

Codesign for Discovery in Social Sciences and Humanities

Addressing the Heterogeneous Needs of a Community in Digital Scholarship

Stefano De Paoli

School of Business, Law and Social Sciences, Abertay University, Dundee, UK, s.depaoli@abertay.ac.uk, orcid.org/0000-0003-1120-4773

Paula Forbes

School of Business, Law and Social Sciences, Abertay University, Dundee, UK, p.forbes@abertay.ac.uk, orcid.org/0000-0003-1737-9929

Giulio Andreini

Net7 Srl, Pisa, Italy, g.andreini@gmail.com, orcid.org/0000-0002-8043-011X

Maciej Maryl

Institute of Literary Research of the Polish Academy of Sciences, Poland, maciej.maryl@ibl.waw.pl, orcid.org/0000-0002-2639-041X

Marta Błaszczynska

Institute of Literary Research of the Polish Academy of Sciences, Poland, marta.blaszczynska@ibl.waw.pl, orcid.org/0000-0002-2377-4565

Abstract

GoTriple is a novel discovery platform for Social Sciences and Humanities (SSH) in Europe. Discovery is a phase of research where scholars seek to locate resources for their work, such as publications or previous projects. The paper details the work done for involving the SSH community in the codesign of GoTriple, focusing on the research discovery activities. It is an investigation of the user needs and barriers toward digital discovery for the SSH community, conducted through codesign. This work encompassed interviews, a questionnaire, codesign workshops and evaluation activities. The paper reports on some outcomes for the codesign and how user needs were identified and served by novel designs supporting discovery for SSH. This process of design is both concerned with creating digital tools for discovery and with the creation of a community of users that could make the platform thrive. The main contribution of the work is therefore the identification of the user needs for digital discovery in SSH and a series of insights on the design with the user community. The paper comprises a report on how codesign principles do support such work.

Keywords: Discovery; workflow; user; social sciences; humanities; codesign

1. Introduction

This paper presents the key results of the user research conducted in the design of GoTriple, a discovery platform for Social Sciences and Humanities (SSH) in Europe. It is an investigation of the user needs and barriers toward digital discovery for the SSH community and it illustrates with a dense and detailed study how codesign principles and practices can support such an investigation. In essence this work discusses the relationship between digital technologies and knowledge for the SSH community as it is enacted through codesign. Codesign in simple terms means an approach that seeks to involve users actively in the design process of new technology and services, to empower them in the decision making. For understanding the contribution of this paper, more specifically, we initially need to introduce some important concepts and points of attention. Firstly, we need to clarify what we mean by the term discovery. Second, we need to describe the reasons for the creation of the GoTriple discovery platform. Third, we need to consider why a user-centered design approach based on codesign was adopted for GoTriple. This will then allow us to introduce the research problems this paper addresses.

It is difficult to ignore the rise of technology, the increased role computers and the Internet play in scholarship, and the growing popularity of digital methods used by SSH. According to some authors, digital technologies have radically changed the ways in which SSH scholars consume and produce knowledge, so far so that we should refer to digital research solutions as ‘knowledge machines’ (Meyer & Schroder, 2023). Among other activities, digital technologies enable researchers to archive, disseminate and consume various research assets (van der Weel & Praal, 2020) in novel ways. An important concept to understand this, analytically, is that of scholarly workflows, which are linear or circular models which break down the scientific practice (from beginning to end) into discrete phases, in order to support the identification or the development of digital tools facilitating the different research phases. For example, Bosman and Kramer (2015) stated that a researcher workflow is composed of Discovery, Analysis, Writing, Publication, Outreach, and Assessment. They consequently provided an extensive mapping of existing digital tools that can be used in each of these phases. Similarly, for Antonijević (2015) a research workflow, with a specific focus on digital humanities, includes ways to “collect, search, analyze, write, communicate, organize, annotate, cite, reflect, archive, and share” (p. 38). Antonijević (2015) conducted ethnographic research to understand how digital humanists work in each of these phases and what tools they use. The workflow concept, of which Bosman and Kramer (2015) and Antonijević (2015) are just two examples, can be traced back to the influential concept of scholarly primitives (Unsworth, 2000) originally envisioned for the field of digital humanities, which entails six core scholarly activities: discovering, annotating, comparing, referring, sampling, illustrating, and representing. This concept was again proposed to facilitate the development of digital tools for “humanities computing”, but has since impacted how we think about digital tools for research. This includes also the use of scholarly primitives as a foundation for creating digital research infrastructures (Blanke & Hedges, 2013). What is important is that all stages of a research workflow from discovery to publication are affected by the advance in technology and digital tools available, as indicated by the DARIAH European survey on scholarly practices and digital needs in the arts and humanities (Costis et al., 2017). In this paper we are concerned with researching one specific part of these workflows, namely the discovery phase. Moreover, we are concerned with the discovery in SSH specifically.

Discovery has been defined as “the capacity to explore, find, access and reuse material such as literature, data, projects, researchers’ profiles etc. that you

would need for your own research work (such as finding a relevant paper which will help with your research, or finding a person you are interested in collaborating with)” (Achenbach et al., 2020). In a research process the discovery phase is the moment in which researchers seek to locate resources which are necessary for their work, and this usually (but not always) happens during the early stages (as reflected in workflows where discovery appears as one of the first elements). The most obvious example is the discovery of literature, but discovery is used also for other resources such as data, projects or people. At the start of a new research project, scholars tend to start working from an analysis of the existing literature, which consequently requires locating the relevant publications on a topic or domain. The advent of digital publishing has brought an information overload (e.g. Baez et al., 2010; Landhuis, 2016) with a significant number of digital outputs available online and consequent difficulties in finding the most relevant literature. Discovery has become more fragmented and difficult (Cahoy, 2018) and has been the subject of processes of investigation and re-engineering to render it more aligned with new digital technologies (Borst & Limani, 2020). This results in the researchers’ general need to have usable discovery tools.

Literature has shown that the “go-to” discovery tools for most scholars tend to be either google scholar (GS) (López-Cózar et al., 2017) or the citation databases Scopus or Web of Science (Mongeon & Paul-Hus, 2016). However, authors have also commented that these solutions come with their own issues and “agendas”. Citation databases are supported by publishing companies and tend to index publications in English, as these are where their business is coming from. GS operates on a completely different approach as it is a search engine, and it supports the discovery of publications in other languages even if it remains largely skewed toward English (López-Cózar et al., 2019). Whilst some authors have pointed out that citation databases are possibly more rigorous than GS for conducting literature analyses (Haddaway et al., 2015), GS is widely used especially because of its ease of use (Jensenius et al., 2018). Moreover, GS also allows the discovery of grey literature, something that citation databases do not permit. However, we also need to acknowledge some of GS’s inherent limitations including the opacity of its algorithms, or the fact that GS comes as a top-down solution based on the google approach (Coiffait, 2019; Rovira et al., 2021). Additionally, citation indexing (in both GS and citation databases) has been noted to potentially fuel over use of metrics for assessing quality, for reasons that go beyond discovery (Coombs & Peters, 2017) (e.g. in the promotion of scholars) or to favour the discovery of more

established scholars and their work over the work of younger scholars (see e.g. Principle 7 in The Leiden Manifesto, Hicks et al., 2015). Lastly, GS and the citation databases are not geared towards open science, and they do not support a fully-fledged multilingual approach to discovery.

As part of the European project Triple, we have conducted user research and codesign work with SSH researchers for the design of a novel discovery platform, called GoTriple. This process of design was concerned with creating digital tools for discovery and with the creation of a community of users that will ensure the platform is a hub of knowledge and a thriving resource. GoTriple was created in response to the outcomes of the OPERAS¹ (Open scholarly communication in the European research area for social sciences and humanities) design study, which were outlined in a white paper (Mounier et al., 2018) and other studies, such as the European survey on scholarly practices and digital needs in the arts and humanities, conducted by DiMPO (Costis et al., 2017). These reports revealed two major problems: 1) it is hard to locate resources and researchers in SSH because of their large fragmentation and heterogeneity, and 2) there is a lack of integrated solutions for discovery in SSH. A variety of SSH digital repositories and many small SSH units in Europe were identified. Since the SSH publications, projects, and people are fragmented, there needs to be an effort to bring together resources and provide the SSH community with digital tools and services as single access points.

The creation of GoTriple follows therefore the goal to create a single access point for SSH discovery, and it has been based on three key pillars: 1) the promotion of Open Science principles; 2) the inclusion of a significant multilingualism component; and 3) a strong involvement of the users during the design process. Elsewhere we have discussed how GoTriple seeks to overcome the limits of proprietary solutions (Achenbach et al., 2022), by advancing open science principles such as open access and promoting multilingualism in discovery. Currently GoTriple supports discovery in 11 languages, including Polish, Croatian, Portuguese, Ukrainian and Italian. We have previously presented some of the technology on which the platform is based, and discussed how discovery is approached from the perspective of harvesting resources (e.g. Boulliard et al., 2020). An additional publication discussed how we are evaluating the measure of the health of the GoTriple user community (De Paoli et al., 2022). In this paper, our goal is to discuss the SSH researchers' community's role in the codesign of GoTriple and reflect

on the challenges of building a digital technology that requires a substantial variety of different user needs. In other words, in this paper we seek to show how codesign principles and practices can support working with a large community of users, possessing heterogeneous discovery needs.

In broad terms, user needs can be considered as statements indicating what designers require to design a digital solution capable of meeting the expectations of an end-user community. They reflect the users' goals, desires or frustrations (e.g. with existing solutions). Whilst our goal was to design a digital solution for the SSH community in Europe, it was clear from the start that this community is wide and heterogeneous, and therefore this brings a degree of complexity in defining and meeting the user needs. The SSH broad field comprises a huge variety of disciplines and subdisciplines, often using very different methods, vocabularies, practices and aiming at different research outputs and impacts. For example, for GoTriple we adopted the definition of SSH by the MORESS project (Mapping of research in European social sciences and humanities)², which has identified 27 disciplines. One could indeed expect significant differences in user needs when it comes to discovery for people working in e.g. geography, sociology, archaeology or musicology. For example, some disciplines work a lot with archives and place particular emphasis on discoverability of achieved materials (e.g. History), whilst for other disciplines archives (e.g. for Sociology) are in proportion less relevant. Moreover, even without considering the different disciplines themselves, there are other significant aspects affecting user needs, for example differences in skills between younger and older scholars; differences between early career scholars who need to establish their work and established scholars in a field, or differences between scholars which have substantial resources at their disposal and those which need to work with limited resources. The goal of this research, then, was to work on the identification of user needs for the GoTriple discovery platform and to codesign core aspects of the platform with SSH users, responding to their needs. The main questions guiding this research were as follows: "what are the user needs of the SSH community toward an open discovery platform?" and "how can we design a discovery platform for SSH that can support the variety of the user needs for the SSH community?".

The following sections of the paper offer an answer to these problems and include: 1) a literature review on aspects such as user research in SSH and the role of workflows; 2) a presentation of the components of the user-research

methodology of GoTriple; 3) some of the results of the codesign of the platform; 4) final reflections on the challenges of designing discovery for the SSH community.

2. Literature Review

The digital revolution in scholarship has enabled new types of operations and activities which, in turn, translates into specific needs for the researcher community, these constitute the user communities of research infrastructures and research platforms. However, whilst designers and developers can create increasingly complex systems relying on the latest technological advancements, the uptake of these systems and digital solutions by users is not a certain thing. Authors have long argued that what is needed to address these issues is a close collaboration between “developers and researchers” (van Zundert, 2012, p. 20) to create deep synergies and understanding between those groups. As Thoden et al. (2017, p. 9) noted for example, “there are many projects in the DH (Digital Humanities) that do address usability and that integrate user-centered design methods. Nevertheless, the resulting tools are often not easy to use or are not self-explanatory”. The collaboration between users and designers is indeed important for delivering digital research technologies, but the basis of this collaboration should and must be first a clear understanding of the user needs toward these technologies.

Specifically, in relation to the concept of discovery and related researcher practices, such as searching for information, there is a varied literature which covers aspects which are relevant for this work. These focus on different demographics of the research community and on their diverse challenges in creating and using digital technologies for discovery. Literature on discovery, however, rarely focuses explicitly on defining user needs, nonetheless by operating an attentive reading it is possible to extract some knowledge about these needs. The following text will concentrate on this.

Part of the discussion about discovery relates to the changing role of libraries with the advent of digital technologies. This is a topic which has been widely discussed in literature (see e.g. Favaro and Hoadley, 2014, for an earlier broad discussion or Llewellyn, 2019), however by shifting our attention to the role of users of the digital discovery services offered by libraries, interesting insights can be extrapolated. Indeed, in this case libraries are often the entities that

either offer digital services for discovery or that must deal with the emerging discovery needs of researchers. In an earlier publication, Wallis et al. (2010) discussed the development of digital libraries for scientific data management and access. This paper highlights the challenges faced in anticipating data requirements of users, building systems for diverse work practices and data types, and the lack of incentives to manage and share data. Whilst this is an early contribution, it makes the interesting point that online/digital services and digital libraries need to be able to capture, manage, and access the increasing volume and variety of scientific material (e.g. data) which is becoming available and accessible. Defining the user requirements for this is complex. This is probably one of the reasons why some authors have argued, as earlier as ten years ago, for the automation of workflows, including in discovery via e.g. libraries (Balaji Babu & Krishnamurthy, 2013). Tenopir et al. (2015) reflected on the problem of the overload of digital materials such as publications and suggest that the trend of keeping up with new publications may be unsustainable in the long run, unless reading is redefined to include solutions such as text mining. Whilst not entirely directed at discovery, this is an early contribution that starts to point to the use of machine learning solutions in the initial phases of the workflow, in this specific case through libraries. Li et al. (2019) for example argued that big data methods should be used to reform and innovate existing library services, and that personalized user needs in the age of big data should drive the development of digital libraries. Tattersal (2019) suggested that discovery in the research workflow requires working with library users to closely understand their digital literacy needs, to support the delivery of digital discovery. Bourke (2022) in his paper explores how the bibliographic control function in an academic library has expanded to include research data in the social sciences and humanities. Therefore, discovery is seen here more from the perspective of librarians than of researchers, especially in the context of support toward research data management and bibliographic control, such as data sources, data documentation, and adherence to the FAIR Guiding Principles.

Whilst the previous examples of literature provide some initial insights into user needs for digital discovery, they give a view from the perspective of the library offering discovery services. To look more directly at the actual users of discovery services, we need to consider literature contributions, that have focused more closely on user practices or on the development of specific digital solutions. For example, Ince et al. (2022a) argued that collaboration among scholars is an important aspect of the research workflow including

in the discovery phase, and that early career scholars especially heavily rely on collaborative tools to support their research workflows and establish their professional identity. The paper therefore indirectly points toward the need for tools that better support collaboration. Krämer et al. (2021) suggest that literature search is closely intertwined with dataset search and that both the search itself and the relevance assessment of the discoveries made by scholars (social scientists in particular) are complex processes. It also highlights the need for dataset search literacy and the importance of tailoring dataset search infrastructures to the observed work processes. The paper mentions certain very broad user needs for discovery digital technologies, such as dedicated search portals and tools that offer interconnectivity between datasets, literature, and other relevant materials. Therefore, the implicit need is to bring together different resources and connect them to facilitate discovery. Sun et al. (2022) emphasise the importance to bring together and analyse the practices and perspectives of both researchers and support specialists in order to build effective infrastructures and services for discovery, in particular for data. It highlights the importance of understanding the perspectives of both groups to inform the development of support work and improve researchers' data discovery practices. Therefore, with a need to go beyond just researchers when considering needs for digital infrastructures, including specifically for discovery. In 2015 the Union of the German Academies of Sciences and Humanities published the results of the Survey and Analysis of Basic Social Science and Humanities Research at the Science Academies and Related Research Organisations of Europe (SASSH). More than 600 European SSH projects "run at or by science academies and learned societies" were surveyed (Leathem & Adrian, 2015, p. 1). The focus was on their practices and topics. One of the important findings was that "the vast majority of projects producing English language publications do not publish exclusively in English, but also in their native languages" (Leathem & Adrian, 2015, p. 132). This indicates clearly a need to consider multilingualism when developing digital discovery solutions for SSH in Europe. Oddone and de França (2019) explore the performance of four platforms that publish, aggregate, and disseminate open access academic books on Twitter. They concentrate on the role of social media in the discovery (using the four platforms as a focus) asserting that metrics of attention and influence observed on Twitter can contribute to the discovery of academic books in open access, increasing their circulation and reach. Whilst not pointing directly at specific user needs for discovery, it is implicit that certain elements of social media (such as sharing, or integration with existing social media) may be relevant for digital

discovery. Martin et al. (2019) in their work emphasise the importance of seamless integration of research infrastructure resources in the discovery process. This to an extent implies an increasing complexity in the tools and platforms for discovery, and again a need for integration (as seen also earlier), this time of technologies rather than resources. Papenmeier et al. (2021) suggest that there is a mismatch between users' information needs and the capabilities of existing data search systems, particularly in the context of data discovery in the research workflow. This is based on an analysis of dataset requests and queries from 72 social scientists. The paper identifies the key aspects of their information needs, including discovery through topics and availability of metadata. Choe et al. (2021) have done work to identify the requirements for limiting the issues that novice researchers face in the discovery stage of the research workflow, and for building an application tool called Papers101. The paper mentions the user needs for discovery, such as prioritising search results, unifying the contexts of multiple search results, and refining and validating search queries. Ince et al. (2022b) offered a qualitative study of how social sciences faculty construct their research workflows and how tools and practices support their research process, in particular this paper highlights the need for improved support and integration of technology in scholarly workflows.

We can see that some of the previous literature dealt with a variety of issues for the users and the importance of certain emerging needs can be extrapolated from the contributions. Changing trends in discovery through digital technologies (including in the role of libraries as providers of discovery services) and changing researchers' practices highlight for example the needs to bring things together (i.e. various suggested form of integration of tools or resources), to receive recommendations or to work with semantic solutions. More advanced propositions foresee a space also for application using artificial intelligence. However, it is hard to find literature that focuses explicitly on the process of defining the user needs and that works on them via participatory design approaches, especially with a focus on SSH.

This leads to a final set of considerations to be approached in this literature review, in relation to the methods for working alongside users in the creation of digital technologies for discovery, or more broadly for digital research tools. It is indeed a second objective of this work, to focus on what would be an appropriate way to approach the design of a discovery solution for SSH based on the user needs. In an interesting paper, reflecting on the design of large

digital research infrastructures, Baker and Karasti (2018), noticed that often the “local level” (i.e. the final end-users) is seen just as the recipient of services more than an active actor in the design, what they call a “neglected thing” in planning research infrastructure design. Although infrastructures are large assemblages of technologies and platforms, this consideration points to the importance of actively involving end-users and understanding their needs in the design process of digital solutions for their research work. A number of methodologies can be applied to investigate user needs. Traditional methods include surveys, interviews, observations of practices, focus groups, and content analysis. Rarer (yet interesting) methodology choices include organising participatory/codesign design workshops (Boukhelifa et al., 2018; Dogunke, 2020), or events encouraging communication between e.g. data/services providers and users. These second approaches, and codesign in particular, see diverse people cooperate in the design process, with a goal of envisioning possible solutions to specific needs and problems (Steen, 2013), with users engaged as co-designers since the very early stages. Methodologically codesign is an exploration of what Simon (1996) defined as the focus of the field of design, namely envisioning through artifacts (e.g. the designed solution, such as a platform) how the world ‘ought to be’. Differently from top-down approaches to design of software such as the known waterfall model (see e.g. Avsion & Fitzgerald, 2003 for an overview), criticised by e.g. Baker and Karasti (2018), codesign is performed by designers, users and other stakeholders together, where the local level consequently becomes actively involved in creating solutions. Even for creating large digital research infrastructures at European level, such as the European Open Science Cloud (EOSC), codesign activities have started to be highly encouraged (Giannoutakis & Tzouvaras, 2017). Albeit it does appear that European infrastructures for digital research in SSH, are still designed gathering needs and requirements top-down, without an explicit focus on active end user participation as co-designers, as the example from Spinello et al. (2021) shows. An interesting factor of such participatory forms of design research is that the process of defining the user needs and of envisioning appropriate solutions for these needs are more flexible and iterative, compared to more traditional design approaches. For example, in a top-down approach, like the waterfall model, design is sequential with requirements collected early in the process and remains stable across the solution’s production. Codesign, participatory design and more generally design thinking approaches instead are iterative and better suited to accommodate changing and evolving user needs that may arise during design and production (see e.g. Lindberg et al., 2011 for a discussion).

In relation specifically to the collection of user needs for digital solutions in SSH, most of the existing user research has focused on large groups of scholars, such as SSH researchers as a whole, or scholars from all SSH disciplines interested in e.g. web archiving. A large part of the methodologies adopted are related to the conduction of surveys or reviews of existing literature, rather than adopting qualitative approaches, which are traditionally better suited for codesign. Existing research on the SSH needs also tends to be tied to specific projects, or national and supra-national initiatives. For example, the European survey on scholarly practices and digital needs in the arts and humanities conducted by the Digital Methods and Practices Observatory Working Group (DiMPO) working within DARIAH-EU was conducted among 2,177 SSH researchers speaking 10 languages and representing 6 national profiles (Costis et al., 2017). The goal was to capture aspects such as merging work practices and needs related to the evolving European digital environment for scholars. Similarly, the OCLC Research Library Partnership Web Archiving Metadata Working Group has produced a review of literature on web archiving (Venlet et al., 2018) covering sources such as published work, conference materials, notes etc., identifying types of users (including SSH scholars), barriers and needs toward web archiving and existing solutions. In 2017 FORS, the Swiss Center of Expertise in the Social Sciences published the results of a survey run among its users (researchers in social sciences). Feedback was gathered on three main themes: sharing data, re-using data and using the services provided by FORS. The results showed that data sharing and re-use were of high importance to the researchers (Heers et al., 2017). On the other hand, discipline-specific research has also been conducted to explore the challenges, needs and practices around the use of digital tools. For example, the British History Online user survey was aimed at the researchers who were most likely to use the infrastructure: historians and genealogists. Casual users were also distinguished as a third user group. The infrastructure was created a decade before the survey was issued. Therefore, its aim was not to identify whether there would be any potential users at all but rather to refresh the existing site according to the users' needs (Crymble, 2016). Similarly, again in the UK, UKRI produced a comprehensive report on the needs of scholars in the Arts and Humanities, in order to shape the Research Council policy on funding and investment (Taylor et al., 2022). In their study, Grubert and Siders (2016) also focused on digital practices in relation to one discipline. They investigated using machine-enabled tools for text analysis by environmental scientists. The conclusion was that digital tools could be particularly useful for these researchers especially because their

work is often multidisciplinary, so they can examine a large body of texts. Online platforms and infrastructures also conduct user research to see if they meet the requirements of those who use their services. The Polish Literary Bibliography (PBL) – an online database with information about literature, film, and theater – surveyed their users to find out their gender, age, educational background and the frequency of their visits on PBL. This will help to plan future strategies for the platform (Koper & Umerle, 2019). CENDARI (Collaborative European Digital Archive Infrastructure) was a project which ran from 2012 to 2016, funded by the European Commission. Its platform and tools aim to support historians and archivists. It was decided that the CENDARI infrastructure would be developed based on user feedback. To find their requirements, participatory design sessions were conducted and use cases applied. One of the interesting findings was that there was not only a need for researchers to be supported at e.g. a particular stage of the workflow, but the users also expressed an interest for the infrastructure to support the whole process of research (Boukhelifa et al., 2018).

3. The Triple Project and its Methodology

As stated in the introduction, this paper is part of the EU project Triple whose main goal was to create a discovery platform for SSH in Europe, under the umbrella of OPERAS. This platform, called GoTriple, was released in March 2023. The GoTriple platform has the goal of addressing some of the known issues of interconnection and interoperability across SSH disciplines and communities. Of note is that GoTriple harvests a large part of the discoverable materials from various aggregators of open access publications such as DOAJ or DOAB, among others. Other material is already available from the Isidore³ search engine (an engine for SSH digital and digitised material). The platform database contains over 14M discoverable documents, aggregated from various sources, as of January 2024. Details on the GoTriple harvesting architecture and other technical aspects can be read from (Bouillard et al., 2020).

One of the key pillars of GoTriple has been working together with the European SSH research community on the definition of their needs and in codesigning the platform with them. As briefly anticipated earlier, codesign is an approach to design that aims at “searching new potential directions and producing design ideas and solutions” (Mattelmäki & Visser, 2011). It is closely related

to Participatory Design where users become co-designers with an intention to envision solutions to problems before these solutions are materially created. The involvement of the users in the design also can be seen as having some political connotation: it empowers the users in the decision-making process facilitating democratization of innovation and emancipation from restrictive work practices enacted by technologies (Ehn, 1990).

Our work has encompassed a variety of methods and different phases of research. In an initial definition phase, we have done work to establish the user needs, through qualitative semi-structured interviews and a Europe-wide questionnaire. This has entailed interviewing 25 SSH scholars and 11 non-academic potential users (such as policy makers, representatives of NGOs or SMEs, thus going beyond just researchers as users). As sampling criteria, we wanted specifically a reasonable coverage of different European countries, different disciplines and different career stages of the researchers. We have interviewed researchers from the following countries: Italy, Portugal, Spain and Greece (as South Europe), Austria, Germany, Czech Republic, Poland and France (as East and Central Europe), UK, Finland and Belgium (as North Europe). We have interviewed researchers from the following SSH disciplines (broadly defined): Sociology, Language & Literature, Archaeology, History, Political Science, History, Digital Philology, International relations, History of Political Thought, Information and communication science, Computer Arts, Digital Philology, Human Geography, Musicology, Digital Humanities, Classical Studies, Art History. Researchers were also sampled based on their career level, including participants at a post-graduate level (e.g. PhD students) up to top level of seniority (e.g. University professors). Interviews were all conducted online using MS Teams and the audio recording transcribed, with participants recruited from various networks and SSH scholarly mailing lists. Interview transcripts were then analysed with thematic analysis in order to identify common patterns and subsequently formalise these patterns in Personas and Scenarios.

Significant focus during interviews was placed on differences across disciplines and other differences that could be significant for the user's needs such as e.g. digital skills or career levels. Similarities and commonalities also were a major focus of the analysis, since across the differences (e.g. different work practices for different disciplines) finding a degree of common ground was seen as fundamental for having a discovery solution for SSH as a whole. From the interview analysis, we then created a set of 8 Personas and

Scenarios, to envision a starting common ground representing our potential user base. Personas are “user archetypes” that help designers in making decisions about the planned solutions. According to Cooper et al., 2007 (p. 81) Personas “are not actual people but are synthesized directly from observations of real people”. Personas are models and “precipitates” of real users that are entirely based on user research and, in particular, they tend to be based on qualitative interviews. Scenarios then tell a story of the Personas using the product or service which will need to be designed (i.e. for example the narrative of a Sociology researcher using the GoTriple platform to discover publications on the topic of ‘femicide’). A questionnaire was, furthermore, conducted in order to get a broader overview of the user needs (with 925 responses from SSH scholars from 26 European countries). However, in this paper we will not report specifically on any results from the questionnaire and concentrate on the other elements of the research. More details about the questionnaire can be consulted in De Paoli (2020).

The initial phase of needs definition was followed by an ideation phase with the conduction of targeted codesign activities, i.e. active and direct work with end-users to enable them to take decisions about the shape of the platform interface. We conducted 10 workshops focusing on two main areas: 1) the codesign of the GoTriple innovative services, which include, amongst other components, a recommender system, an annotation tool and a crowdfunding channel; 2) the codesign of dashboards and key components of the GoTriple user interface such as the user profiles. Fifty-two SSH researchers and other stakeholders participated in these workshops. Most of the innovative services of GoTriple were in fact already existing software solutions (like the annotation tool Pundit). The codesign work on the innovative services concerned their integration into the platform interface as well as on refining these services for the SSH community. The codesign for the dashboards was more open-ended instead as we needed to design these from scratch to build the platform interface and the related user experience. Later in the results section we will concentrate on this second part of the codesign work.

Since codesign was conducted entirely during the covid-19 lockdown and social-distancing periods, the workshops took place online with the support of an online board tool (Miro) and the use of various known canvasses and codesign activities. This also impacted attendance, despite the workshop being hosted online, it was more difficult to have an oversight on attendance even if people had agreed to participate (e.g. people occasionally did

not show up to the online workshop). Activities used during the workshops included ranking exercises, voting on preferences, “post up” or crazy 8’s. Affinity mapping was used to analyse the material. Post up is a divergent methodology that is used to help participants produce as many ideas as possible on a topic (Gray et al., 2010). This type of activity is used in codesign to fuel creativity, avoid critical thinking and skepticism and embrace brainstorming. In our work, starting from an overarching question, participants were asked to write their ideas on notes: this activity was timeboxed, usually for 10 minutes. At the end of the 10 minutes, each participant was asked to present her/his notes to the whole group. This was a very important part of the activity because it is where we better understood the perspective of all the participants, and where they could discuss ideas among them. Crazy 8’s is an activity of the Google Design Sprint in which it is possible to challenge participants to sketch eight ideas in eight minutes. It is similar to another known codesign activity called six-to-one. is also a divergent methodology, and it is useful to foster creativity: usually the first two or three sketches come easy while it becomes harder and harder to sketch the remaining ones. The process of pushing the participants creativity to the limit, asking them to sketch more ideas is aimed at producing unexpected and non-trivial results.

4. Results

4.1. SSH User Community Needs

In the project’s initial definition phase, we conducted user research in interviews and a questionnaire. The goal of the interviews was to identify common needs across the significant heterogeneity of the SSH community, which include amongst others: 1) working in differing SSH disciplines which have differing work practices, methods or approaches; 2) differences in needs based on career levels, since the needs of e.g. a senior researcher may not be the same as those of students; 3) other differences such as age, since older scholar may feel differences with younger generations working in the same areas. Among interviewees, some commonly mentioned problems encountered during discovery activities were (as identified via thematic analysis):

- Not finding everything that you need when searching. This is especially difficult in interdisciplinary research.

- Differing Keyword terms for similar topics used by different disciplines makes it harder to search.
- Overload of information – it is hard to sieve through the long list usually supplied for items of relevance by e.g. search engines like google scholar.
- Finding what you need then not having access to the article (not Open Access).
- Difficulties when renaming and exporting files to the favoured formats.
- Difficulty when you do not have a university affiliation – access to journals and other data often relies heavily on this.
- Language differences when searching – different terms being used in different languages.

The initial discovery is, however, only part of the process of searching for relevant material. Indeed, from the interviews' analysis it emerged clearly that other difficulties can be encountered after the initial discovery. These include:

- Having to learn a lot of new technical/digital skills.
- There was evidence that “older” academics experience some feeling of being left behind with the digital skills that are required to be an effective researcher in an environment which sees an increased use of digital tools for research.
- Some interviewees experienced clear difficulties in retrieving stored information (for example, when publications' file names, when downloaded from a publisher website are given a number by default rather than a meaningful title, when stored as a PDF).
- Many researchers, as it is now a common practice, use reference management systems (RMS) such as Zotero or Mendeley for organising, storing and retrieving publications, but it is often inconvenient to share material with colleagues across the different tools that are in use.
- Several academics mentioned shortcuts in their discovery process such as resorting to emailing yourself with links (e.g. relevant publications or a twitter post) as a way to be able to find them again.
- Annotations made on PDF files are not searchable, and ideally academics would like to search within a collection of saved PDF files by doing a keyword search.

As part of the interviews, we asked what a new platform could do to ease their discovery work practices and ultimately facilitate their research work.

Several observations were extracted from the analysis. When asked about the functionalities that could perhaps make their life easier, academics replied with the following themes:

- Linkages to other fields working on the same topic.
- A way to get a good overview of the research field when collaborating with others, finding out who the key researchers are and establishing whether there are any gaps in specific areas.
- A way to find relevant academics with expertise by geographical region (for example to invite them to attend a workshop).
- Send push notifications when new publications arise and make suggestions for items of interest
- The ability to search for and follow relevant projects and people rather than just publications.
- Academics are often reluctant to make a ‘cold call’ to a new person, but like the idea of introductions or recommendations of people from friends/colleagues.
- Being able to send and receive digital research collections/libraries to/from colleagues/collaborators.
- The ability to carry out multiple collaborative tasks within a single platform, such as through online groups working on similar topics.
- An alternative to google scholar curated in an open fashion by those producing the platform (i.e. the project team), linked to individual identifiers (e.g. ORCID).

With these results, we then formalized 8 Personas and related Scenarios describing the Personas using the future discovery platform. We focused on the variety of needs emerging, in terms of different disciplines, where the needs of e.g. a sociologist may not be the same as the needs of a scholar working in musicology. Different needs emerged also in terms of age or career level with particular focus on skills and competencies, as the following two examples of Personas show (Figures 1 and 2).

These two examples show some aspects of our initial modeling of the users and the work done to manage the different aspects of their needs in relation to the complexity of the SSH community. The first Persona (Figure 1) is a young scholar (a post-doc), working in the discipline of Human Geography. The second (Figure 2) is a relatively “older” academic working in Literature. They both come from different countries (the UK and France). One works in

Fig. 1: Persona of an early career SSH researcher.



Fig. 2: Persona of a senior SSH researcher.

Professor Julien Martin

AGE: 49

ACADEMIC POSITION: Senior lecturer

DISCIPLINE: French Literature

NATIONALITY: French

WORKING IN: Sorbonne Université

USER STORY: As an experienced scholar, I want to speed up my discovery process in order to keep up with my research field.

NARRATIVE: Julien is becoming frustrated that he is slower than his younger colleagues at conducting his research on 18th Century French Literature and feels somewhat left behind with technology use. He conducts his research activities in the way he always has done, starting with the bibliography and searching for relevant books and publications using his University library search tool. He also uses internet archives to search for relevant work. Books are still fundamental in his field of work. Julien is thinking about using a Reference Management system after a colleague recommended one, but mainly organises his relevant material using a reference document (a Word file) and he creates different folders on his computer where he stores items by category. A consequence of this is that some files are stored multiple times.

Julien conducts his work mainly on his own, but has a small network of colleagues with whom he discusses ideas (both in person and via email). He would like to be able to exchange libraries with a close colleague. He would also like to know how to make better use of the digital tools he uses, but is not sure who to ask for help. He doesn't want to look 'stupid' and would prefer to have easy to understand online support.

PAIN POINTS:

- Not knowing who key researchers in the field are anymore (due to larger community)
- Not knowing how to use new digital tools for doing research
- Feeling 'slow' and left-behind compared to younger researchers

GOALS:

- Would like to develop his research Profile
- Promote his publications
- Improve his research skills using digital tools
- Share ideas with others in a Community of Practice

QUOTE: "I am a traditional researcher, I'm used to searching, starting with the most important book, then moving to articles and using the bibliographies. I know that the world has changed in a drastic way in the last 20 years. My apprenticeship as a researcher belonged to a prehistoric era, even if I am not so old."

TECH EXPERTISE: ■■■■■■■■■■

INTERDISCIPLINARITY: ■■■■■■■■■■

COLLABORATION: ■■■■■■■■■■

Tools used: Microsoft Office; University Library Search; Google Scholar; National Archives; Academia.edu

The TRIPLE project is funded by the European Commission, under Grant Agreement No. 863420

Social Sciences, the other in Humanities. Each Persona has their own pain points. For Emily for example, one pain point relates to the difficulties of discovering other people to work with and of keeping a balance between the need to discover all the relevant information (e.g. publications) and the risk of information overload. For Julien a pain point is the feeling of being left behind because of lack of digital skills or not knowing who the key researchers in a field are, because of the fragmentation of the community. To note, in the lower right-hand corner of each Persona some specific traits, which include technology expertise, interdisciplinarity and collaboration, showing differences among the Personas, using a 10 points rating scale. These reflect both the pain points and goals in a synthetic and immediate way.

Each Persona was accompanied by a user Scenario from which we derived granular needs (n = 72) for the design. The example of one Scenario (related to the Persona Julien) is presented in Figure 3. The needs derived from each Scenario were then grouped into high level functionalities for the platform and for each functionality we developed a simple user story. In other words, user needs related to the same or similar functionalities present in different Scenarios were sorted and brought together under functionalities. This was done for facilitating the work on the interface prototyping as then each user story could easily convey the main user goal for each functionality of the platform. Thirteen high level functionalities/features for the platform were identified including, among others: 1) Create account/profile; 2) manage account/profile; 3) Discovery of resources; 4) Discovery of data; 5) Advanced discovery; 6) Saving discoveries; 7) Sharing discoveries.

The following are two examples: one for the feature “Discovery of resources”, and the other for the feature “User profile management” with the associated needs that emerged from the interviews, and the different Personas/ Scenarios. The needs are numbered by scenario e.g. 7.3 – means the user need 3, from the Scenario number 7, 8.1 means the user need 1 from the Scenario number 8. It is important to note that not all the needs that were extrapolated from the Scenarios and that were grouped in functionalities, were then later prioritised for the design. All of the functionalities were presented in a table and then discussed with the stakeholders in a prioritisation exercise to ensure that the most important features would become a priority and be developed first, with those that were deemed less important added to the ‘do later’ or ‘do only if time allows’ column. In the case below, for example, we dropped the search for presentations and did not design and develop an

Fig. 3: Scenario of a senior SSH researcher.



Professor Julien Martin

AGE: 49

ACADEMIC POSITION: Senior lecturer

DISCIPLINE: French Literature

NATIONALITY: French

WORKING IN: Sorbonne Université

SCENARIO:

Professor Julien Martin is about to release a new book that he has written over the last year. His colleagues have advised him that he should spend some time promoting his book online, but not being a big 'social media' fan he is unsure of the best approach to take. He has recently been introduced to the Triple platform which makes discovering research easier and he has been impressed with the platform's ability to produce his 'Profile' that highlights his interests and previous publications, without too much effort on his part as it is automatically uploaded once he identifies himself (confirming his ID) and he just has to confirm it is correct. He decides that adding details of his new book to his public-facing profile page would be useful, he finds it easy to add by simply including the unique identifying number that his publisher has sent him for the book. Once it is uploaded he is able to use the 'Highlight' feature to make the book more prominent when people view his profile page. He is also able to 'share to social media' channels easily, so he chooses to share information about the book on Twitter to reach a wider audience.

What Julien really likes about Triple is the more visual information given when presenting search results, he likes being able to see the type of data it is at a glance and to see the metrics (Impact factor/ number of citations/number of influential citations without having to spend time downloading the document first. He feels that he gets a much better idea of how useful the item will be to him without having to read the whole article or book. He also enjoys the 'clustering' visual information and finds himself spending a lot of time in this view, annotating and enriching his saved material.

The Triple platform is able to recommend other academics working within the same field as Julien, he notices that some of them are in a special interest 'Group' (SIG) within Triple about 18th Century French literature. He joins the group and finds that this new Community of Practice is an excellent source of information for his work. Many people are sharing information regarding upcoming conferences and new publications. There is also a helpful forum where people can chat. Julien is able to ask advice regarding new digital tools via the forum, another participant shares a link to an excellent online MOOC that is available to learn more about digital humanities methods. He creates a new SIG about the new digital tool and is then able to utilise the forum to ask questions when he encounters a few problems. The forum feature also offers him advice on being more efficient regarding his reference collection and is an excellent place to hear about upcoming events such as webinars and conferences.

The TRIPLE project is funded by the European Commission, under Grant Agreement No. 863420



‘article overview feature’. However, it is possible for the user to discover publications, people, projects and to a limited extent also data using GoTriple as these needs were indeed brought forward into the design.

Feature: Discovery of resources

User Story: As a user I would like to use TRIPLE to discover resources which are relevant to me so that my work benefits from this

- 2.5 The user shall be able to Search for publications
- 8.1 The user shall be able to Search for a dataset
- 7.1 The user shall be able to Search ordering by ‘impact’
- 7.2 The user shall be able to Search by most recent publication
- 7.3 The user shall be able to Search for projects
- 7.4 The user shall be able to Search for presentations
- 5.2 The user shall be able to Read an ‘Article Overview’ for a publication
- 8.5 The user shall be able to Save search terms to be presented with this search again

Feature: Manage Account/Profile

User Story: As a user I would like to easily manage my account so that I can promote my own work and share my discoveries

- 2.1 The user shall be able to Create a profile on the platform (from scratch)
- 6.2 The user shall be able to Create a profile (using existing data – via Unique Identifier)
- 6.4 The user shall be able to View metrics on how often others view/cite their work
- 1.7 The user shall be able to View Profiles of other people
- 1.1 The user shall be able to Receive notifications about new publications of relevance
- 1.9 The user shall be able to Add events to Profile page
- 1.11 The user shall be able to Send invitations to an event
- 1.10 The user shall be able to View metrics of who has seen the profile 2.4
The user shall be able to Share details easily to social media channels
- 2.2 The user shall be able to Add details of a new publication to their profile page
- 2.3 The user shall be able to Highlight a new publication

4.2. Codesign of Dashboards and Profiles

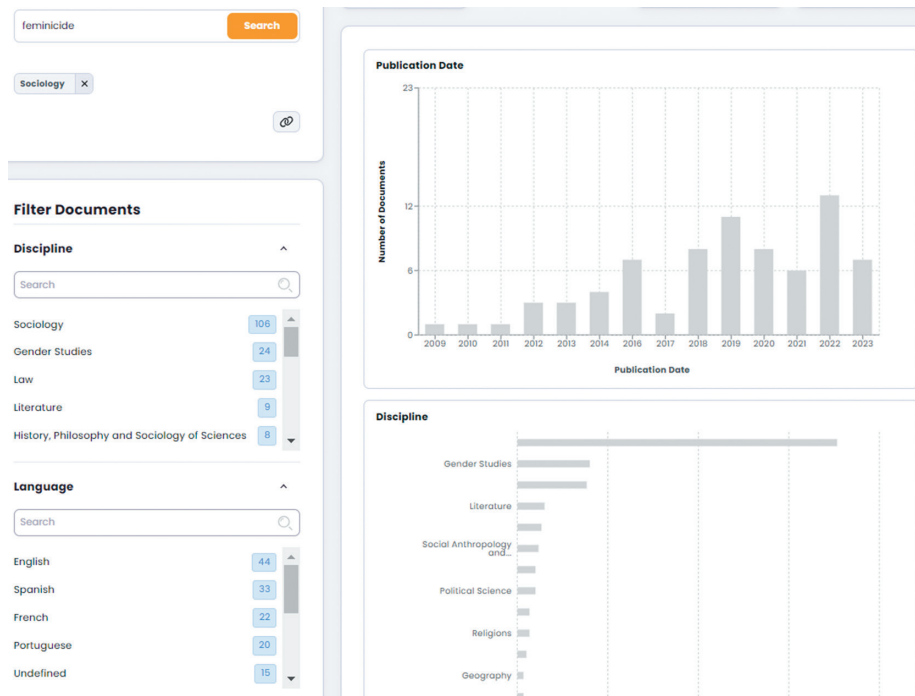
The codesign for GoTriple encompassed work done for: 1) innovative services and for 2) core features for the discovery, largely in the form of dashboards, profiles and search results. In this section we will concentrate on presenting results related to the second aspect.

Dashboards are a type of user interface that allows a quick overview of a selection of key metrics and information. Digital platforms often have a large amount of data which might be interesting for the users, but formats like tables for presenting the data are difficult for users to understand and require an in-depth analysis. Dashboards are a way to select what the most relevant information is and display it in a way that is immediately comprehensible. However, for dashboards to be of use for the users, they require careful design to distill the most relevant information and show it to users with effective interface elements such as indicators, charts and lists of items. Profile pages are a common type of feature that are available on many platforms: social networks, professional networks, research platforms, sports platforms. Potentially any application that requires user registration can provide a user profile page. This type of page is usually aimed at presenting the user to the public, displaying the relevant information for the related domain: for example, on LinkedIn the profile page will display all the professional-related information of a person. In this regard profiles may also have some specific functions, depending on the focus/area in which a specific platform operates. In LinkedIn, profiles broadcast skills and experience and thus may be relevant for recruitment (Zide et al., 2014) or for furthering one's career (Martín-Martín et al., 2016). In research and academic platforms, authors have noted that profiles appear quite pervasive (Martín-Martín et al., 2016) and these can have a variety of purposes such as sharing publications with the community and offering greater responsiveness than traditional publishing does (Ovadia, 2014). In GoTriple there are five pages for which we had planned to adopt the dashboard-approach to optimize the user experience, and to select the relevant information to show. Three of these dashboards were planned since the project submission, and the user needs toward these had been refined during the interviewing stage of the research. During the interviewing phase, however, we identified the potential benefits toward creating two additional dashboards, in particular the Discipline Dashboard and the User Profile Dashboard.

The aim of the GoTriple dashboard (1st dashboard) is to provide an immediate overview of the general metrics of the platform and their evolution in time: users should use this page to develop a sense of the content and who the users of GoTriple are and how these evolved over time. The search interface (the actual core discovery interface, see Figure 4) was also designed considering it as a dashboard (2nd dashboard): the results of a search performed by the user on the platform represent a large amount of information that can be approached from a different perspective, visually displayed as charts and indicators. In this case the visual presentation cannot replace the normal list view of the search results, but rather complements and enhances it.

During the interviews conducted in the definition phase, we understood that disciplines could function as a compass for scholars for moving through the platform's content. For this reason, we decided to design a new Discipline

Fig. 4: Part of the search dashboard of GoTriple with discovery results also shown in graphs, including how discovery keywords appear across disciplines.



Dashboard (3rd dashboard), a page where all the main relevant information about the resources and activities related to a discipline are presented to the user in a visual manner, and where it is possible to access all related resources and profiles.

Finally, the public user profile (4th dashboard) and private user dashboard (5th dashboard) are profile pages (as previously described) for which we decided to adopt some dashboard-like patterns, synthesizing the available data to make them immediately understandable. Profiles emerged as an important user need during the interviews, with a strong focus on promoting one's work and contacting other researchers and potential partners.

When designing a dashboard or a profile page the possibilities are endless. It is however of paramount importance to narrow down some relevant options. For this reason, we planned to involve potential users of the platform to codesign these pages with them from the start of the project onwards. We will discuss one of the codesign sessions specifically run for the codesign of the Discipline Dashboard.

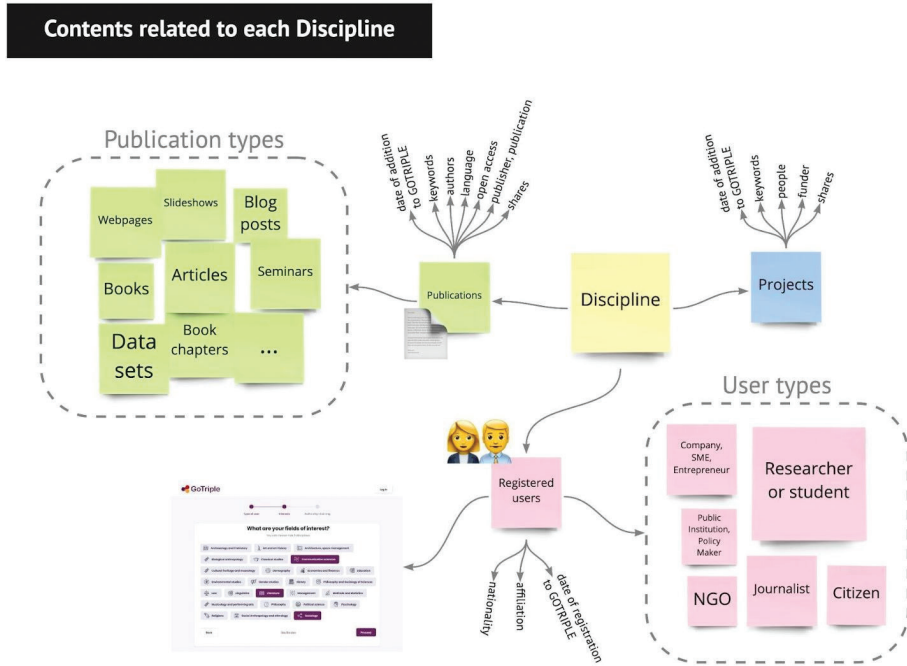
4.3. Discipline Dashboard Codesign

We now present results from one of the codesign sessions specifically for the Discipline Dashboard. In the first part of the online workshop, we provided some general information about the logical structure of the contents of GoTriple to allow participants to understand how disciplines are related to the resources and the user profiles. A diagram was shown for this purpose (presented in Figure 5), showing these relations and clarifying then the purpose of designing a Discipline Dashboard for the platform.

Then we provided a brief overview of some possible interface solutions to display the contents and relations. We tried not to bias the participants, but this step was necessary since they were asked to design some sketches of possible interfaces. The interface solution ideas shown included things such as word clouds, content previews, lists of items, timelines, or different types of charts.

The workshop included a Post up activity (Figure 6) and then a sketching phase using the Crazy 8's method (Figure 7). As expected, most of the

Fig. 5: Diagram showing the content of GoTriple and the relation with disciplines. This was discussed at the beginning to allow participants to understand the potential roles of disciplines within the GoTriple design.



outcomes from the ideation session were included by the participants in their sketches. Participants were asked to vote on the sketches that were produced. In this section we report the main takeaways that emerged during voting of the sketches and a few more that were highlighted by the affinity mapping review of the workshop's recording.

During the post up phase the participants provided a varied set of ideas for the dashboard, such as:

- Interdisciplinarity by keywords: connect and integrate several disciplines to avoid researchers working in isolated domains.
- Disciplines network chart: showing relations between disciplines and keywords
- Discipline page search bar: search input that allows to perform a search within the current discipline.

Fig. 6: The ideas generated by the participants during the post up activity of the workshop (names are fictitious).

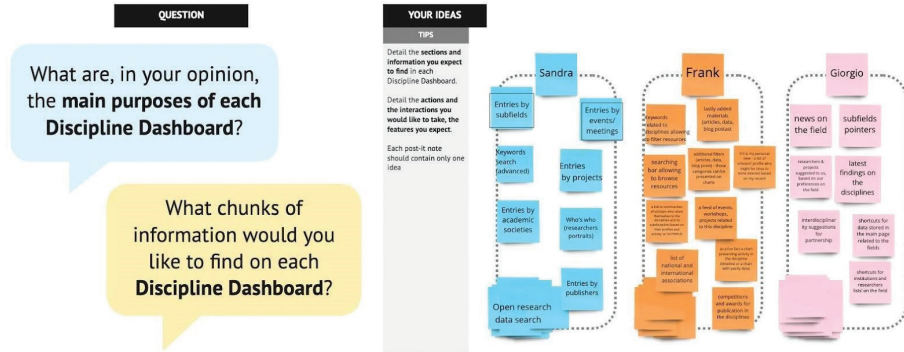
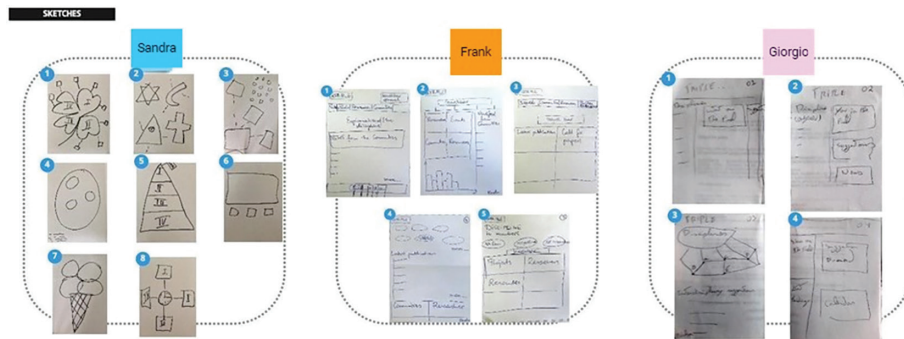


Fig. 7: Diagram showing sketches produced by participants during the codesign.



- Keywords bar chart: a bar chart with the most common keywords within a discipline.
- What's new in the discipline: the discipline page should provide information on the new related contents, like new publications, new datasets, new findings in the field.
- News and events: the Discipline dashboard could also display some content like news, events, awards, and any other useful time-based information.
- Disciplines icons: disciplines should be described visually using illustrations or icons, to make them more recognizable and easily understood.

During the Crazy8's, the participants sketched a variety of ideas for the dashboard. These were sketched on paper, briefly shown on video during the workshop, and later collected as pictures (since the participants participated remotely). The goal of this activity remains in the idea generation, where designers can collect a variety of insights before deciding on a specific design. Figure 7 shows sketches made by the workshop participants (not everybody produced 8 sketches). Figure 8 shows in better resolution two of the sketches where some ideas were then used for the interface design.

In the sketches in Figure 8, the participant gave prominence to finding projects, researchers and resources (i.e. publications) within the Discipline Dashboard. The second sketch clearly shows a graph which could represent publications available in GoTriple by e.g. year.

After the workshop we conducted an affinity mapping exercise with all the results, and alongside this analysis we drafted a mockup of a potential interface on a whiteboard (see Figure 9). Some key findings from the analysis are as follows. Certain keywords should be visible to users (for example, types of publication, level of accessibility) as they represent the logical sub-level to navigate discoveries within disciplines: these keywords could be represented as a list or as a chart. Moreover, keywords can be exploited to filter

Fig. 8: Details of some of the participants sketches, with details that were brought forward in the final design.

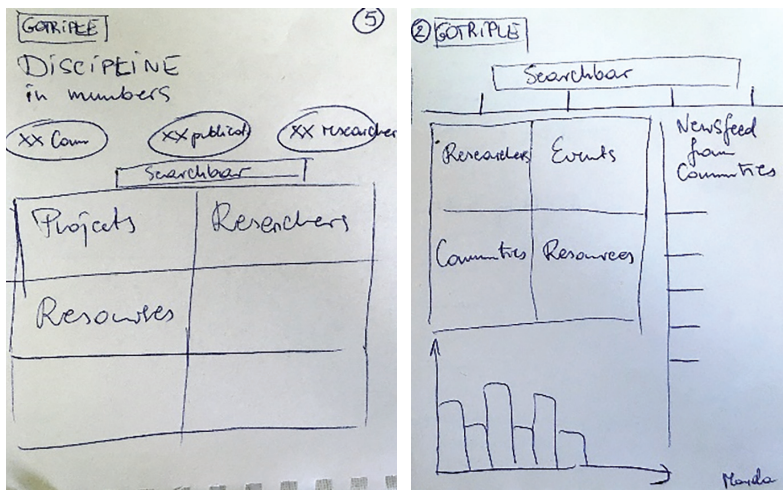


Fig. 9: Affinity mapping and initial mock-up of the Disciplines Dashboard.



the resources within a discipline. Each Discipline Dashboard could also display sections with resources from other disciplines that share the same keywords: this would facilitate navigation across domains. The dashboard should include a search bar to search within the current discipline, a bar chart depicting the types of resources and a chart with the repositories that are the most active in that domain. Workshop participants requested the option of following each discipline and getting notifications when a new corresponding resource is added or a new user working in that discipline has registered on GoTriple. However, this feature has not been implemented yet.

Each Discipline Dashboard should be constantly updated, displaying newly added resources and registered users; participants also requested the possibility to have news and information about new developments in each discipline (e.g. events or awards). This would shape the Discipline Dashboard into an omni-comprehensive page that users interested in a field could refer to, to see what's new and stay up to date. Even if this goes beyond the scope of the Triple project, it is an interesting idea for possible future developments.

5. Design of the Discipline Dashboard

What follows are images of the final design (or parts of the design) of the Discipline Dashboard, emerged from a prototyping phase, and now included in the available version of GoTriple. The Discipline Dashboard effectively is composed of three levels of interaction. The first level (available here: <https://www.gotriple.eu/disciplines>) is a list of items (the 27 disciplines from the MORESS categories we have been using widely in the project). Disciplines are shown as a list and for each there are the number of documents (i.e. publications and projects) that are discoverable in GoTriple. Figure 10 shows a portion of this list with 3 disciplines. Readers should note that this categorization of documents/projects is done through metadata and use of machine learning. By clicking on each of the disciplines from the list, users are then redirected to a dashboard which shows graphs with the temporal distribution of the discoverable documents for each discipline as shown in Figure 11, for the example of Sociology. Clearly there are many more publications available than projects as can be seen from the graph. By clicking on the “Documents”

Fig. 10: Part of the first level of the Discipline Dashboard, with disciplines shown as a list of items.

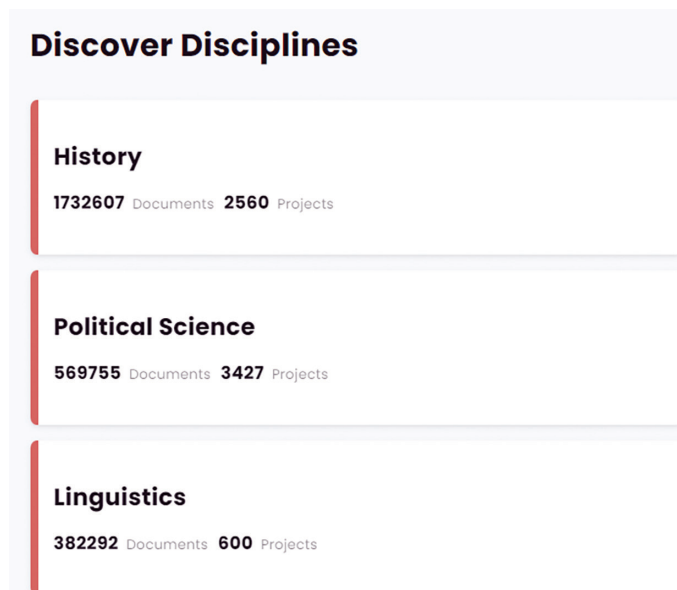
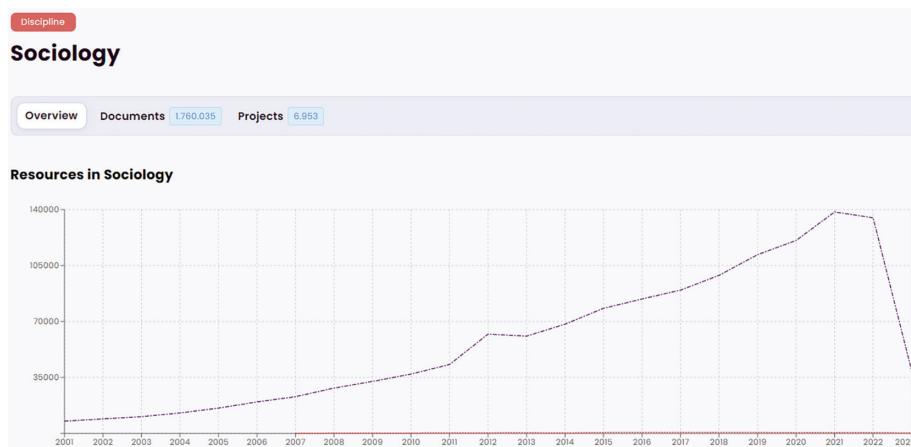


Fig. 11: Second level of the Dashboard with graphs showing the available documents and projects over time.



or “Projects”, the user is then sent to the Search Dashboard (Figure 12) which shows e.g. the publications discoverable for that discipline (e.g. Sociology). There the user can refine the discovery by using the available facets, for example refining by language, type of publication and so on.

6. Discussion

We have discussed in this paper the relevance of having discovery solutions for SSH which are codesigned with the user community to serve their specific user needs. We also reflected on the complexity of defining the user needs toward digital research technologies for a wide and heterogeneous community of users. To this end, through presenting some key results of the user research conducted for the GoTriple platform, this manuscript focused on answering two main research problems: “what are the user needs of the SSH community toward an open discovery platform?” and “how can we design a discovery platform that can support the variety of the user needs for the SSH community?”.

Designing usable tools for supporting the work of researchers is strongly related to the concept of the research workflow (Antonijeic, 2015; Bosman & Kramer, 2015; Unsworth, 2000). This concept seeks to formalize the research

Fig. 12: The third level of the Discipline Dashboard is the Search Dashboard with all the discoverable material for the specific discipline. The figure shows a discovery for Theses published in the year 2018.

The screenshot displays the 'Sociology' search dashboard. At the top, it shows 'Discipline: Sociology' and navigation tabs for 'Overview', 'Documents' (13,941), and 'Projects' (589). The 'Your Search' section includes a search bar and filters for 'Thesis' and 'In 2018'. The 'Filter Documents' section on the left allows filtering by language (English: 7,703, Undefined: 1,774, Other: 1,134, Swedish: 1,058, Turkish: 851) and type (Thesis: 13,941, Text: 786, Review: 322, Other: 108, Undefined: 20). It also has options for 'Free full text available' and 'Provider'. The main results area shows three theses:

- 'It also belongs to the avant-garde'. African trade unionist at FDGB University Fritz Heckert (1961-1963); 'It also belongs to the avant-garde'. African trade Unionists at th...**
 Author: [Angermann, Eric](#)
 Thesis, 2018-08-21 | 900 | DDR | Dekolonisierung | + 20
 Kurz nach dem Beginn des Mauerbaus erreichten im September 1961 Delegationen afrikanischer und asiatischer Gewerkschaften die Hochschule der Deutschen Gewerkschaften „Fritz Heckert“ in Bernau, einem Vorort Berlins. In den folgenden anderthalb Jahren lebten, studierten und arbeiteten...
- Loyal and Elegant Subjects of the Sublime State ; Headgear and the Multiple Dimensions of Modernizing/-ed Ottoman Identity**
 Author: [Jana, Kotja](#)
 Thesis, 2018-02-19 | 900 | Ottoman History | Turkish History | + 10
 In dieser Arbeit untersuche ich osmanisch-türkische Kleidungspolitiken im 19. und frühen 20. Jahrhundert. Der Frage folgend, was ein Fokus auf Männlichkeit und Kleidung über Modernisierungsdiskurse offenbaren kann, untersuche ich Konflikte rund um Kopfbedeckungen für...
- New approaches to the objective diagnosis of alcohol abuses**
 Author: [Giacomazzi, Elena](#)
 Thesis, 2018 | Ethyl glucuronide | EtG | alcohol metabolite | + 1
 Driving under the influence of alcohol is one of the most common risk factor of road accidents and it is one of the main causes of mortality. Since the detection of ethanol in the body is possible only for a relatively short time after intake, the assessment of a condition of alcohol intoxication/ad...
- The needs of parents with children with autism spectrum**

process into a linear set of stages to identify requirements for each stage and support the creation or identification of existing appropriate research digital tools. Discovery is normally one component of these workflows and it tends to appear in the early stages, if not the very first stage.

It is evident that involving a large research community such as the SSH community in Europe in codesigning a novel discovery solution presents several challenges. Firstly the fact that this community is rather wide and

heterogeneous, encompassing people working across several disciplines, working on a huge variety of topics (we interviewed people working on little known ancient Greek philosophers and people working on e.g. the adoption of Machine Learning to process digital documents), adopting a significant number of different methods and having different levels of digital resources and skills, and working in different countries with e.g. different systems, available resources, etc. Designing an all-encompassing platform like GoTriple which ideally would need to serve the discovery needs of all this heterogeneity therefore requires compromises or explicit choices by the design team. In our case, we have discussed how common ground was found in the difference across scholarships, through codesign. During interviews conducted in the definition phase of the design research, several researchers spoke about the relevance of disciplinary organisations of resources (e.g. publications, data), and spoke about the concept of discipline as an important lens through which they perceive knowledge and the world. We foresaw this as an important basis for discovery through GoTriple, where de-facto the significant disciplinary variety of SSH has become one of the key entry points of discovery, through a multi-layered Discipline Dashboard. Moreover, disciplines are not treated as siloed entities, indeed it is possible for example that certain publications belong to multiple disciplines, that they share the same keywords and that users have interests in multiple disciplinary knowledge. Disciplines thus allowed an important integration of the discoverable resources, which were made available on the GoTriple interface through graphs, or filtering facets. We argue therefore that a key important insight from our study is that adopting codesign as an approach to work with the SSH user community has the potential to unveil functional needs that point to a central and shared conceptual/methodological need of SSH researchers. In this specific example in relation to the users' need for a more exhaustive/inclusive cross-disciplinary overview of their broad domains. In line with this assumption of finding synthesis across heterogeneity, we would like to remark on the importance of using Personas and Scenarios especially in contexts where synthesis across significant variety and difference of user needs must be found. Personas and Scenario proved essential during the discussion and mediation of the design team with the software developers. These modeling instruments allowed us to discuss the feasibility of some of the needs and related features and to assess which emerging user needs were out of scope for the platform remit. Moreover, mediation needed to take place to design a solution that could serve conflicting needs. For example, we had gathered from interviewing established scholars (e.g. like Professors) that they were

keen to have on the GoTriple user profiles a tracker of the number of citations of their publications (see need 6.4 related to the “User profile” feature, presented in Section 3), in a manner similar to what is available on other discovery solutions like google scholar or Scopus. This is clearly a feature to which researchers have become accustomed over the years and could consequently translate into a specific element for the GoTriple profile interface. Younger scholars, however, when interviewed implicitly expressed a dislike about such metrics claiming that they tend to promote established scholars with many publications, over those who still have little or no publications (e.g. PhD students). Having citation metrics on the profiles would thus become an obstacle for early career scholars to creating a profile. It is interesting to note that this is also in line with some of the observations of the Principle 7 of The Leiden Manifesto, which argued that metrics such as the h-index tend to favour established scholars. A choice had to be made therefore on which one of these two conflicting user needs to advance in the design of the GoTriple user profiles. We decided to second the early career scholar, and metrics of citation were thus not included in the design, even if the need emerged during the research.

Moreover, emerging user needs require scrutiny to understand not only any potential conflict but also for assessing their general usefulness in the context of the specific work domain, e.g. in Discovery. Indeed, a few needs emerging from our work appeared relevant to address some of the researchers’ immediate problems and goals, but were not likely relevant for the discovery part of the workflow, on which we were focusing our design. Few of the interviewees expressed, for example, a need for having something in GoTriple that could support them in organising events (like a local workshop) and consequently the need for using the platform to directly invite interested people (see needs 1.9 and 1.11 related to the “User profile” feature), for example based on their interests or location. These needs partly relate to the discovery of people based on e.g. their interests or topics of their work, however we felt that the need related with organising and promoting events was outside the scope of a discovery platform and thus we decided to not consider it during the actual design.

Other users wanted tools to create groups within a platform, and while this need would have been potentially useful within our discovery platform (i.e. for sharing discoveries or work on the discovery of common topics), the limits of the resources available did not allow the development of this

functionality. Whilst nothing prevents “group features” being implemented in the future, available resources also impact on the capacity of a project to meet user needs. Conveying discovery results to the user in a variety of formats for example, emerged as a key user needs. Whilst scholars are accustomed to receiving discovery of publications as lists (as e.g. they appear on a google scholar search), receiving discovery results in multiple formats was identified as a fundamental element. We translated this into a requirement for designing a set of dashboards that could serve the discovery practices in multiple directions. Discoveries are then presented to users not only as lists but also through graphs, groupings (of e.g. disciplines, or access license) or languages. We felt this was a user need that could cut across the variety and heterogeneity of the user community and getting this right would have gone a long way on the creation of a discovery platform serving the whole SSH community.

Reflecting on previous work, we have seen in the literature review, that authors pointed to the different emerging relevant needs for discovery, which include amongst other the needs for integration of tools and resources, or the need for multilingual services (Krämer et al. 2021; Leathem & Adrian, 2015; Martin et al., 2019). These two needs do seem to align with the key studies upon which inspiration for the creation of the GoTriple platform was taken, in particular the OPERAS white paper (Mounier et al., 2018) and the DiMPO study (Costis et al., 2017) which had noticed the wide dispersion and fragmentation of SSH resources and groups and hence the need for offering some form of integration and a single access point. However previous literature rarely (if at all) focused on a granular definition of user needs to achieve this integration, to the level in which insights for creating and designing an actual discovery platform for SSH could be achieved. The focus remains generally on offering services through the library functions (e.g. Bourke, 2022), and on studying with an analytical focus emerging practices of the workflows, including discovery (e.g. Ince et al. 2022b; Papenmeier et al., 2021; Sun et al., 2022). In these studies, the user needs, whilst mentioned, are never or rarely a core focus and in conducting our review of the literature we had to extract and separate them from the analytical work of the authors.

Moreover, practical works reporting on the processes of creating solutions for discovery also are very few (one example cited earlier is Choe et al., 2021), and there is little about the involvement of the user community in the design process. However, it has long been noted that when developing digital

technologies or infrastructures for SSH research, it is important to engage and actively involve the researchers (Thoden et al., 2017; van Zundert, 2012), in order to ensure the uptake of the new solutions or create technologies that are easy to learn and use. Previous contributions on e.g. gathering user needs of SSH scholars for digital tools had noted the problem of making technologies without actively engaging with the user community, with Baker and Karasti (2018) even noting that we face a “neglected level” of engagement with the actual users of research services. Moreover, even when engagement has been done to identify user needs, it is fair to say that most previous contributions have worked extensively through surveys or reviews of existing materials such as literature (e.g. Costis et al., 2017; Crymble, 2016; Venlet et al., 2018), but there is far less work on involving SSH scholars actively in codesign. A codesign approach for GoTriple allowed us not only to define user needs but also to engage SSH scholars with creative tasks, exploring ideas, imaginative solutions and ultimately shape an interface which offers a variety of ways to explore, consume and share discovered material.

7. Future Work

The European SSH discovery platform GoTriple has effectively been launched in a near to final version in March 2023, and at the time of writing of this manuscript, the project partners are making some final improvements to the underlying software and the design. User testing also has been conducted (but not discussed in this paper) to evaluate the usability of the interface. The next big task will be to build a thriving community of SSH scholars using the platform. A user engagement strategy is underway, whilst we already have a few hundred early adopters. Whilst we worked with the SSH community in the codesign, the success of GoTriple will depend on having thousands of users actively incorporating GoTriple in their workflows. GoTriple is one of the services offered by OPERAS European Infrastructure and is included in the European Open Science Cloud (EOSC) catalogue of services. As GoTriple will continue after the funding period as an OPERAS service, there will be new updates and improvements and we expect to see a much more extensive use of the platform by SSH scholars and other users across Europe. Consequently, more work will need to be done with the user community, on a continuous basis to improve the interface as more users will join and start using GoTriple in their workflow.

Acknowledgments

The authors acknowledge funding from the European Union's Horizon 2020 programme under grant agreement No. 863420. The authors thank all the SSH researchers that took part in this research.

References

- Achenbach, K., Błaszczczyńska, M., De Paoli, S., Di Donato, F., Dumouchel, S., Forbes, P., Kraker, P., & Vignoli, M. (2022). Defining discovery: Is Google Scholar a discovery platform? An essay on the need for a new approach to scholarly discovery. *Open Research Europe*, 2(28). <https://doi.org/10.12688/openreseurope.14318.2>
- Antonijević, S. (2015). *Amongst digital humanists: An ethnographic study of digital knowledge production*. Palgrave Macmillan.
- Avison, D., & Fitzgerald, G. (2003). *Information systems development: Methodologies, techniques and tools* (3rd ed.). McGraw-Hill.
- Baez, M., Birukou, A., Casati, F., & Marchese, M. (2010). Addressing information overload in the scientific community. *IEEE Internet Computing*, 14(6), 31–38. <https://doi.org/10.1109/MIC.2010.107>
- Baker, K. S., & Karasti, H. (2018, August). Data care and its politics: Designing for local collective data management as a neglected thing. *PDC 18: Proceedings of the 15th Participatory Design Conference: Full Papers, 1*, Article 10. <https://doi.org/10.1145/3210586.3210587>
- Balaji Babu, P., & Krishnamurthy, M. (2013). Library automation to resource discovery: A review of emerging challenges. *The Electronic Library*, 31(4), 433–451. <https://doi.org/10.1108/EL-11-2011-0159>
- Blanke, T., & Hedges, M. (2013). Scholarly primitives: Building institutional infrastructure for humanities e-Science. *Future Generation Computer Systems*, 29(2), 654–661. <https://doi.org/10.1016/j.future.2011.06.006>
- Borst, T., & Limani, F. (2020). Patterns for searching data on the web across different research communities. *LIBER Quarterly: The Journal of the Association of European Research Libraries*, 30(1), 1–21. <https://doi.org/10.18352/lq.10317>
- Bosman, J., & Kramer, B. (2015, November 11). 101 Innovations in Scholarly Communication: How researchers are getting to grip with the myriad of new tools. *Impact of Social Sciences Blog*, <http://eprints.lse.ac.uk/70920/>
- Bouillard, M., Roi, A., Brunel, M., Capelli, L., De Santis, L., Dumouchel, S., Geogriadis, H., Gingold, A., Goosen, T., König, A., Maryl, M., Pacheco, A.,

- Polydoratou, P., Rohden, J., Stojanovski, J., & Umerle, T. (2020). *Triple Deliverable: D2.2 Data Harvesting Best Practices Document for Data Providers* [Project deliverable]. Zenodo. <https://doi.org/10.5281/zenodo.4438651>
- Boukhelifa, N., Bryant, M., Bulatović, N., Čukić, I., Fekete, J. D., Knežević, M., Lehmann, D., & Thiel, C. (2018). The CENDARI infrastructure. *Journal on Computing and Cultural Heritage (JOCCH)*, 11(2), 1–20. <https://doi.org/10.1145/3092906>
- Bourke, T. (2022). Bibliographic control of research datasets: Reflections from the EU library. *JLIS: Italian Journal of Library, Archives and Information Science*, 13(1), 321–334. <https://doi.org/10.4403/jlis.it-12723>
- Cahoy, E. S. (2018). Leave the browser behind: Placing discovery within the user’s workflow. *LIBER Quarterly: The Journal of the Association of European Research Libraries*, 28(1), 1–19. <https://doi.org/10.18352/lq.10221>
- Choe, K., Jung, S., Park, S., Hong, H., & Seo, J. (2021). Papers101: Supporting the discovery process in the literature review workflow for novice researchers. *2021 IEEE 14th Pacific Visualization Symposium (PacificVis)*, 176–180. <https://doi.org/10.1109/PacificVis52677.2021.00037>
- Coiffait, L. (2019, March 20). Criticisms of the citation system, and Google Scholar in particular. *Social Science Space*. <https://www.socialsciencespace.com/2019/03/criticisms-of-the-citation-system-and-google-scholar-in-particular/>
- Coombs, S. K., & Peters, I. (2017). The Leiden Manifesto under review: What libraries can learn from it. *Digital Library Perspectives*, 33(4), 324–338. <https://doi.org/10.1108/DLP-01-2017-0004>
- Cooper A., Reimann, R., & Cronin, D. (2007). *About face 3: The essentials of interaction design*. John Wiley & Sons.
- Costis, D., Chatzidiakou, N., Benardou, A., Clivaz, C., Cunningham, J., Dabek, M., Garrido, P., Gonzalez-Blanco, E., Hadalin, J., Hughes, L., Immenhauser, B., Joly, A., Kelpšienė, I., Kozak, M., Kuzman, K., Lukin, M., Marinski, I., Maryl, M., Owain, R., ... Zebec, T. (2017). *European survey on scholarly practices and digital needs in the arts and humanities – Highlights Report*. DARIAH-EU Scholarly practices survey. <https://doi.org/10.5281/zenodo.260101>
- Crymble, A. (2016). Digital library search preferences amongst historians and genealogists: British History Online user survey. *Digital Humanities Quarterly*, 10(4). <http://www.digitalhumanities.org/dhq/vol/10/4/000270/000270.html>
- De Paoli, S. (2020). *Triple Deliverable: D3.1 Iteration on the User Needs* [Project deliverable]. Zenodo. <https://doi.org/10.5281/zenodo.4636592>
- De Paoli, S., Blotière, E., Forbes, P., & Arasteh-Roodsary, S. (2022). Measuring and promoting the success of an Open Science discovery platform through “compass indicators”: The GoTriple case. *Publications*, 10(4), 49. <https://doi.org/10.3390/publications10040049>

Dogunke, S. (2020). Co-design in libraries. *New Review of Academic Librarianship*, 26(2–4), 243–260. <https://doi.org/10.1080/13614533.2020.1810081>

Ehn, P. (1990). *Work-oriented design of computer artifacts*. Lawrence Erlbaum Associates Inc.

Favaro, S., & Hoadley, C. (2014). The changing role of digital tools and academic libraries in scholarly workflows: A review. *Nordic Journal of Information Literacy in Higher Education*, 6(1), 6–22. <https://doi.org/10.15845/noril.v6i1.174>

Giannoutakis, K. M., & Tzovaras, D. (2017). The European strategy in research infrastructures and Open Science Cloud. In L. Kalinichenko, S. O. Kuznetsov, & Y. Manolopoulos (Eds.), *Data Analytics and Management in Data Intensive Domains: XVIII International Conference, DAMDID/RCDL 2016* (pp. 207–221). Springer International Publishing. <https://doi.org/10.1007/978-3-319-57135-5>

Gray, D., Brown, S., & Macanuso, J. (2010). *Gamestorming: A playbook for innovators, rulebreakers, and changemakers*. O'Reilly Media.

Grubert, E., & Siders, A. (2016). Benefits and applications of interdisciplinary digital tools for environmental meta-reviews and analyses. *Environmental Research Letters*, 11(9), Article 093001. <https://doi.org/10.1088/1748-9326/11/9/093001>

Haddaway, N. R., Collins, A. M., Coughlin, D., & Kirk, S. (2015). The role of Google Scholar in evidence reviews and its applicability to grey literature searching. *PLoS One*, 10(9), Article e0138237. <https://doi.org/10.1371/journal.pone.0138237>

Heers, M., Ferrez, E., & Morgan DePaula, E. (2017). *Data sharing and re-use: Researcher practices, attitudes and needs - FORS survey of social science researchers in Switzerland*. FORS. <https://core.ac.uk/download/pdf/226980824.pdf>

Hicks, D., Wouters, P., Waltman, L., De Rijcke, S., & Rafols, I. (2015). Bibliometrics: The Leiden Manifesto for research metrics. *Nature*, 520(7548), 429–431. <https://doi.org/10.1038/520429a>

Ince, S., Hoadley, C., & Kirschner, P. (2022a). Collaborative technology practices in social science early career scholarly research workflows. *Journal of Librarianship and Information Science*. <https://doi.org/10.1177/09610006221140124>

Ince, S., Hoadley, C., & Kirschner, P. A. (2022b). A qualitative study of social sciences faculty research workflows. *Journal of Documentation*, 78(6), 1321–1337. <https://doi.org/10.1108/JD-08-2021-0168>

Jenselius, F. R., Htun, M., Samuels, D. J., Singer, D. A., Lawrence, A., & Chwe, M. (2018). The benefits and pitfalls of Google Scholar. *Political Science & Politics*, 51(4), 820–824. <https://doi.org/10.1017/S104909651800094X>

Koper, B., & Umerle, T. (2019, July 9–12). *Polish literary bibliography-new research data portal for complex cultural dataset* [Poster presentation]. Digital Humanities Conference 2019 Utrecht, The Netherlands.

Krämer, T., Papenmeier, A., Carevic, Z., Kern, D., & Mathiak, B. (2021). Data-seeking behaviour in the social sciences. *International Journal on Digital Libraries*, 22, 175–195. <https://doi.org/10.1007/s00799-021-00303-0>

Landhuis, E. (2016). Scientific literature: Information overload. *Nature*, 535(7612), 457–458. <https://doi.org/10.1038/nj7612-457a>

Leathem, C., & Adrian, D. (2015). *Survey and analysis of basic social science and humanities research at the science academies and related research organisations of Europe*. Union of the German Academies of Sciences and Humanities. https://edoc.bbaw.de/files/2331/2015_ProjectReport_SASSH_englisch_A1b.pdf

Li, S., Jiao, F., Zhang, Y., & Xu, X. (2019). Problems and changes in digital libraries in the age of big data from the perspective of user services. *The Journal of Academic Librarianship*, 45(1), 22–30. <https://doi.org/10.1016/j.acalib.2018.11.012>

Lindberg, T., Meinel, C., & Wagner, R. (2011). Design thinking: A fruitful concept for IT development? In C. Meinel, L. Leifer, & H. Plattner (Eds.), *Design thinking. Understanding Innovation* (pp. 3–18). Springer. https://doi.org/10.1007/978-3-642-13757-0_1

Llewellyn, A. (2019). Innovations in learning and teaching in academic libraries: A literature review. *New Review of Academic Librarianship*, 25(2–4), 129–149. <https://doi.org/10.1080/13614533.2019.1678494>

López-Cózar, E. D., Orduña-Malea, E., Martín-Martín, A., & Ayllón, J. M. (2017). Google Scholar: the big data bibliographic tool. In F. J. Cantú-Ortiz (Ed.), *Research analytics: Boosting University productivity and competitiveness through scientometrics* (pp. 59–80). CRC Press.

López-Cózar, E. D., Orduña-Malea, E., & Martín-Martín, A. (2019). Google Scholar as a data source for research assessment. In W. Glänzel, H. F. Moed, U. Schmoch, & M. Thelwall (Eds.), *Springer handbook of science and technology indicators* (pp. 95–127). Springer. <https://doi.org/10.1007/978-3-030-02511-3>

Martin, P., Remy, L., Theodoridou, M., Jeffery, K., & Zhao, Z. (2019). Mapping heterogeneous research infrastructure metadata into a unified catalogue for use in a generic virtual research environment. *Future Generation Computer Systems*, 101, 1–13. <https://doi.org/10.1016/j.future.2019.05.076>

Martín-Martín, A., Orduña-Malea, E., & Delgado López-Cózar, E. (2016). *The role of ego in academic profile services: Comparing Google Scholar, ResearchGate, Mendeley, and ResearcherID.* SSRN. <http://dx.doi.org/10.2139/ssrn.2745892>

Mattelmäki, T., & Visser, F. S. (2011). *Lost in co-X-interpretations of co-design and co-creation* [Conference paper]. Zenodo. <https://doi.org/10.5281/zenodo.5821297>

Meyer, E. T., & Schroeder, R. (2023). *Knowledge machines: Digital transformations of the sciences and humanities*. MIT Press.

- Mongeon, P., & Paul-Hus, A. (2016). The journal coverage of Web of Science and Scopus: A comparative analysis. *Scientometrics*, 106, 213–228. <https://doi.org/10.1007/s11192-015-1765-5>
- Mounier, P., Ferwerda, E., Dumouchel, S., Gatti, R., Gingold, A., Radovic, D., Smaniotto A., Stojanovski J., de Vries S., & Waaijers, L. (2018). *OPERAS platforms and services white paper* [Other]. Zenodo. <https://zenodo.org/doi/10.5281/zenodo.1324058>
- Oddone, N. E., & de França, C. M. D. (2019). Plataformas de livros acadêmicos em acesso aberto e sua representação no Twitter: Métricas de divulgação, descoberta e avaliação. *Transinformação*, 31. <https://doi.org/10.1590/2318-0889201931e190011>
- Ovadia, S. (2014). ResearchGate and Academia.edu: Academic social networks. *Behavioral & Social Sciences Librarian*, 33(3), 165–169. <https://doi.org/10.1080/01639269.2014.934093>
- Papenmeier, A., Krämer, T., Friedrich, T., Hienert, D., & Kern, D. (2021). Genuine information needs of social scientists looking for data. *Proceedings of the Association for Information Science and Technology*, 58(1), 292–302. <https://doi.org/10.1002/pra2.457>
- Rovira, C., Codina, L., & Lopezosa, C. (2021). Language bias in the Google Scholar ranking algorithm. *Future Internet*, 13(2), 31. <https://doi.org/10.3390/fi13020031>
- Simon, H. A. (1996). *The sciences of the artificial* (3rd ed.). MIT Press.
- Spinello, A. O., Giglito, D., & Lockley, E. (2021). Management of open access research infrastructures in large EU projects: The “CultureLabs” case. *CNR-IRCrES Working Paper*, 9, 1–17. <http://dx.doi.org/10.23760/2421-7158.2021.009>
- Steen, M. (2013). Co-design as a process of joint inquiry and imagination. *Design Issues*, 29(2), 16–28. https://doi.org/10.1162/DESI_a_00207
- Sun, G., Friedrich, T., Gregory, K., & Mathiak, B. (2022). *Are we building the data discovery infrastructure researchers want? Comparing perspectives of support specialists and researchers*. arXiv. <https://doi.org/10.48550/arXiv.2209.14655>
- Tattersall, A. (2019). Technology has all the answers, but we must start thinking about asking the right questions. *Library Hi Tech News*, 36(10), 12–15. <https://doi.org/10.1108/LHTN-09-2019-0058>
- Taylor, R., Walker, J., Hettrick, S., Broadbent, P., & de Roure, D. (2022). *Shaping data and software policy in the arts and humanities research community*. AHRC Independent Report. <https://www.ukri.org/wp-content/uploads/2022/10/AHRC-011122-SSIRReport-ShapingDataAndSoftwarePolicyInTheArtsAndHumanities.pdf>
- Tenopir, C., King, D. W., Christian, L., & Volentine, R. (2015). Scholarly article seeking, reading, and use: A continuing evolution from print to electronic in the sciences and social sciences. *Learned Publishing*, 28(2), 93–105. <https://doi.org/10.1087/20150203>

Thoden, K., Stiller, J., Bulatovic, N., Meiners, H. L., & Boukhelifa, N. (2017). User-centered design practices in digital humanities—experiences from dariah and cendari. *ABI Technik*, 37(1), 2–11. <https://doi.org/10.1515/abitech-2017-0002>

Unsworth, J. (2000, May 13). *Scholarly primitives: What methods do humanities researchers have in common, and how might our tools reflect this* [Conference presentation]. Symposium on Humanities Computing: Formal Methods, Experimental Practice, King's College, London, United Kingdom. <https://people.brandeis.edu/~unsworth/Kings.5-00/primitives.html>

van der Weel, A., & Praal, F. (2020). Publishing in the Digital Humanities: The treacle of the academic tradition. In J. Edmond (Ed.), *Digital technology and the practices of Humanities research* (pp. 21–48). Open Book Publishers. <https://doi.org/10.11647/OBP.0192.02>

Van Zundert, J. (2012). If you build it, will we come? Large scale digital infrastructures as a dead end for digital humanities. *Historical Social Research*, 37(3), 165–186. <https://doi.org/10.12759/hsr.37.2012.3.165-186>

Venlet, J., Farrell, K. S., Kim, T., O'Dell, A. J., & Dooley, J. (2018). *Descriptive metadata for web archiving: Literature review of user needs*. OCLC Research. <https://apo.org.au/sites/default/files/resource-files/2018-02/apo-nid132136.pdf>

Wallis, J. C., Mayernik, M. S., Borgman, C. L., & Pepe, A. (2010, June). Digital libraries for scientific data discovery and reuse: From vision to practical reality. *JCDL Proceedings 10* (pp. 333–340). <https://doi.org/10.1145/1816123.1816173>

Zide, J., Elman, B., & Shahani-Denning, C. (2014). LinkedIn and recruitment: How profiles differ across occupations. *Employee Relations*, 36(5), 583–604. <https://doi.org/10.1108/ER-07-2013-0086>

Notes

¹ <https://operas-eu.org/>.

² <https://cordis.europa.eu/project/id/HPSE-CT-2002-60060>.

³ <https://isidore.science/>.