally with primary source research relating to the Holocaust.

EHRI has developed a very flexible Fellowship program that allows fellows to combine several host institutions in one fellowship and to decide the length of their visit, from one to six weeks, as to fit their academic needs. During research visits, EHRI Fellows are encouraged to investigate material at other institutions within the host country, a practice that allows them to contact more specialists within their research domain as part of their development of inter- and multi-disciplinary theoretical approaches and methodologies.

Significant work has taken place regarding heterogeneous data integration and harvesting through WP9. Many institutions who wish to integrate their metadata with the EHRI Portal struggle with various challenges associated with technological barriers. The new EHRI (Mobile) Data Integration Lab[34], created in 2021, is working to assist different CHIs on their journey toward optimally sustainable data integration. Due to the Covid-19 pandemic, the

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[28] https://www.clarin.eu

[29] https://oscars-project.eu

[30] https://campus.dariah.eu

[31] https://www.centropa.org/en

[32] https://holocaustremembrance.com/what-we-do/our-work/ihra-project-monitoring-access-holocaust-collections

[33] https://www.coursera.org/learn/holocaust-primary-sources/

[34] See EHRI-3 D9.2 Mobile Data Integration Lab Implemented, February 2021.

data integration began via digital communication tools. The workflows and plans are a combination of mobile, hybrid and digital support. As EHRI-3 has progressed, the Data Integration Lab has continued to advance the integration of new sources into the EHRI Portal, updating data that has already been in the EHRI Portal for considerable time and explore making sustainable connections that will produce more regular updates of the ingested metadata. WP9 has also created regional hubs the hubs that bridge the need to have local expertise with the need to understand EHRI's overall methodology for data integration. The Data Integration Lab has demonstrated a new efficiency in updating or creating archival descriptions, with an increase of 20% overall between May 2019 and January 2022.[35]

EHRI is also working on supporting FAIR-IMPACT actions, including work by EHRI partners such as KD, KCL and DANS on PIDs, Trusted Digital Repositories, and research software metadata. Additionally, DANS developed an online course on OpenPlato, designed to provide CHIs that provide access to Holocaust data and researchers with an introduction to research data management, data management plans, FAIR data and Open Research. Furthermore, EHRI is on the governing board of the SSH Open Cluster, helping to promote synergies and open science initiatives between disciplines.

9   The EHRI Innovation Roadmap

In every phase of EHRI so far, new and innovative methods have been employed to enhance EHRI's work. As EHRI approaches becoming a permanent RI, it is necessary to set out the principles under which EHRI intends to pursue future innovation. The following guidelines form the EHRI Innovation Roadmap, a framework that will inform EHRI's future innovation agenda.

The diagram in Figure 3 shows how the guidelines (below) fit into the three main areas of innovation focus identified by EHRI for future innovation plans. Each of these areas is represented by a different colour in Figure 3, with items overlap two areas outlined in the colour of the secondary area. These guidelines have been created on the basis of research conducted via WP3 through a comprehensive survey of activities undertaken in all EHRI-3 WPs, a workshop held with Work Package Leaders (WPLs), and cross-WP discussions.

EHRI will:
- work with the European Open Science Cloud (EOSC) and Social Sciences and Humanities Open Cloud (SSHOC) to continue to provide seamless access and implement as best as possible the FAIR Guiding Principles for scientific data management and stewardship.[36]
- promote the creation and use of open standards and open-source compliant tools.
- work closely with established and future national nodes to understand national variations in what constitutes innovation. EHRI in-house expertise will be used as part of the support for EHRI national nodes and to encourage engagement with archival, heritage, educational and industry partners.
- continue to develop and advance its network of experts in all areas of Holocaust research, remembrance, and education, showcasing the benefits of EHRI membership and EHRI resources.

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[35] EHRI-3 D9.3 Interim Report on Data Integration, February 2022.

[36] Mark D. Wilkinson, Michael Dumontier et al., "The FAIR Guiding Principles for scientific data management and stewardship", *Scientific Data* (2016) https://www.nature.com/articles/sdata201618

- explore opportunities to collaborate with industry.
- communicate with EHRI Partners to ensure that EHRI innovations are shared within the consortium and examples of best practice are shared at all levels of experience.
- communicate with archival, heritage, education, and technological institutions, both internal and external to EHRI, to discover new technologies and methodologies that could be incorporated into Holocaust related research.
- develop and integrate regional research communities and communities of experts
- continue to disseminate new methodological advancements through online resources and in-person training, workshops and seminars.
- continue to develop its digital tools and resources, using and incorporating novel technologies, and promoting them via the pre-existing web resources, as well as any web presence created by national nodes.
- continue to develop links with existing European Social Science and Humanities (SSH) RIs such as DARIAH, E-RIHS and CLARIN to exploit synergies across the European RI landscape and collaborate in areas of mutual interest such as creation of multilingual and other innovative outputs.
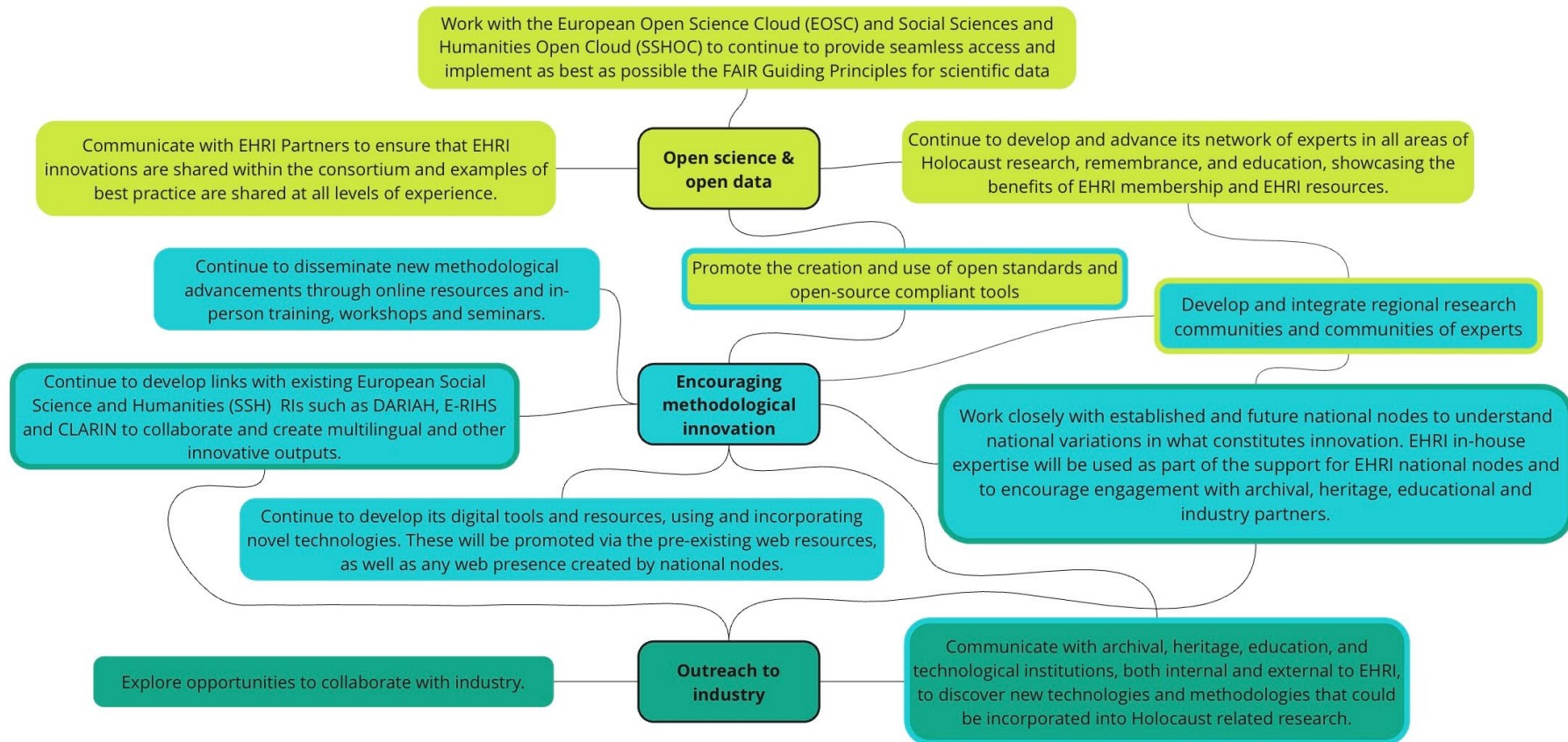
Work with the European Open Science Cloud (EOSC) and Social Sciences and Humanities Open Cloud (SSHOC) to continue to provide seamless access and implement as best as possible the FAIR Guiding Principles for scientific data

Open science & open data

Communicate with EHRI Partners to ensure that EHRI innovations are shared within the consortium and examples of best practice are shared at all levels of experience.

Continue to develop and advance its network of experts in all areas of Holocaust research, remembrance, and education, showcasing the benefits of EHRI membership and EHRI resources.

Continue to disseminate new methodological advancements through online resources and in-person training, workshops and seminars.

Promote the creation and use of open standards and open-source compliant tools

Develop and integrate regional research communities and communities of experts

Encouraging methodological innovation

Continue to develop links with existing European Social Science and Humanities (SSH) RIs such as DARIAH, E-RIHS and CLARIN to collaborate and create multilingual and other innovative outputs.

Work closely with established and future national nodes to understand national variations in what constitutes innovation. EHRI in-house expertise will be used as part of the support for EHRI national nodes and to encourage engagement with archival, heritage, educational and industry partners.

Continue to develop its digital tools and resources, using and incorporating novel technologies. These will be promoted via the pre-existing web resources, as well as any web presence created by national nodes.

Explore opportunities to collaborate with industry.

Outreach to industry

Communicate with archival, heritage, education, and technological institutions, both internal and external to EHRI, to discover new technologies and methodologies that could be incorporated into Holocaust related research.

Figure 3 - EHRI Innovation Roadmap: Guidelines for future innovation

10 Links to Industry

Through online and in-person events and collaborations during EHRI-3, many links with industry have been created including with:

- [Amara](#) – a nonprofit technology company specialising in captioning and subtitling videos;
- [From The Page](#) – a crowdsourcing platform for archives and libraries where volunteers transcribe, index, and describe historic documents;
- [IIIF](#) - a set of open standards for delivering high-quality, attributed digital objects online at scale;
- [Teklia](#) – a company offering a range of technologies from text recognition (OCR/HTR) to document classification and indexing including handwriting recognition, image analysis and named entity extraction;
- [Telecats](#) – a company delivering AI voice solutions that empower customer service;
- [Their Story](#) – a platform that streamlines the process for any community to collect, preserve, and engage with the audiovisual stories of the individuals that make up their community;
- [Zooniverse](#) - the world's largest and most popular platform for people-powered research.

All of these businesses work in the fields of digital innovation, including areas such as artificial intelligence, automatic speech recognition, optical character recognition, and crowdsourcing. These are themes at the cutting edge of research and the collaborations have come about as a result of activities arranged throughout EHRI-3 such as WP12 jointly organising events with CLARIN, as well as online seminars to disseminate the latest innovations to the EHRI consortium and beyond. It is through such collaborations that further links to industry will be created and developed within EHRI, and these links will be further explored through future grant applications and projects.

11 Conclusion

Through a comprehensive review of EHRI's work from EHRI's creation in 2010 to the present day, it becomes clear how EHRI has already developed significant innovations within the key areas of Open Science and data, encouraging methodological innovation, and outreach to industry. EHRI is committed to furthering Holocaust research through international, interdisciplinary expertise, sharing knowledge and best practice, and exploring new ways of analysing research material and improving access to archival sources.

The EHRI Innovation Roadmap above provides the necessary structure for the continuation and development of innovation within the research infrastructure and can be adopted by the future EHRI-ERIC to guide its innovation activities. The future RI will be a distributed European Research Infrastructure (ERIC) consisting of a Central Hub and several National Nodes, along with consortia of national organisations active in EHRI's domain. The activities of the National Nodes will be coordinated via a National Coordinator Committee (NNC). Working groups will be set up to assist the NCC with specific tasks or to provide it with expertise in specific domains and regions. The NCC may set up a working group on Innovation to represent experts from diverse multidisciplinary fields and from countries with diverse implementation levels when it comes to innovative approaches to Holocaust research and documentation. Such a working group could jointly monitor relevant new technological and methodological developments, define priority areas for innovation support and investment as well as coordinate activities across the distributed RI to address the digital and cultural divides identified as barriers to innovation. It will also be a crucial forum to devise the best ways to test and implement innovative approaches to Holocaust research and

documentation within their specific national user groups to ensure an effective transfer into practice.

Recent work undertaken in EHRI has demonstrated the success of the Innovation Roadmap as this framework for current and future innovation. For example, by working with other European RIs, EHRI has disseminated new methodological advancements through workshops and seminars, developed digital tools, discovered new technologies that can be incorporated into Holocaust related research, explored opportunities to collaborate with industry, promoted the creation and use of open-source standards compliant tools, and this has led to two collaborative applications from EHRI to the Open Science Clusters' Action for Research & Society (OSCARS).

As the roadmap shows, the areas that we have identified are all interlinked, and when activity is undertaken in one area it leads to development and innovation in other areas. As EHRI moves forward with this approach and by adhering to the principles outlined in the EHRI Innovation Roadmap, EHRI will remain at the cutting edge of methodological innovation, open science, open data, and collaboration with industry.