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# The Value of Network Sustainability: Why We Join Research Infrastructures

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## Introduction

- 1 In the social sciences and humanities, scholarly communication is at the heart of researchers' activities. Scholarly communication practices differ greatly from those in other disciplines. An example of this is the format of the monograph, which reveals other particularities such as the workflow, the way researchers collaborate, the correlation between fieldwork and theory, and the way arguments are elaborated and constructed (OPERAS Consortium, 2017). The publication can thus not be considered the last step of the research process or merely as the output produced, but it is indissolubly linked to the whole research process (OPERAS Consortium, 2017).
- 2 The research landscape in the social sciences and humanities, however, is diverted and fragmented into an environment of many small players who are highly specialized. This is mainly due to multiple disciplines and sub-disciplines, as well as different languages (Mounier, 2017). This specificity in the social sciences and humanities should not be considered a flaw but rather an adaption to the reality of the research landscape. Nonetheless, the fragmented scientific community becomes disintegrated if the different players act in isolation and negatively impact one another (Mounier, 2017).
- 3 To tackle the situation, the European Commission works on setting up the European Open Science Cloud, an infrastructure to support open science in Europe (European Commission, 2016). At the same time, a research-driven approach to the

internationalization of scholarly communication in the social sciences and humanities is needed. This approach can bring together researchers from multiple disciplines and various infrastructures using different tools and languages and integrate their research into the European Open Science Cloud.

- 4 This paper explores how OPERAS (open access in the european research area through scholarly communication), a research infrastructure that addresses these particular challenges in the social sciences and humanities, implements network sustainability and how such a sustainable network benefits and at the same time arises from its partners. The Max Weber Foundation, an OPERAS core group member, is used as an example. The paper provides an overview of the Max Weber Foundation and the OPERAS research infrastructure and uses a network analytical approach to OPERAS as a community network. It then investigates the concept of network sustainability and presents concrete examples of how this is implemented within the research infrastructure.

## Max Weber Foundation

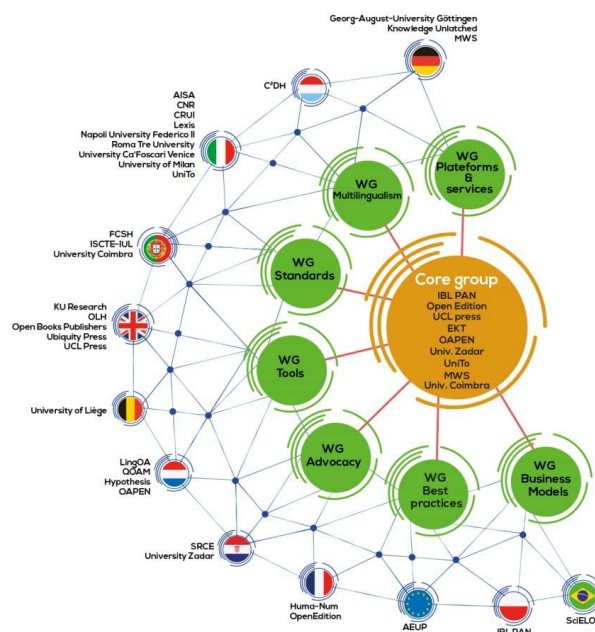
- 5 The Max Weber Foundation is a legal entity, funded by the German Ministry of Education and Research, but nonetheless independent in its activities as a research organization. The foundation is comprised of ten humanities research institutes abroad. Its goal is to promote research focusing on history, culture, economy and on the social sciences, and to foster a mutual understanding between Germany and the guest countries. The electronic publication platform [perspectivia.net](http://perspectivia.net) is the international, cross-epochal and interdisciplinary portal of the foundation (Max Weber Foundation, 2018).
- 6 The Max Weber Foundation closely works with national infrastructure partners, especially DARIAH-DE, to develop services at a national level. DARIAH-DE is a consortium developing and providing digital infrastructure and services to support research in the humanities and social sciences with digital methods and procedures (DARIAH-DE Consortium, 2018). With joint research projects and cooperation partners, such as the “Forum Transregionale Studien,” the Max Weber Foundation takes part in the internationalization of research in the social sciences and humanities. The forum is a national German organization with partners from different research centers. It seeks the internationalization of research by enabling scholars from abroad to work on transnational research topics as invited fellows or at conferences (Forum Transregionale Studien, 2018).
- 7 Without having any significant service provider for an information infrastructure in their own organization, the Max Weber Foundation relies on direct partnerships and national or international initiatives including libraries, computing centers, digital humanities centers and joint infrastructure projects. As a core group member of OPERAS, the Max Weber Foundation has a vital interest in shaping a sustainable research infrastructure and integrating research in the social sciences and humanities internationally.

## OPERAS–distributed research infrastructure

- 8 OPERAS was born from a clear understanding that the specific challenges in scholarly communication in the social sciences and humanities have to be addressed in a common effort. The research infrastructure presently gathers 35 organizations from thirteen

European countries as well as one international partner and is coordinated by a nine-member core group. It is led from France by OpenEdition, an infrastructure dedicated to electronic resources in the humanities and open sciences. OPERAS members' backgrounds are very diverse: publishers and publication platforms, infrastructure providers and libraries, universities and research organizations. OPERAS is supported by OPERAS-D (design) and HIRMEOS (High Integration of Research Monographs in the European Open Science Infrastructure), two projects funded under Horizon 2020, the biggest research and innovation program of the European Union. The projects' results are the backbone for the future services that the OPERAS research infrastructure will deploy. Not all OPERAS partners are actively involved in both of the projects and some partners only participate in one of them. The Max Weber Foundation is a project partner in both, OPERAS-D and HIRMEOS, and a core group member of OPERAS.

Img. 1: The OPERAS network



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- 9 As key objective, the OPERAS-D project has prepared a design study that defines governance models, scientific and technical concepts for future services that the infrastructure will provide, and has established a roadmap to achieve these goals according to the requirements for long-term sustainability. The study's main findings are
  1. the need to consider scholarly communication as the heart of scientific research and not as one of its outputs, particularly in the social sciences and humanities;
  2. the fragmentation of the field; and
  3. the need and the conditions for integration at European level (OPERAS Consortium, 2017).
- 10 The design study serves as a basis on which the future of OPERAS is built. The Max Weber Foundation's formal role in OPERAS-D is to ensure a clear and efficient communication and dissemination of the project's results.
- 11 HIRMEOS aims to integrate open access monographs into the open science ecosystem in a systematic and coordinated fashion. To improve interoperability between publishing

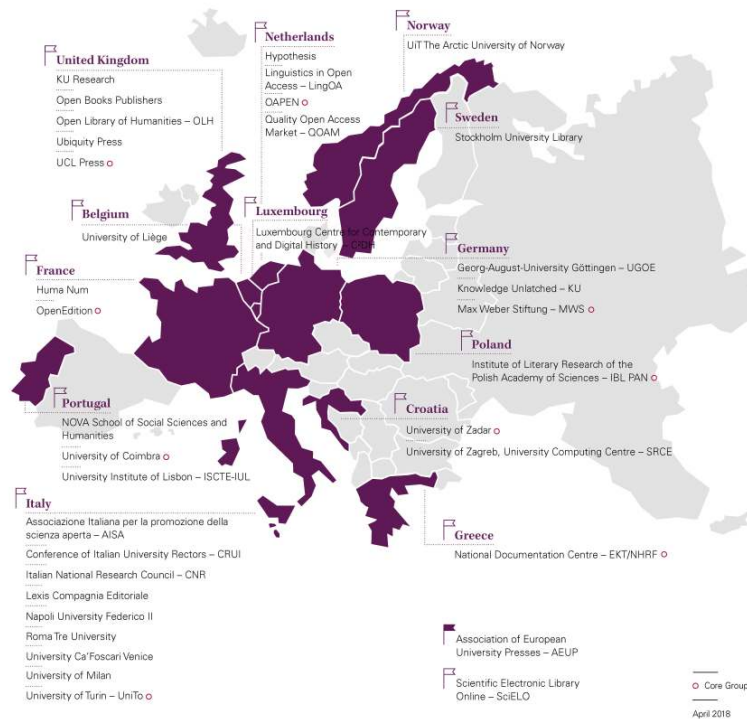
platforms and referencing and indexing service providers, five sets of data and metadata are implemented on participating platforms: identification metadata, named entities data, certification metadata, annotation data and metrics metadata (HIRMEOS Consortium, 2018). The Max Weber Foundation, while not being one of the implementing platforms, formally participates in the communication and dissemination of HIRMEOS' project results.

- 12 Using the two projects' results, the research infrastructure OPERAS will deploy services at three levels. At a first level, shared services between partners will offer communication and publication services to their communities. This includes advocacy for open science, trainings, definition and adoption of best practices, research and development activities, as well as developing sustainable and fair business models for open access. At a second level, integration into the European Open Science Cloud will be achieved, especially through the HIRMEOS project. Finally, unified services in the European Research Area will be offered: a certification service, a discovery service, and a research for society service (OPERAS Consortium, 2017).
- 13 To ensure the continuity of OPERAS after the two projects OPERAS-D and HIRMEOS have ended, the research infrastructure is currently applying to the Roadmap 2018 of the European Strategy Forum on Research Infrastructures (ESFRI), the European Commission's most important instrument to develop the scientific integration of Europe.

## OPERAS as a community network

- 14 Social networks have increasingly been studied since the early 20th century. With the rise of social network analysis, an interdisciplinary approach that works on the premise that all social life is formed by relations and on the patterns that these create, scholars of all disciplines have started to systemically study social networks (Marin and Wellman, 2011). Within social network theory, a network is often defined as "a set of nodes (or network members) that are tied by one or more types of relations" (Wasserman and Faust, 1994). In principle, everyone and everything can be a network member; including organizations, companies, web pages, countries, or positions (Marin and Wellman, 2011).
- 15 In the case of OPERAS, the partners that have signed a letter of support to the research infrastructure and have been accepted as members can be seen as the nodes of the social network. Even though the term social network is commonly synonymously used for social media networks such as Twitter and Facebook, a social network is not necessarily an online network. To avoid confusion, however, I will in the following use the term community network for the network of OPERAS partners rather than social network.

Img. 2: OPERAS partners



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- 16 An attempt at grouping OPERAS members is useful for understanding the community network's structure. Partners can be grouped according to the countries they are based in (see img. 2), according to their formal function in OPERAS (nine partners are core group members, see img. 1) or according to the type of their organization. A categorization according to the type of organization could involve publishers and organizations that are dedicated to open access publishing (*Association of European University Presses; Institute of Literary Research of the Polish Academy of Sciences; Lexis Compagnia Editoriale; Linguistics in Open Access; Open Books Publisher; Open Library of Humanities; Quality Open Access Market; Ubiquity Press; UCL Press*), libraries (*Scientific Electronic Library Online; Stockholm University Library; Georg-August-University Göttingen; UiT The Arctic University of Norway*), universities and research organizations (*Conference of Italian University Rectors; Italian National Research Council; Luxembourg Centre for Contemporary and Digital History; Max Weber Foundation – German Humanities Institutes Abroad; Napoli University Federico II; NOVA School of Social Sciences and Humanities; Roma Tre University; University Ca'Foscari Venice; University Computing Centre of the University of Zagreb; University Institute of Lisbon; University of Coimbra; University of Liège; University of Milan; University of Turin; University of Zadar*), and infrastructures for open access operating mostly on a national level (*Associazione Italiana per la promozione della scienza aperta; Huma Num; Hypothesis; Knowledge Unlatched; KU Research; National Documentation Centre; OAPEN; OpenEdition, SciELO*).
- 17 While it is helpful to have a clearer understanding of what types of stakeholders are partnering in OPERAS, a grouping of the individual stakeholders within the network is not advisable. A categorization according to countries does not take into account the different functions a member has within OPERAS nor the various types of stakeholders that are members of the research infrastructure. The same holds true for categorizing

partners according to their function in OPERAS, which does not include the national differences between stakeholders nor does it differentiate between the types of organizations. Lastly, a grouping according to members' types of organizations creates the problem of multiple group memberships. The Max Weber Foundation, for instance, is comprised of ten humanities research institutes abroad. Yet, the foundation also operates a publication platform. It is thus not only a member of the group of universities and research organizations but at the same time also a quasi-publisher. Another example is Georg-August-University Göttingen, which is a public German university but is participating in OPERAS through their university library. Therefore, in chapter 6, which introduces the implementation of network sustainability within OPERAS, I will not group the research infrastructure's members but rather look at all partners as interdependent but individual nodes.

- 18 What then are the benefits to a network analytical approach to the sustainability of a research infrastructure? I could find little literature that explicitly deals with the centrality of community networks for the sustainability of research infrastructures. There is, however, research on the role of social networks for project stakeholder management. Provan and Kenis show that the form of governance has a huge impact on the effectiveness of a network (Provan and Kenis, 2007) and Chung and Crawford, for example, propose to use social network theory to identify stakeholders and improve project management (Chung and Crawford, 2015). In the field of technology clusters and companies, there is research that shows that social network formation is crucial to the sustainability of technology clusters and economic activities in some regions (Casper, 2007) and an influential paper has shown that the success of Silicon Valley can largely be understood through network analysis (Saxenian, 1996). For research infrastructures, a network analytical approach takes the attention away from the "static" expertise and formally defined tasks of a single member and draws it towards the "mobile" connections that this member has with other partners and to the work that is done "informally". It thus recognizes the value of sharing expertise and knowledge and of the informal connections within research infrastructures (Marin and Wellman, 2011). I argue in the following that these are crucial aspects to the sustainability of a distributed research infrastructure such as OPERAS.

## Network sustainability

- 19 Concepts for sustainable research infrastructures in the social sciences and humanities have only recently entered the international agenda.
- 20 The Brundtland Report of 1987 triggered a worldwide discussion on sustainability and environmental concerns. The report defines sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (United Nations, 1987). It furthermore outlines three areas of sustainability: economic, social, and environmental sustainability. This widely used definition of sustainability, even if not clearly inclusive of research infrastructures, can be adapted to them. Research infrastructures also need to satisfy present requirements while staying flexible and resilient to meet future needs—needs which are not at all self-evident. Sustainable research infrastructures must therefore constantly evaluate how the requirements they serve are developing and adjust to them.

- 21 The 2030 Agenda has enhanced the Brundtland definition in 2015 with 17 Sustainable Development Goals (SDGs) and 169 targets – none of which include the social sciences and humanities or target research infrastructures (United Nations, 2015). Goal no.17, however, which asks for a revitalization of global partnerships for sustainable development, defines “multi-stakeholder partnerships that mobilize and share knowledge, expertise, technology and financial resources” as an important systemic issue (United Nations, 2018).
- 22 Adapting the Brundtland definition and the SDGs to research infrastructures, three areas of sustainability arise:
1. *economic sustainability* which guarantees the research infrastructure’s funding and the efficiency of its governance;
  2. *technical sustainability* that includes data storage and the resiliency of dynamic software; and
  3. *network sustainability* which includes gaining access to other networks and interest groups, sharing knowledge and increasing each other’s visibility, and staying current and state-of-the-art.
- 23 When is a network sustainable? Granovetter, who in 1973 introduced the now famous idea of the strength of weak ties, argues that while it is obvious that strong ties are beneficial to a network—they share information readily and communicate frequently—weak ties enable the network to gain information and access to nodes that are more distant and therefore to information that is original (Granovetter, 1973). Applying this to a distributed research infrastructure means that the network needs a strong core as well as diverse and distributed partners. More recently, Krebs and Holley have identified five general patterns that can be observed in effective networks: nodes share common attributes and goals, they are diverse, there are several paths between nodes, the average path length is short, and some nodes are more important than others (Krebs and Holley, 2005). They furthermore argue that because networks are often left unmanaged, nodes sharing similar attributes connect and close by, resulting in a lack of diversity and effective paths of communication within the network (Krebs and Holley, 2005). Effective community networks, they argue, arise with an active leader taking responsibility and forming a hub. The leader then usually connects to outside potential partners, making them part of the network and thereby extending it. In an efficient and sustainable network, the leader needs to encourage connections between the nodes according to the individual needs. Some interactions might lie dormant, but the paths need to be created (Krebs and Holley, 2005). This “hub-and-spoke” model, however, should only be a temporary structure as it places too much power and liability in the hub. The network becomes more resilient the fewer nodes include the hub for their connections. The transition of the leader from the weaver of the network to a facilitator of network weaving is crucial for a sustainable network (Krebs and Holley, 2005). While Krebs and Holley exemplify their research on economic networks, it is an important insight that is also useful when looking at distributed research infrastructures. Thus, a sustainable network in the context of a distributed research infrastructure does not merely imply forming connections to exchange information during professional and scientific conferences in the short run—although the importance of this should not be underestimated—but to achieve long-term and large-scale integration and unification as a basic service for researchers.
- 24 Network sustainability for research infrastructures is, although phrased differently, included in the report on long-term sustainability of research infrastructures published

by the ESFRI Long-Term Sustainability Working Group. They argue that “a robust long-term vision is the most important prerequisite in order to successfully and sustainably build and operate” a research infrastructure (ESFRI, 2017). This vision goes well beyond financing mechanisms and business models for research infrastructures. The report suggests, among others, to launch continued and practically-oriented initiatives to improve the management of research infrastructures “through the exchange of best practices and lessons learnt, and contribute to strategic planning, evaluation, and training” (ESFRI, 2017).

- 25 Taking into account the research that has been done on the sustainability of networks and bearing in mind the specificities of a distributed research infrastructure, I will show in the following chapter that a sustainable network enables a distributed research infrastructure to understand future needs, to then address those needs, and finally to also shape them. This is not only beneficial for the research infrastructure but also for the partners individually, as shown on the example of the Max Weber Foundation.

## Network sustainability: practical implementation

- 26 The projects OPERAS-D and HIRMEOS have substantially increased the sustainability of the research infrastructure OPERAS. OPERAS-D has developed a concept for economic sustainability, which includes a governance model and a future roadmap for the research infrastructure in the OPERAS Design Study. The HIRMEOS project addresses the technical sustainability of the services developed within OPERAS. While both, economic and technical sustainability, are closely interlinked with network sustainability, the following seeks to isolate how network sustainability is achieved and why this is not only beneficial for OPERAS but also for its partners.

### Understanding future needs

- 27 A clear benefit for the Max Weber Foundation and other partners arises from *gaining access to other networks and interest groups* that they can rely on when organizing workshops or conferences or are in need of specific information or expertise. The community network connects the foundation with other interest groups, for instance national infrastructures but also European initiatives as e.g. CESSDA—a consortium promoting international research cooperation and results, CLARIN—a European research infrastructure for language resources and technology, DARIAH-EU—a pan-European infrastructure supporting digital research and methods in the social sciences and humanities, and OpenAIRE—a project promoting open scholarship. While some of these are formal partners of the OPERAS infrastructure (DARIAH-EU, e.g., is a partner of the HIRMEOS project) the connection to other networks and interest groups takes place through other members. In most cases, more than one partner in OPERAS can connect other members to these networks and interest groups.
- 28 At the same time, OPERAS benefits from the Max Weber Foundation’s knowledge of and connections within Germany and the host countries of its institutes. An example of this is the OPERAS-D final conference, to take place in summer 2018, that brings together different stakeholders from and outside of OPERAS. Regardless of the conference’s topic, the selection of relevant speakers was only possible because of the OPERAS community network. In addition, the conference will grant access to a larger international



community to all OPERAS partners. The same holds true for the HIRMEOS project, where partners conduct webinars and workshops together.

- 29 This reciprocal network sustainability ultimately ensures that OPERAS stays and becomes aware of future needs which can only then be addressed. Gaining access to other networks and interest groups is only possible with a network of diverse partners, the strong “weak ties.” It can also only be robust if there are several partners that can connect others to outside networks and interest groups.

## Addressing future needs

- 30 The strongest benefits from research infrastructures with a sustainable network arise from *sharing knowledge, information, and experience*. OPERAS has set up working groups which develop white papers on the topics of advocacy for open access, tools (research and development), standards, business models, best practices, multilingualism, and platforms and services. The working groups represent groups of partners sharing the same goals but who have diverse backgrounds. While in the beginning OPERAS’ coordinator OpenEdition has acted as a hub for the research infrastructure, the working groups are a first step to facilitate network weaving for the core group members of OPERAS who act as contact points for the working groups (see img. 1). The Max Weber Foundation is the contact point of the advocacy working group and thus unites the expertise of various OPERAS members in this area. The working groups enable the Max Weber Foundation to actively pass on its expertise while at the same time acquiring knowledge from other partners. The working group papers are a result of this process where sharing information with a network benefits all partners. This especially holds true for the identification of future projects that OPERAS partners can work on together, which is an essential part of the working groups.
- 31 Another example from the HIRMEOS project is the metrics collection tool. Javier Arias from Open Book Publishers describes this and the benefits for organizations with fewer resources in “Collecting inclusive usage metrics for Open Access publications: the HIRMEOS project” (Arias, 2018).
- 32 Sharing knowledge, information and expertise aids OPERAS in becoming sustainable as it prepares the infrastructure in solving challenges that it has previously identified and addressing future needs. To sustainably share knowledge, information and expertise, however, communication needs to happen via short paths but be organized through partners that are especially committed to the research infrastructure.
- 33 Another aspect that supports OPERAS in addressing future needs is that the research infrastructure *increases the visibility* of the Max Weber Foundation as a research organization internationally and contributes to the reputation of its researchers. This is important as a main obstacle to publishing open access for researchers is the perceived lower reputation (OPERAS “Advocacy Working Group”, 2018). Increasing one’s own visibility and reputation outside the national context can thus help to meet this challenge. At the same time, OPERAS can more effectively address future requirements if it is visible, which becomes possible with more widely known partners.

## Shaping future needs

- 34 More than merely addressing future needs, a sustainable community network supports partners of a research infrastructure in shaping the future landscape. The community network of OPERAS has for example supported the Max Weber Foundation in participating in an active discourse on open access and legal issues in Europe. It thus supports partners in *staying current and state-of-the-art*. More concretely, OPERAS has signed the Scholarly Publishing and Academic Resources Coalition's (SPARC) open letter protesting against the planned reform of the European Union's copyright directive and has led the Max Weber Foundation to sign the Jussieu Call for open science and bibliodiversity, thus supporting a flourishing and diverse academic publishing landscape.
- 35 Another example stems from the HIRMEOS project, which enables the platforms that directly benefit from its services to develop and provide their own services within OPERAS and to integrate into the European Open Science Cloud. The Max Weber Foundation is a project partner of HIRMEOS without being one of the implementing platforms. The network value for the foundation arises from actively participating in the shaping of future services and the processes of standardization. The latter is urgently needed for the foundation as it specializes in transnational and transregional research projects.
- 36 Staying current and state-of-the-art is a prerequisite for partners of a distributed research infrastructure to actively shape future needs. This only becomes possible if partners of a research infrastructure share some common attributes and goals but are diverse enough to influence the landscape from different angles.

## Obstacles to network sustainability

- 37 Implementation of network sustainability does not always work smoothly. Some of the aspects described in the previous chapter can be achieved through the management of the research infrastructure and the business model. This includes, for instance, creating a core group to facilitate the network weaving of strategic partners, implementing regular video conferences to assist a continuous communication, and forming working groups to connect partners with similar goals. Also the formal requirements of funded projects supporting a research infrastructure contribute to a sustainable network.
- 38 Yet, the intrinsic commitment of partners involved is crucial. It stems on the one hand from the benefits of network sustainability for themselves and on the other hand on the sustainability and thus effectiveness of the infrastructure it creates. This causes a virtuous circle where partners' commitments stem from the direct benefits of network sustainability, which increases the network sustainability, which in turn intensifies the advantages mentioned before. However, while the benefits are huge, they often do not show immediately. This can lead to a lower level of dedication than desired. Reasons for this include time constraints, a lack of labor force, money constraints, and a misjudgment of the overall work that participation in a distributed research infrastructure requires.
- 39 While this lowers the overall effectiveness of a distributed research infrastructure, it does not necessarily impede a sustainable network that can understand, address and shape future needs. The level of commitment does not have to be equally high for all partners at

all times because a sustainable network has several paths between the nodes. One can lie dormant and others can be used in its place. Yet, oftentimes research infrastructures do not have several paths between the nodes. OPERAS has, for instance, only one partner in some geographical regions (see img. 2) and within the core group there is only one partner each who is the responsible contact point for a working group (see img. 1). If the level of commitment of one of these partners is low, the research infrastructure's network sustainability risks impairment.

- 40 Another problem is the length of the average path between nodes, which should be as short as possible in a sustainable network. In the case of OPERAS, OpenEdition, which has in the beginning acted as the hub of the research infrastructure, began to enable the core group members to act as network weavers themselves. Yet, this does not shorten the communication paths of all members of the network equally, especially if they are only involved in one of the working groups. A network with long communication channels quickly becomes inflexible and unable to perform its function of understanding, addressing and shaping future needs.
- 41 Not all these obstacles will necessarily impede network sustainability. Yet, every research infrastructure is well advised to take these possible risks into account.

## Conclusion

- 42 In order to become and stay sustainable, distributed research infrastructures must satisfy present requirements while staying flexible and resilient to meet future needs. This means that it is not enough to only consider their economic model and technical viability. Research infrastructures with a sustainable network can understand, address and shape future requirements through granting their partners access to other networks and interest groups, through sharing knowledge, information and experience and increasing each other's visibility, and by enabling their partners to stay current and state-of-the-art. They can only do so if partners share common attributes and goals but are diverse at the same time. Communication between members of a research network has to follow short paths while some partners (a core group) are more important to the communication within the research infrastructure than others. Finally, there needs to be more than one path between partners to make a research network sustainable.
- 43 While some of these aspects can be achieved through the management of the research infrastructure and the business model, most derive to a large extent from an intrinsic commitment of the partners involved. The level of commitment does not have to be high at all times if the research infrastructure has more than one path of communication between its partners. However, this is not yet the case with many partners in OPERAS, making the research infrastructure vulnerable. In addition, the length of the average path of communication between partners should be as short as possible in a sustainable network. OPERAS has shortened the lengths of the communication channels by establishing working groups but they are still long for members of only one communication group. This risks inflexibility and therefore the sustainability of the network.
- 44 Network sustainability deserves permanent efforts. While funded research projects are clearing the path for a sustainable community network, stakeholders of a research infrastructure need to actively engage. Shared services, such as conferences, trainings,

and advocacy for open science require constant exchange of information. Projects may serve as development sprints and content providers, yet keeping track of new developments and evaluating techniques is a permanent task for all partners and goes beyond every project's lifetime. While the project OPERAS-D has identified current challenges for scholarly communication in the social sciences and humanities, a sustainable research infrastructure needs to constantly reevaluate the status quo. The solutions, particularly for unified services such as certification, discovery, and research for society, require continuous adaptation to future needs. To be able to also shape those future needs, a sustainable research infrastructure must actively participate in a discourse in the respective field. Solutions to the challenges distributed research infrastructures face can for that reason only be sustainable if addressed by an international consortium.

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## APPENDIXES

### List of figures

Img. 1: "The OPERAS network." January 2018. © Laetitia Martin.

Img. 2: "OPERAS partners." April 2018. CC By.

## ABSTRACTS

This paper develops the concept of network sustainability. To become and stay sustainable, distributed research infrastructures must satisfy present needs while at the same time be flexible and resilient to meet future requirements. For this it is not enough to merely build a resilient economic model and be technically viable. Research infrastructures that can understand, address and shape future needs have a sustainable community network. Clear characteristics of a research infrastructure with a sustainable network are that partners gain access to other networks and interest groups, that knowledge, information and expertise is shared freely among partners, that the infrastructure increases partners' visibilities and vice versa, and that partners are enabled to stay current and state-of-the-art. This is shown on OPERAS (open access in the

European research area through scholarly communication), a research infrastructure for open scholarly communication in the social sciences and humanities, and its partner the Max Weber Foundation, a German research institution.

## INDEX

**Keywords:** network sustainability, scholarly communication, open access, open science, social sciences and humanities

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