Göttingen/eResearch Alliance

Report for the External Advisory Board of the Göttingen eResearch Alliance

2014-2016 and 2017-2018

The Göttingen eResearch Alliance is run mutually by

Niedersächsische Staats- und Universitätsbibliothek Göttingen (www.sub.uni-goettingen.de) and

Gesellschaft für wissenschaftliche Datenverarbeitung mbH Göttingen (www.gwdg.de).

In association with University Medical Center Göttingen (http://www.med.uni-goettingen.de).

Member of Göttingen Campus (http://grc.uni-goettingen.de).

eRA_Report_Advisory_Board_20170116.docx

Last modified: 10.01.2017, The Göttingen eResearch Alliance Team

Contents

0 Executive summary

The Göttingen eResearch Alliance (eRA) is a university initiative by two local research-oriented information-infrastructure providers, the Göttingen State and University Library and the Gesellschaft für wissenschaftliche Datenverarbeitung Göttingen mbH (computing and IT competence center) to establish an institutional support structure for research data management and eResearch. The eRA offers a new integrated set of services for digital research infrastructures. The focus of the four-year build-up phase is on services supporting professional research data management (RDM) along the research data lifecycle, such as generation of data management plans, sustainable storage and accessibility of data, as well as publication of data. Underpinning these offers is a university-wide research data policy, which has been adopted by the university Senate and presidential board, as well as the faculty council and the management board of the University Medical Center Göttingen (UMG). The offered services address all faculties and research projects on the Göttingen Campus (GC). The services will be adapted to discipline or project specific needs, in close collaboration between the researchers and the eRA. Beyond the area of RDM, the eRA will successively add digital tools and services to its portfolio.

The eRA was established in 2014 as part of the university strategy to advance the (digital) research infrastructure of the GC. It is funded initially through the presidential board of the university for a build-up phase of four years. A multidisciplinary team of 5 full-time equivalents is engaged - in this cross-cutting, horizontal approach - in coordinating campus-led activities to establish sustainable and innovative RDM services for the support of researchers in all phases of the research life cycle. Part of this endeavor is fostering the formation of a community on data management and data science across the campus and across the disciplines. An emphasis is on the cooperation of the information infrastructure providers and the Research Department (central administration) of the university, allowing the eRA to become the *central contact* for all researchers. The organizational structure has a strong participatory component. For instance, in June 2015, the department of medical informatics at the UMG joined the alliance, contributing discipline specific expertise to the team. Another important example is the *eResearch Council of the Göttingen Campus*. Established in June 2015, the council consists of representatives from the faculties and non-university research institutions at the GC with interest and expertise in eResearch. This

platform allows for feedback and networking/initiating new collaborations among the council members and the eRA.

In particular, the eRA's working program contains four areas of activities in the context of the goals mentioned above, i.e., *consulting, training, connecting,* and *developing*.

A major part of the *consulting* service is the field of grant proposals, especially for large coordinated projects. For example, workflows have been established together with the Research Department to provide quality assurance of the proposed projects. *Training* in data management and digital research methods is central to enable early career and senior researchers to make use of the potential and face the challenges that lie within the digital transformation (e.g., data volume, complexity, funder's requirements, etc.). Besides efforts to implement digital skill and data science into the curricula, the eRA team is offering training courses on data management practices tailored to the specific needs of research groups. These courses are very well received and the participants act as multipliers advertising the benefits of RDM and the offerings of the eRA within their faculties. *Connecting* subsumes outreach and networking. Establishing an expert network on campus is important for offering valuable digital services and for identifying synergies. Especially during the consulting process mentioned above, and at workshops (on the GC), there is the opportunity to extend the network. The *developing* activity is characterized by active participation in research projects (e.g., as embedded data manager) on the one hand. On the other hand, the team together with other groups from the information infrastructure providers are developing more generic digital services and tools, which are easily adjustable and aimed to be reused by many projects (e.g., persistent identifier service, data repository, research facilities information portal, electronic lab notebook).

In the first half of the build-up phase a basic service portfolio and workflows with central administration and other players on the campus were established. Reaching out to the scientific community to promote the enterprise eRA across the GC, as well as buildingup an initial network of experts were other important activities in this phase. In this sense, the eRA acts as an intermediary between service providers and researchers of the GC, translating scientific into infrastructural requirements. In the second half, it is planned to focus on the *developing* activity and establish key digital services for researchers as mentioned above. Another focus will be on the development of the future structure or business model of the eRA.

This document was compiled in preparation of the inaugural meeting of the *External Advisory Board of the eRA* on January 16, 2017.

1 Introduction

1.1 The Georg-August University Göttingen

The Georg-August University Göttingen belongs to the Top-Ten universities in Germany[1] and to the Top-100 in the world[2]. The table below gives you some figures for 2016[3]. The University was founded in 1737 and is a full-scale university.

Table 1 Facts about the Göttingen University

Category	Number
Students	31.396
International Students	3.926
Graduates	4.182
International Graduates	402
Graduation / Doctorates	718
International Graduations / Doctorates	194
Third Party Funding	139,6 M
Employees	12.268

Göttingen University is a public law foundation and is headed by a presidential board. The president, Prof. Dr. Ulrike Beisiegel is in office since 2011. Five vice-presidents complement the presidential board, namely Prof. Dr. Andrea Bührmann (Studies and Teaching), Prof. Dr. Hiltraud Casper-Hehne (International Affairs), Prof. Dr. Ulf Diederichsen (Research Sector), Prof. Dr. Norbert Lossau (Research and Information Infrastructures) and Dr. Holger Schroeter (Finance and Human Resources).

[1] Site „Georg-August-Universität Göttingen“. In: Wikipedia, Die freie Enzyklopädie. Bearbeitungsstand: 10. Dezember 2016, 18:38 UTC. URL: https://de.wikipedia.org/w/index.php?title=Georg-August-Universit%C3%A4t_G%C3%B6ttingen&oldid=160514043 (Recalled: 20.12.2016, 12:22 UTC)

[2] See https://www.timeshighereducation.com/world-university-rankings/2016/world-ranking#!/page/0/length/25/sort_by/rank/sort_order/asc/cols/stats (Recalled: 20.12.2016)

[3] See https://www.uni-goettingen.de/de/zahlen-daten-und-fakten/24499.html (Recalled: 20.12.2016)

1.2 Infrastructure Providers

1.2.1 Göttingen State and University Library

Göttingen State and University Library (SUB) is one of the largest libraries in Germany (around 8 million media in 2015). The SUB is a globally acknowledged competence center in the field of "Digital Library"[4]. It possesses important collections of media from the 18th century and has comprehensive knowledge regarding the digitalization of these media collections.

The SUB Göttingen has a strong research profile, with about 40 of a total of 450 employees involved in research projects. The "Research and Development Department" (RDD) is operating its third-party funded projects in cooperation with several research institutions in Göttingen and beyond. RDD develops new services and tools within the information and communication technology field. The focus of the department is on topics like building up Virtual Research Environments and Research Infrastructures for academic data and services. Successfully finished research projects from RDD have led to current services of the library, which are offered and maintained by the department Digital Library (DB - "Digitale Bibliothek"). All SUB eRA members are affiliated to the Research and Development Department of SUB.

1.2.2 Gesellschaft für wissenschaftliche Datenverarbeitung mbH Göttingen

The Gesellschaft für Wissenschaftliche Datenverarbeitung Göttingen mbH (GWDG) is a joint facility of Göttingen University and the Max Planck Society. It is the university's data center and functions as the data and IT competence center for the Max Planck Society. As competence center GWDG is active within the scientific field of practical and applied computer science. The "eScience" working group is GWDG's research and development department. It counts about 30 members, who are engaged in computer science projects. Like the SUB's Research and Development Department the eScience working group is operating its third party funded projects in cooperation with research partners in Göttingen and beyond. The focus of the eScience working group is on the following topics: data and information

[4] See https://www.deutsche-digitale-bibliothek.de/

management, long term data storage, IT service management, big data, cloud computing, parallel computing and scientific computing. All GWDG eRA members are affiliated to the eScience working group.

As data and IT competence center the GWDG supplies a data processing system for research institutes and universities. In this respect, it is involved in the scientific design of IT/telecommunications technology for different purposes. This includes technologies and infrastructures to support research projects and university teaching. By providing services for research institutes and universities as a research funding facility, the GWDG also contributes to advise scientific users on questions in the field of information and communication technology, and participates in implementing solutions that support the research processes. Training offers supplement the technical services and enable researchers to use software solutions adequately.

1.3 The Göttingen Campus

The Göttingen Campus[5] (GC) was established in 2006 as an alliance between the university and local non-university research institutions:

- University of Göttingen, Public Law Foundation,
- University Medical Center Göttingen, Public Law Foundation,
- Göttingen Academy of Sciences and Humanities,
- German Aerospace Center,
- German Primate Center,
- MPI for Biophysical Chemistry,
- MPI for Dynamics and Self-Organization,
- MPI for Experimental Medicine,
- MPI for Solar System Research,
- MPI for the Study of Religious and Ethnic Diversity.

With this cooperation, strategies to promote research, teaching, and the training of young researchers throughout the GC can be developed jointly. The GC has a common governance structure facilitating interdisciplinary research throughout the campus. Several projects in Göttingen are collaborations between the participating research institutions. [6]

[5] See http://grc.uni-goettingen.de

[6] See http://grc.uni-goettingen.de/index.php?id=kra

This network facilitates an active exchange between junior and senior researchers. All members of the GC benefit from (international) networks of individual institutions, whereby new collaborations can arise and innovating research concepts can be developed.

The GC is coordinated by the Campus Office. In a collaborative effort SUB and GWDG provide the campus IT and information infrastructure to support research and teaching at the campus.

2 The Göttingen eResearch Alliance

2.1 Formation

As a competence center, the Göttingen eResearch Alliance (eRA) was a central element of the “research infrastructure” measure within the university's Zukunftskonzept II of the third excellence initiative in 2012. The measure was rated as outstanding by the international expert committee. With regard to potential funding of the eResearch component by the BMBF (Federal Ministry of Education and Research), it was not included in the funding proposal to the MWK (Lower Saxony Ministry of Science and Culture). Instead, the concept was further developed under the title "Gö-For-Infra" and submitted to the BMBF in fall 2012 as a sketch. In 2013, the BMBF assessed the concept as promising. When in 2014 still no third-party funding was available, the university, after several years of conceptual preparation, went into the practical implementation of the concepts developed and concentrated on particularly central areas of the Gö-For-Infra-concept. In mid-2014, the eRA was established as an association of the GWDG and the SUB.

The eRA is run mutually by GWDG and SUB. Within the eRA context SUB and GWDG are working in a cooperative partnership to improve the research infrastructure at the campus. The main goal is to provide infrastructure and services to the researchers of the GC in order to support them during their research processes. The eRA strongly contributes to consistently develop the digital research infrastructure in a sustainable and innovative way. Consequently, the digital research infrastructure, as well as its usage and advancement are also objects of research in both institutions. The research and development departments of both institutions, RDD and the eScience working group, are cooperating within the eRA to build on existing expertise and to transfer knowledge on different working fields between the partners.

One further advantage of the cooperation is the ability to present a single point of contact for researchers, research associations, and faculties on the GC. In this context the eRA supports the GC to accomplish its mission to promote joint measures for teaching young researchers and to provide an excellent research infrastructure at the GC.

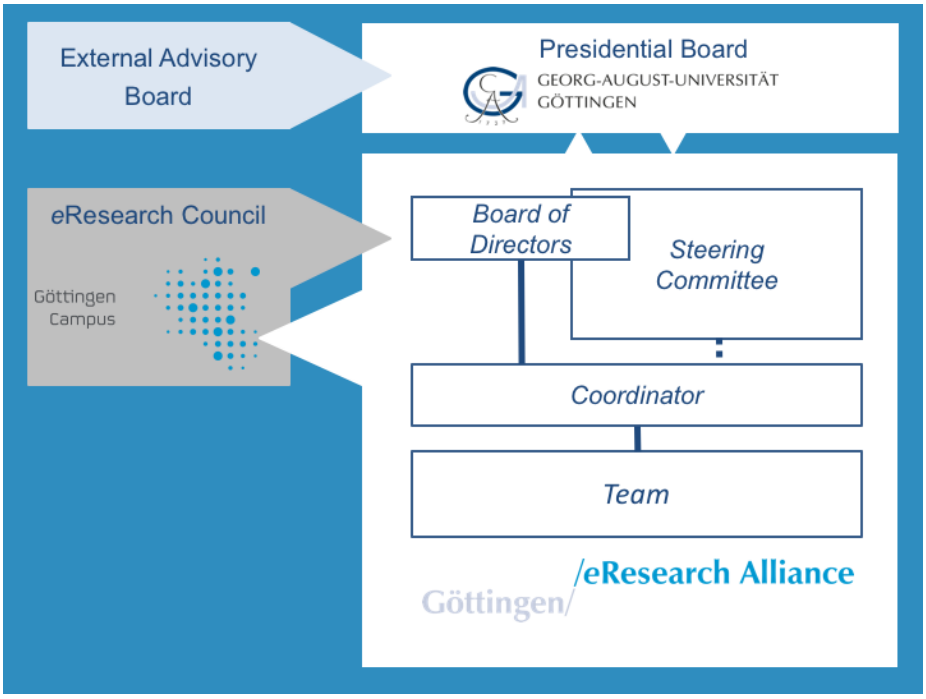


Figure 1: Organizational structure of the Göttingen eResearch Alliance

2.2 Structure

Figure 1 illustrates the structure of the eRA. The directors of the SUB and GWDG form the board of directors of the eRA. This board is supported by a steering committee being responsible for the operational implementation of services. In this context work and resource plans are elaborated by the steering committee. Members of the steering committee are the directors of SUB and GWDG as well as senior staff from SUB, GWDG, the Research Department, and the Department of Medical Informatics. The coordinator of the eRA links the steering committee to the eRA core team and ensures the transfer of information between different working levels.The eResearch Council of the Göttingen Campus with about 30 members was established in June 2015 to involve researchers all over the campus in the eRA project. Therefore, every research institute at the GC was requested to appoint representatives, who have expertise on eResearch related topics in their respective fields, into the council. The eResearch Council is an essential advisory body that consults the eRA board of directors and steering committee concerning the realization of work programs and specific services.

Furthermore, the eResearch Council functions as multiplier within several departments.
Strategic Goals

The eRA's strategic goals were formulated in the proposals mentioned in Sect. 2.1. The four main goals are described as follows:

1. Consulting researchers on eResearch issues, in particular in grant applications,
2. Developing and operating complex (and discipline-specific) information-infrastructure services and tools,
3. Consulting and imparting of methodology skills for management, publication and analysis of research data,
4. Establishing training and teaching in the area of eResearch.

The overall goal here is to support researchers with technological and information scientific services to make existing research methods more efficient and also enable new methods. Since the eRA is designed as a pilot project, services are first to be offered to selected groups of researchers, and developed together with them. With increasing professionalization, however, the range of services is to be extended step-by-step and as needed.

The cooperation between infrastructure providers and the university administration is very important, as it allows a comprehensive support for the researcher in terms of digital tools, communication and administrational processes along the research life cycle (Fig. 2; cf., Simukovic 2014[7]; Jahnke et al. 2012[8]).

[7] http://www.slideshare.net/ElenaSimukovic/2014-0221-fdmhuberlin; accessed 03.01.2017

[8] Lori Jahnke and Andrew Ashercover, Spencer D. C. Keralis with an introduction by Charles Henry, August 2012. 43 pp., ISBN 978-1-932326-42-0, CLIR pub154, https://www.clir.org/pubs/reports/pub154

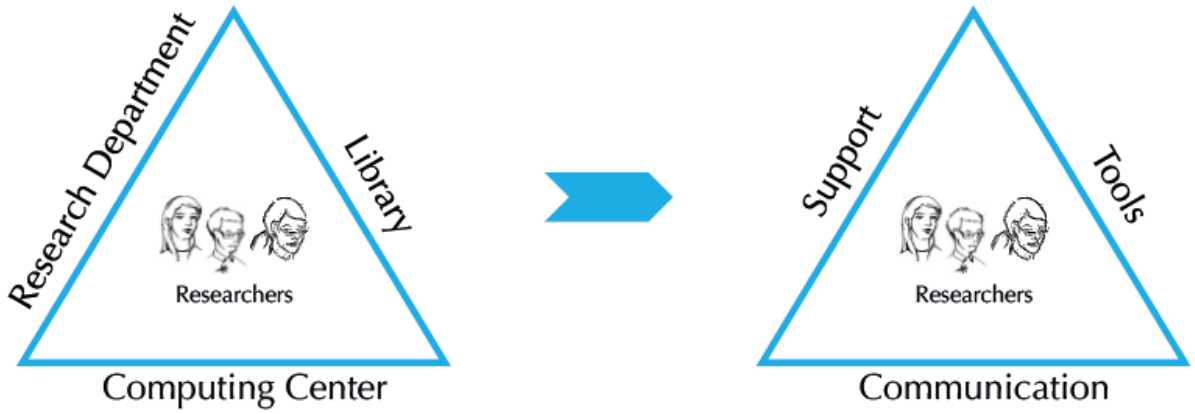


Figure 2: The „golden triangle“ of eResearch support for researchers.

The strategic goals listed above translate into four areas of activities descried in detail in Sect. 3. For the eRA pilot phase, specific topics were identified as

1. Research data management,
2. Digitization and integration of collections,
3. Imaging techniques and visualization
4. Data analysis in various research contexts (bioinformatics, literature and political sciences etc.).

The second area was transferred to the DB department before the eRA started. Further strategic goals of the eRA concern the positioning and cooperation of their founding institutes SUB and GWDG, and can be summarized as the following:

- the further development of existing IT- and information infrastructure of GWDG and SUB
- presenting *one* single point of contact to researchers, research associations and faculties for eResearch related topics
- the extension of existing collaboration and coordination with the university's consultant for research data management (RDM) in the Research Department

2.3 Team and affiliated staff members

The five proposed full-time positions were granted in 2014, and are equally funded by the GWDG and SUB. Currently the team consists of 8 (7 active) staff members.

At SUB

Dr. Jens Dierkes is the coordinator of the eRA. As a physicist, he spent over ten years in astrophysical research. A large part of it was related to the Astronomical Virtual Observatory, either using it for his own research, or developing and disseminating infrastructural support for the astronomical community. Before joining the eRA, he was the manager of the Cologne office of the Bonn-Cologne Graduate School for Physics and Astronomy.

Dr. Ann-Catrin Fender (on leave until June 2017) is a landscape ecologist with a PhD in biological diversity and ecology. Before she started working for eRA, she has been working intensively with BExIS and research data. She has a further training as librarian.

Timo Gnadt is a computer scientist. After four years of research in the field of artificial intelligence (AI) and robotics he has been involved with the topics Virtual Research Environments and RDM since 2011. Within eRA, his tasks contain training and consultation. Besides his work in the eRA he is also working as an embedded data manager in the information-infrastructure subproject (INF) of the Coordinated Research Center 990 ("Ecological and Socioeconomic Functions of Tropical Lowland Rainforest Transformation Systems in Sumatra, Indonesia")[9].

Jessika Rücknagel is a library and information scientist. After graduation in 2015 she worked in the infrastructure project re3data[10] at the Humboldt-Universität zu Berlin. Her research interests are RDM topics. Her responsibilities for eRA are PID service and consultation tasks.

At GWDG

Fatih Berber is a graduate engineer. He has been engaged in data management topics since four years and is currently doing doctoral research on the concept of persistent identification for research data. Before his start in the eRA, he worked on the technical infrastructure within the TextGrid project. Within the eRA, he is working on PID service, software development

[9] https://www.uni-goettingen.de/en/310995.html

[10] See http://www.re3data.org/

and consultation tasks. Besides his eRA activities he is employed as developer in the CRC 755 ("Nanoscale Photonic Imaging")[11].

Peter Kiraly studied history and has been working as a software developer for several years now. His interests lie in the areas of data science, semantic web, digital humanities and scientific visualization. For the eRA he is involved in software development, software adaption, and data modelling.

Christopher Menke is a computer scientist (MSc). He has been engaged in research on Cloud Computing, e.g. in the context of the MIKELANGELO[12] project, for several years now. Within the eRA, he is developing an open Identity Management System for the GC.

Lena Steilen is a historian and cultural anthropologist (M.A.). Before her work in the Göttingen eResearch Alliance she worked for the digital humanities project DARIAH-DE[13]. Her activities included dealing with questions on the visualization of time and space. For the eRA she is working in the areas organization and outreach.

Affiliated Members

Dr. Harald Kusch joined the Institute of Medical Informatics in 2014 as a scientist for a RDM. Since 2015 he is member of the eRA steering committee, building the bridge to eResearch topics at University Medical Center Göttingen. Trained as biologist he before was researcher in the field of microbiological Omics based studies and in this context concerned with long term sustainability of research data.

Dr. Jens Nieschulze is research officer for data management at the Research Department of the University. Trained as a forest biometrician he has a 10 year experience of developing and running data management platforms as infrastructure units of larger research networks. Beginning in 2011 he pioneered the structured consultation of research network proposals as a

[11] See http://www.uni-goettingen.de/de/318955.html

[12] See https://www.mikelangelo-project.eu/

[13] See https://de.dariah.eu/

Research Department service, now continued by eRA, where he serves in the STRG and the team.

In the original funding proposal, SUB and GWDG committed themselves to continue the efforts of the eRA with two permanent positions, starting from 2018.

3 eRA Services and Report for 2014-2016

One of the central goals of the eRA is to establish itself as the central point of contact on the GC for questions related to eResearch. We are engaged in the following activities and services:

1. Consulting - the advising of researchers and research projects
2. Connecting - spanning the activities of Outreach and Networking
3. Training - creating awareness and imparting knowledge on eResearch topics
4. Developing - offering and adapting services and technical project involvement

Figure 3 schematically represents the four main service components offered by the eRA. The following description focuses on activities of the eRA team.

3.1 Consulting

Within our service portfolio, “Consulting” is the major eRA activity. Our goal is to establish the eRA as the first point of contact at the GC for all questions regarding eResearch issues. This long-term goal is also supported by our consulting activities as well as our involvement in several projects (see Sect. 3.4) and our outreach and network activities (see Sect. 3.3). The major aim of our consultations is to improve the data management practices on the campus as well as facilitating the usage of existing tools and services. All members of the GC are encouraged to contact us directly to receive support for research projects and working groups.

Typical areas of consulting cover technical and organizational as well as legal aspects:

Figure 3: Services of the eResearch Alliance

- Data storage and repository (e.g., publishing according to funders' or publishers' requirements)
- Data management
- Assessment of costs and resources
- Creating data management plans
- Clarification of responsibilities and project data policies
- Development of databases or other technical solutions, e.g. to support data sharing or storing
- Persistent Identifier Systems
- Legal issues
- licenses and citation
- aspects for data publishing, e.g. data protection

Our consultation tasks can be distinguished into 3 groups, namely: 1) project proposal advice and support for projects, 2) arranging contacts between researchers with experts and service provider, and 3) direct processing of inquiries.

The first group is the most prominent one since funders' requirement regarding the management of research data become more severe. To ensure that grant applications consider important formal aspects and more importantly adhere to funders' guidelines or policies, the UGOE established a quality assurance procedure which is coordinated by the Research Department. Before a project is submitted, the research commission of the university decides whether the proposal complies with the university's quality criteria and with funders' requirements. The eRA is responsible for advising the projects to draft a concept for data management strategies and to ensure that eResearch related issues are clarified with all infrastructure and service providers involved. Together with the Research Department we created a guide listing the aspects that are considered by the eRA[14]. The following subsection describes the cooperation between the eRA and the Research Department in more detail. In excess of this quality controlling all projects are encouraged to contact the eRA in order to optimize their data management and publishing strategies.

The second group comprises all inquiries that the eRA cannot answer directly. In this case experts on the campus (or beyond) are identified and consulted by an eRA member. Depending on the circumstances the team member either gathers information to answer the inquiry or he/she introduces the inquirer to a respective contact. Among other things questions on methodologies (e.g. How to visualize or process certain data types such as GIS data, or what software can be used for specified purposes?) reach us.

Inquiries addressing our area of expertise, where a direct processing can be realized, fall into the third group. Questions concerning PID systems, creating a data management plan, usage of tools such as Zotero or other software products supporting the research process are common requests. Since June 2016 the eRA is responsible for the registration service for Digital Object Identifier (DOI) based on the SUB membership in the DataCite consortium (see Sect. 3.3). This means the eRA also deals with external inquiries regarding the DOI registration.

[14] See http://www.eresearch.uni-goettingen.de/sites/default/files/StellungnahmeGuide-V2-SenatsFoKo.pdf (only in German)

3.1.1 Research Proposals

Proposals for large coordinated research programs undergo a university internal quality assurance process. The process is managed by the Research Department, which coordinates all involved parties like the research committee, the Equal Opportunities Office, or the eRA. The Research Department is responsible for a factual control, whereas the research committee conducts a scientific review. As part of the quality assurance process, the designated speaker of a research project is in contact with the Research Department and hands in drafts of the proposal. All information is available to the involved parties. Subsequently, and as part of an internal workflow depicted in Figure 4, one eRA member is nominated to consult the project in question and to finally create a statement concerning the data and eResearch strategies in the proposal. The statement is provided to the research committee, which considers the statement for its scientific evaluation. Ideally, this process is accompanied by a meeting between the eRA member and the project's speaker to clarify questions and to improve the data management strategy if necessary. During this phase we constantly exchange information with the Research Department. By contacting the projects, we can ensure that all aspects regarding data management and handling are mentioned within the submitted proposal. Furthermore, we can identify what resources a certain project requires.

The presented workflows and procedures apply to all proposals to the German Research Foundation falling under the application formats "Collaborative Research Centres" (CRC)[15], Research Units[16], and Research Training Groups (RTG)[17].

[15] See http://www.dfg.de/en/research_funding/programmes/coordinated_programmes/collaborative_research_centres/index.html

[16] See http://www.dfg.de/en/research_funding/programmes/coordinated_programmes/research_units/index.html

[17] See http://www.dfg.de/en/research_funding/programmes/coordinated_programmes/research_training_groups/index.html

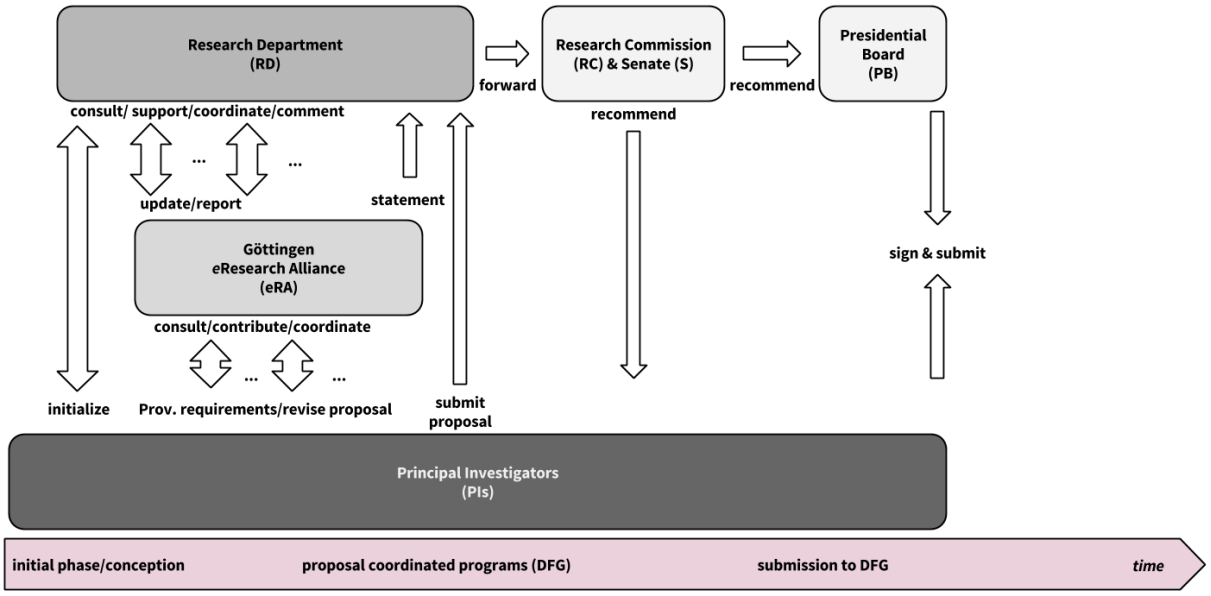


Figure 4: Schematics of the grant-application consulting workflow.

This process, however, only captures a certain part of project landscape on the campus. Other project formats also have the option to consult the Research Department or us if they require assistance during the proposal phase. To promote application of the data policy throughout the campus, the presidential board adjusted the existing incentive of start-up funding for all research projects by including a passage about a mandatory consultation of the eRA concerning data management. Without such consultation, start-up funding can be conditioned.

3.2 Training

Training is another central part of the eRA mission, and an essential instrument to disseminate knowledge on eResearch related topics. During different training formats, we increase awareness among young researchers for data management issues, such as backup and storage of research material, file and folder organization, and creating metadata to ensure the long-term archiving and usage of research data. Furthermore, important aspects for the sharing of data and collaboration within a research project are topics in training sessions. In close cooperation with SUB department Electronic Publishing (EPU) we discuss publication strategies, e.g. the possibility to publish research output as an open access publication, with young researchers. We also always include a presentation of discipline-specific eResearch solutions at the campus that are available for young researchers and students.

Until this year most training events were organized upon request from research group leaders or young researchers themselves. Our main target group are young researchers on the post-graduate level (PhD students or above) at an early stage of their academic career. Training sessions are held in discipline-specific as well as cross-discipline groups. In the latter case it is common that participants of one session have related research topics, use similar tools and methods for their research or are organized within the same project, e.g. in a CRC or RTG. Starting next year, we will establish fixed training events for all interested students and young researchers at the GC.

To prepare requested training sessions, we typically arrange a face-to-face meeting with the requesting person and, if possible, with the group speaker or coordinator. During this meeting, we clarify which thematic focus is needed. In this respect, we try to assess the level of prior knowledge on eResearch topics. This includes whether campus services are used, what discipline- or group-specific challenges regarding the management of research data might exist, and which didactic methods we should choose to involve the participants. Finally, we determine a time slot and clarify organizational questions, e.g. the duration of training courses or the level of obligation (mandatory vs. voluntary). To reach the target group advertising is organized and, if necessary, a registration procedure is implemented. For these tasks, we are usually supported by the requesting researcher or coordinators.

Within a typical training session, we give a short introduction of the eRA and present requested topics. How deep topics are covered then greatly depends on the duration and on the arranged thematic focus. Usually our presentations take half of the training event's time. Interactive components supplement our presentation, aiming to show best practices and to get the participants involved in the management of data and eResearch issues. Such components include hands-on exercises, e.g. at the computer, group work, open discussions or student's presentations to illustrate their research routine and the data they work with. Afterwards participants receive the slides from the trainings. Additionally, selected slide sets from our training material are published on the eRA website. The topics of our trainings are in most cases centered on RDM or specific aspects related to it, such as backup and storage or data publication. Another frequently requested and included topic is the availability and usage of eResearch services.

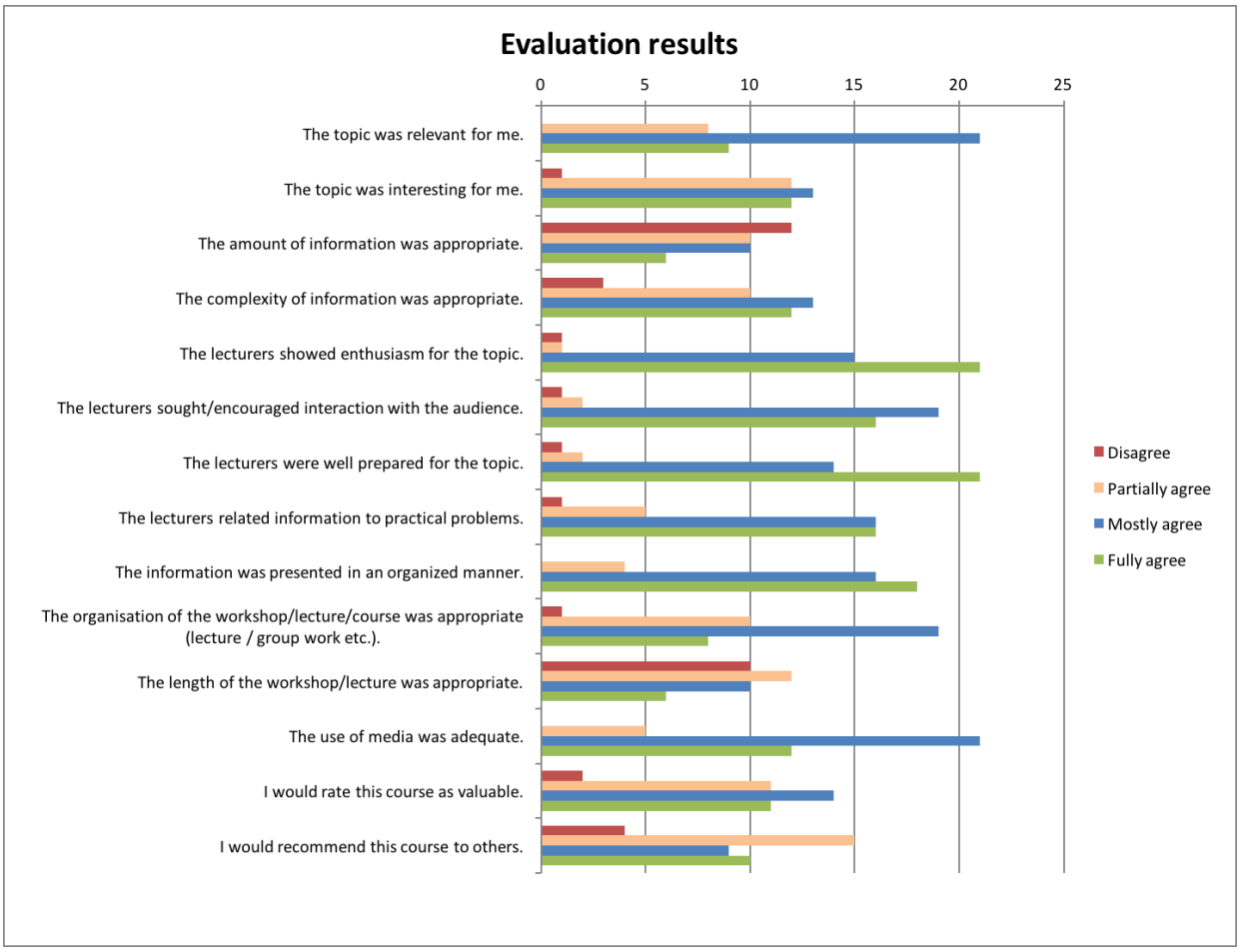
In two years of eRA, we gave 16 training sessions and information events, ranging

- from 15 minutes to 7,5 hours over 2 days' time
- from 6 participants to over 30 with an average of roughly 20
- from disciplines like library sciences over life sciences and natural sciences to economics and humanities.

The content as well as the format of the trainings were in each case and continually adapted to the discipline, interest and prior knowledge of the target group. In order to also extend the team's didactic knowledge and inspire new training formats, we attended a half-day team training at the university's Hochschuldidaktik (Division for Teaching and Learning in Higher Education) on the topic "Didactic arrangement of trainings" in April 2015.

Training courses with a length of 1 hour or above are evaluated by handing out a 1-page sheet at the end of the course. The constructive feedback we received so far was positive, although request for more domain-specific examples on how to deal with data are desired. In addition to these evaluation sheets, we usually scheduled a dedicated slot for questions from the audience on the topics which were addressed in the training session, but also on topics that they might have missed. Examples for frequently stated comments and questions are:

- Could you give some concrete examples or provide tutorials on how to store and backup data?
- What are the implications of the presented strategies for dealing with data mining software and approaches?
- How can we contribute to a harmonization of standards and classifications in our community?
- What platforms should we use to establish a subject specific exchange on data management basics?



From a total of 38 returned evaluation sheets (see Appendix), most researchers were content or satisfied with our trainings. The preparation time for a training course varies strongly. Especially in the starting phase and for the first training events, preparation could easily take up 2 weeks or more. Even at the current stage, longer events such as those over a full day (6h) or spanning two days, at least one week needs to be scheduled for a proper preparation. Shorter events between one and three hours can however be prepared in 2-5 days. This variation depends on the didactic measures planned and effort involved for relating to discipline-specific challenges. To correspond to the articulated need to provide more specific examples and services for the different disciplines, domains or projects, further cooperation with experts, projects, and networks is needed to effectively prepare training events with a strong disciplinary and thematic focus.

3.3 Connecting

This section summarizes two areas of activities, namely “outreach” to promote services and events on the GC and “networking” to connect us to initiatives, groups, or experts on the GC

and beyond. Both sub-areas are subsumed under the activity "Connecting", although different groups and persons are addressed. Nevertheless, a strong interaction between these sub-areas along with similar activities can be recognized to reach out to different target groups.

3.3.1 Outreach

Within the activity area "Outreach" we pursue the aim to promote our services so that researchers and other departments acknowledge the eRA as valuable source of expertise and information. To achieve this, we inform researchers on the GC that we, as eResearch alliance, offer support for researcher and projects to optimize research processes, advise on new information and communication technologies as well as eResearch methodologies, and recommend suitable services available at the campus. To reach the researchers on the campus, we organize information events and workshops and provide information material on our website. For example, we prepared a presentation of basic eResearch training sessions that is accessible on our website so that interested researchers can find an overall introduction to the topics of data storing, organizing, and managing. Furthermore, we are preparing an updated version of the eRA flyer which we are handing out at events, workshops and other occasions. While the flyer is intended to inform researchers about our services, our websites provides general information.

Presented topics are for instance data management aspects. To have an overview of existing services and to make it easier for researchers to find services for different purposes, we created a service catalogue, listing several services and tools that are available at the GC[18]. We also started to develop a template for creating a data management plan that we will provide on our website. To obtain more functionality and to improve the website's usability, in spring 2015 we decided to move our website out of the university's content management system to a Drupal-based framework. Our website went online in fall 2015. Currently we are working on the restructuring of the website and preparing profound information texts to better act as an eResearch knowledge portal for the GC.

[18] See http://www.eresearch.uni-goettingen.de/service-catalog

3.3.2 Networking

Networking is at the core of our activities. On the campus, it serves two purposes:

- Establishing a network among the information-infrastructure providers and eResearch experts on the campus. These also include service points like those for statistics and geospatial information.
- Fostering networking and cooperation of researchers across the campus and across disciplines. To successfully support researchers and projects we maintain and expand the eRA network mentioned above. These connections help us to consult respective contacts to assist researchers of the GC in finding the expertise they need to solve eResearch related problems. Within the last two years the university's consultant for RDM, who is involved in several eRA activities, and the eRA team has been able to get in touch with several bodies at the GC (e.g., departments, working groups, etc.). With the parties presented below we established close relations. We cooperate on different levels and regarding various issues with these parties.

Locally, we are in touch with colleagues, departments and other networks. Besides the advisory function of the eResearch Council for the Göttingen Campus, its members have expertise in specific topics of eResearch paired with the expert knowledge in their respective fields. The members are well connected within their departments and faculties. This allows us to reach down to the level of working groups to start a dialog about data management and eResearch. Summaries from minutes of the four meetings can be found in Sect. 5.2.

Proper scientific conduct is closely related to research data and research data management. Therefore, the eRA and the ombudsman's office for Good Scientific Practice at Göttingen University[19] are coordinating their activities (e.g., training events) and exchange information about subject specific processes. We are participating in regular meetings of the campus network on Good Scientific Practice.

We also intensified our network of colleagues within SUB and GWDG departments. For example, together with colleagues from other departments of SUB we offer information

[19] http://www.uni-goettingen.de/en/223832.html

events and training sessions. One specific example is a training session organized by the subject librarian of physics and chemistry, which offered an information-literacy menu ("Informationskompetenz-Menü für Arbeitsgruppen", only available in German)[20]. For more information about joint events, please look at Sect. 3.2 on Training.

In principle, all projects can consult us on eResearch topics. In particular, through the network of coordinators of coordinated research programs and graduate schools, we can identify the need for training and info events for young researchers, and co-organize them together with the coordinators and motivated graduates.

In parallel to the development of the information-infrastructure, the university pursues the objective to further develop the research infrastructure, especially at times when scientific problems are becoming increasingly transdisciplinary. The so-called *campus laboratories* combine methodological research, pools of research facilities, resources or databases, education, training, as well as services as part of a transversal research-oriented unit. They serve as platforms to advance the development of research methods, to promote the exchange of ideas, and stimulate new projects across the campus. Two campus laboratories have currently been established: (a) *Advanced imaging, microscopy, and spectroscopy (AIMS)*[21], which focuses on high angular resolution imaging methods. Fields of application are for example physical and physio-chemical analytical problems. (b) The second campus laboratory is *Digitization and computer assisted analytics in the humanities and social sciences (DCAGG[22])*, led by Prof. Caroline Sporleder (Chair for Digital Humanities of the Institute of Computer Science at the University). Specific objectives are the research-oriented development and sustainable implementation of innovative methods for digitization and analysis (e.g., of texts and objects), support and networking even of small research projects, which have a pilot character, and enabling easy access to digital methods and removing

[20] See https://www.sub.uni-goettingen.de/fileadmin/media/texte/fachreferate/fachreferat_chemie_technik/IK-Menue_Chemie_Physik_20151002.pdf

[21] See https://www.uni-goettingen.de/de/532762.html

[22] German abbreviation for: Digitalisierung und computergestützte Analytik in den Geistes- und Gesellschaftswissenschaften

barriers in general. This campus laboratory currently contains four branches, i.e. text analysis, 3D digitization, geospatial applications (GIS), and visualization. Interestingly, all the areas appear to contain elements which are of relevance to many research projects well beyond the humanities, thus reaching out to the whole campus.

The eRA is involved in both campus laboratories in the context of data management. In DCAGG, we are furthermore represented in the steering group and are actively involved in the development of the campus laboratory. As part of our consultingactivities, we often have the opportunity to liaise researchers with the campus laboratories.

We are also cultivating contacts and collaborations with other national and international initiatives engaged in RDM. On a national level, we are involved in the nestor/DINI working group for research data and organized a workshop in October 2016. This particular working group has the aim to coordinate activities regarding RDM in Germany on a working level. In addition to this, the executive board of the Deutsche Initiative für Netzwerkinformation (DINI e. V.) is managed by the SUB. Besides this national initiative, the eRA is active within the persistent identifier consortia DataCite[23] and ePIC[24].

We are in close contact with the eInfrastructure Austria[25] project, which is a national initiative and aims at improving the Austrian research infrastructure by coordinated measures and activities. Other examples for exchange of experiences are: (i) an internal workshop (Dec. 2016) at the "Digitale Hochschule – NRW" network[26], which is a state initiative to coordinate the activities of the many universities, libraries, and computing centers in North-Rhine-Westphalia. (ii) Visit by members of the "Stabstelle Forschungsdatenmanagement"[27] of the

[23] https://www.datacite.org/

[24] http://www.pidconsortium.eu/

[25] See https://www.e-infrastructures.at/en/startpage/

[26] See https://www.dh-nrw.de/en/ (only available in German)

[27] See https://www.uni-marburg.de/projekte/forschungsdaten/projekt/stabsstelle (only in German)

Philipps-Universität Marburg and the Hessen-state-initiative (Nov. 2016). Furthermore, Göttingen University hosted the first congress of CIOs of German universities in June 2016.

Göttingen University, the SUB, and the GWDG are continuously establishing, international collaborations. The eRA is closely involved in these collaborations when it comes to RDM and eResearch. There have been several working visits to Göttingen and/or to the partners. Here, we give a few examples:

i. 2-day workshop of the U4 network about the research data life cycle, organized by the eRA and hosted at the SUB[28]. Here the four partner universities Gent, Uppsala, Groningen, and Göttingen discussed about storage facilities, policies on data management, publication and re-use of data, current research information systems (CRIS) and institutional repositories, public relations, relations management, training on IT support for researchers, and connecting datasets to publications. Several areas of mutual interest and cooperation were identified and experiences were shared.
ii. Visit by representatives of the library of the University of California, San Diego (Mar. and Oct. 2016). Among the visitors was David Minor, the program director for research data curation. We have started a dialog about commonalities and differences between the data curation efforts at both campuses and to find areas of future cooperation.
iii. Visit of representatives from SUB and GWDG at the University of Edinburgh, upon invitation by Gavin McLachlan, CIO and Librarian to the University. Topics addressed were RDM, digital skills, heritage collections, and digital university.

Apart from these visits on a working level, the eRA benefits from the networking activities of the board of directors, who are actively involved in numerous boards and committees. Some prominent examples for these involvements are:

Table 2: Network activities of the board of directors

Network	Function	Who	Since when
IEEE (Institute of Electrical and Electronics Engineers)	Member	Prof. Dr. Ramin Yahyapour	2015
Confederation of Open Access Repositories (COAR)	Member of the Executive Board	Dr. Wolfram Horstmann	2015
Hekksagon Network	Göttingen representative	Prof. Dr. Ramin Yahyapour	2014
"Schwerpunktinitiative Digitale Information" der Allianz der Wissenschaftsorganisationen	Member of the Steering Group	Dr. Wolfram Horstmann	2014
Rat für Informationsinfrastrukturen	Member	Prof. Dr. Ramin Yahyapour	2014
Research Data Alliance (RDA)	RDA Europe Forum; RDA Global, RDA Organisational Advisory Board, Libraries for Research Data (Co-Chair); Long Tail of Research Data (Co-Chair)	Dr. Wolfram Horstmann	2014
Göttingen Centre for Digital Humanities (GCDH)	Member of the Executive Board	Dr. Wolfram Horstmann	2014
IT-Innovations-Cluster Südniedersachsen	Member	Prof. Dr. Ramin Yahyapour	2011

3.4 Developing

The fourth area of eRA activities is the development of digital tools and services. Our aim here is to develop digital solutions for research projects, while making best use of existing solutions and resources on the campus and in the community. Our main focus is on expanding and improving the research infrastructure for various eResearch purposes on the campus. The strategy is to develop a set of tools and services, from which individual components can be used and combined with each other by researchers during the research life cycle. Regular contact with researchers allows us to continuously collect concrete requirements and feedback on such (digital) services. These activities can be differentiated into two groups: (i) Digital service development and (ii) project participation.

This field of activities is particularly important, since it adds tangible results respectively products for the researchers. Adapting and developing services is the main instrument for the eRA to improve and expand the technical research infrastructure at the GC. Three members of the eRA team are staffed by computer scientists to actively develop technical solutions for different purposes. Furthermore, we discuss strategies and conceptual developments within the team, the steering group, and colleagues from other departments. In the following, we present some noteworthy examples and the roles the eRA team members played.

3.4.1 Digital service development

We describe in this section projects, whose products are intended to become services most of which will be offered under the brand of eRA, e. g. publication of research data, the provision of PIDs, etc. These developments are mostly done in cooperation with other groups at SUB and GWDG.

Publication management and data repository

Managing research data and scientific publication for the whole campus and across working domains (private – collaborative – public; cf., Treloar 2007[29]) and disciplines is a challange for information-infrastructure providers. As stated above, in Göttingen we develop a sound

[29] http://www.dlib.org/dlib/september07/treloar/09treloar.html

essential and extensible infrastructure, from which individual researchers and collaborations can chose the appropriate components for their specific use cases. This infrastructure builds upon existing components, e.g. network file servers, cloud storage (ownCloud), a PID service (DataCite, ePIC), a middleware to reference data and attach metadata to data objects (CDSTAR[30]), etc. What is necessary is to provide workflows, tools, and best practices to support crossing the working domains, both as a generic service and as adjustable tools for a specific use case.

Two such components are a publication management system and a data repository[31]. The first one is to provide every researcher at the GC with a service that allows to maintain hers/his publication list and to publish it onto hers/his personal university web page. An export functionality to other academic platforms like ORCID is foreseen. This service will be complemented with a local institutional data repository. This is in particular of interest for long-tail research projects, and data resources can be directly linked to from the publication management system. The publication management plays an important role for the preparation of the German Excellence Strategy in 2017/2018. We initiated project to set up an institutional repository. The stakeholders decided to use – at least for the publication management - the open source software LibreCat[32], which is developed at the University Libraries of Bielefeld (Germany), Ghent (Belgium), and Lund (Sweden), as it can handle both the publication and data management. At the time of starting the project the time frame for the Excellence Strategy has not been published. With the publication of the time frame it was decided to focus on the publication management, to create the publication lists of the approximately 130 principal investigators involved in the Excellence Strategy. Besides having a profound basis for referring to the PIs' publications, the goal of this phase is to establish a defined group for creating and testing workflows and the system's functionality. In the next

[30] https://info.gwdg.de/docs/doku.php?id=en:services:storage_services:gwdg_cdstar:start

[31] We use the term repository in a wider sense than just the publication of data. The platform should also serve the collaborative domain, in which, e. g., access privileges can be assigned.

[32] See http://librecat.org/

stage, it is planned to enlist the publications of all researchers at the GC within the publication management environment of LibreCat.

We acquired a first evaluation of LibreCat's repository environment, but we would like to test another repository before we finally settle the choice for the data repository. As the second candidate, we will install Dataverse[33]. This open source system is widely used and supports all phases of the life cycle of research data. This evaluation is done by the eRA team, which fits into the overall schedule, as the current focus of the development team (primarily SUB department digital library and Péter Kiraly) lies on the publication lists. The initial decision for the repository will be revised in early 2017 (expected Feb.). The implementation will be realized in close cooperation with the SUB department digital library, since the finalized repository will supposedly be maintained by the SUB.

eRA's role in the publication management project is the preparation of data, which was exported from multiple databases, in particular Web of Science, PUBMed, Crossref and other external sources. One of the issues that need to be tackled in this respect is the normalization of harvested metadata to further process the data. In addition to this, since LibreCat is still under development and only limited documentation is available, the first working step was to document LibreCat's internal data schema. eRA's role for the data repository is to collect use cases and workflows, requirements in terms of technical, organizational specifications and to find out, and to test/evaluate the functionalities of LibreCat and Dataverse in respect of the requirements and the possibility for adjustments.

Identity management system

We aim to improve the user identification for different GWDG services. The current identity management system used by the GWDG, which enables students and staff members to access SUB and GWDG services, is licensed on the user level. This means that costs arise for every user that is registered within this central system. As a consequence, collaborations with external researchers are difficult to realize. To simplify the registration of external users an Open Source Identity Management System will be connected to the central identity management system. Further services are developed, e.g. to offer external users self-

[33] See http://dataverse.org/

registration or access via Shibboleth. For this, extensive adjustments to the existing identity management infrastructure are required. This improvement is an important development to better support research projects with national and international partners.

Event Calendar

We participated in the development of the Event Calendar[34] of the GC. This calendar announces interesting events and workshops of all institutions of the GC. We mainly worked at the backend development and created an API so that individual institutions can use the interface to exchange information between existing calendar applications and the Event Calendar.

Persistent Identifier Service

To enable projects to identify research data, the eRA offers a PID service which will be developed further during 2017. Two types of identifiers are offered for the GC, namely Digital Object Identifiers (DOIs) and Handle-PIDs. This is possible because of the memberships of SUB and GWDG in the DataCite (DOI) and in the ePIC consortia. Within both institutions, one member of the eRA team is involved in the PID activities. Thus, the eRA has profound knowledge of the respective PID frameworks. The PID infrastructure of the GWDG is maintained by an eRA member, who also works on the conceptual development of the ePIC service. As part of the DataCite sevices of the SUB, we are also offering DOI consultancy for German institutions in the field of humanities.

Research Facility Portal

During a networking event of the GC, the participants expressed great interest in a web-based research facilities information portal for the campus. This portal should provide basic information about "large equipment"[35], i.e., the vendor, technical specification, terms of use, location, user documentation, and contact. At an eResearch-Council meeting, some members proposed to include less costly research equipment as well as software. We have established a small council-working group and subsequently a cooperation with the Swiss project "Open-

[34] https://events.goettingen-campus.de/

[35] Research facilities which cost at least 150.000 €.

IRIS"[36] at the Friedrich Miescher Institute for Biomedical Research in Basel, which provides an open platform to manage research facilities. Together, we are currently in the process of adapting the system to our requirements.

Furthermore, the university and the UMG have a keen interest to include this portal in the management workflows of the central administration and the research facilities commission of the senate. In close cooperation with the Research Departments of both the university and the UMG, we are working on the implementation of administrative workflows and of attributes specifically required by the central administration into our Open-IRIS instance.

Next steps planned are testing the portal with a selected small group of researchers and administrative staff in the first quarter of 2017.

3.4.2 Project Participation

Mîn-PANOS

In this cooperation project[37], an archaeological information system (AIS) for a science case in Egyptian studies is being developed. The project is already running since 2012. The cooperation started in 2015 in preparation for the application at VolkwagenStiftung for the second funding phase. In particular, we will provide support by our data-modelling specialist for the remaining term (unitl June 2017) to clean and update the data model to existing standards, and prepare the implementation of the model into a web portal. The second funding phase will also deal with the interface to WebGIS applications. This project will provide a good example for connecting an individual research project with activities in the campus laboratory "Digitalisierung und computergestützte Analytik in den Geistes- und Gesellschaftswissenschaften" (Digitization and computer-assisted analytics in the humanities and social sciences) and the new GIS specialist at SUB and a focus will be on the potential of reuse of components of the AIS in other humanities projects.

[36] http://iris.science-it.ch/landing/?ReturnUrl=%2f

[37] http://min-panos.uni-goettingen.de/

Geochemistry

In geochemistry, the digital transformation delivers a deluge of new and high-quality data that on the one hand allows for unprecedented scientific endeavors, but on the other hand requires for advanced technologies and techniques to handle the data. To address these issues, a first initiative to foster and develop a "digital geochemistry" formed in early 2016 and produced a whitepaper "Geochemische Datenbanken und Probenarchivierung"[38] (geochemical databases and archiving of specimen). As a result, Prof. Dr. Gerhard Wörner (PI, Geowissenschaftliches Zentrum at the Georg-August-University Göttingen) and the eRA have formed a small working group to develop prototypes of components according to the whitepaper, which will eventually lead to a grant application in early 2017.

Infrastructure Projects and CRC

To further connect the eRA with other projects and research groups three of our members have a half-time position with the eRA and are also employed in infrastructure projects. Two of them are hired in an Information-infrastructure project (INF) of CRCs. This combination facilitates knowledge transfer on the one side and allows the eRA to gain experiences with the support of research projects. The third member is involved in the MIKELANGELO project, which is an EU-funded project in the field of big data and high performance computing. Tasks of the eRA members can be administration and support of information systems, evaluating and improving the project-specific research infrastructure, adaption of existing information systems and tools, creating a data policy to clarify handling of research materials or training of researchers in different fields.

Moreover, the eRA functions as an important instrument to identify valuable information systems at the campus to assess if such services and tools are reusable. By the means of this technology transfer, existing tools can be sustainably maintained, adapted and further developed. A successful example in this context is the INF-project of the CRC 1002 "Modulary Units in Heart Failure". In this project, data are organized in a research data platform which is cooperatively developed by the CRC's INF-project and the GWDG. The project's research data are structured, collected and processed to enable data reuse. Required

[38] http://www.gmit-online.de/wp-content/uploads/2016/06/GMIT_64.pdf

strategies and tools are selected, implemented and evaluated. Developed modules of the data platform are reused in other life science consortia (e.g. CRC 1190, IRTG 1816). Additionally, due to eRA's consultation and support the exchange of knowledge and experiences is realized across disciplinary borders.

Research Data Management Organizer (RDMO)

Data management is not a singular event that culminates in the data management plan attached to a funding proposal. Since the research life cycle is not linear[39] the data and the associated management process are constantly changing. The project *Research Data Management Organiser* (RDMO)[40] under the lead of the Leibniz Institute for Astrophysics Potsdam (AIP), develops an application, which allows researchers to plan and to organize the data management throughout the life cycle of the project. This application can be installed at an institution, which offers flexibility to better integrate the tool into the local environment. The eRA is associated partner and is committed to test and roll out a local instance of RDMO. This is planned for the first quarter of 2017. The RDMO project is currently applying for a second funding phase, starting in April 2017. In this phase, adaptions and implementation of further functionalities, based on the feedback of the associated partners are foreseen.

Europeana

Besides the local projects we participate in the Europeana Network's Data Quality Committee. In this respect one eRA team member is investigating the metadata quality of Europeana content, and implements workflows to improve the metadata. Since Europeana is a large EU-project making European cultural heritage accessible to a broad audience, metadata quality aspects are of great importance to make the digitalized media findable and interpretable. Metadata provenance is a current topic in Göttingen that was nominated at the last eRA Council meeting as future research field for the eRA.

---

[39] The Problem of Data by Lori Jahnke, Andrew Asher, and Spencer D. C. Keralis, CLIR pub154

https://www.clir.org/pubs/reports/pub154

[40] http://rdmorganiser.github.io/en/

4 Project plan

4.1 Initial plan 2014-2016

In the starting phase of the eRA several short and long-term goals were identified by both the eRA steering committee and the core team, and thematically grouped. Table 3 lists the goals together with comments regarding their current statuses.

Table 3: Project plan for the eRA activities for 10/2014-10/2016

	Main Task	Status / Achieved in
1	**Management**	
1.1	**Management: Boards and staff coordination**	
	Hiring of staff: eRA-team	Nov 2014
	Constitution of advisory board	Jan 2017
	Constitution of eResearch council	Apr 2015
	Staff use concept	Nov 2015
	Developer pool	Oct 2016
1.2	**Management: Collaboration**	
	Choice and implementation of collaborative tools	Mar 2015
	Administration and Monitoring Ticket-System	Feb 2015, currently evaluating new ticket system
	Administration Wiki	Oct 2014
	Administration Mailing lists	Oct 2014
	Administration Shared Storage	Oct 2014: GWDG CloudShare Jun 2016: GWDG ownCloud
	Implementation, organization, chairing of team meetings	Nov 2014 Dec 2015: new structure
	Establish Workflows with other SUB and GWDG departments and Research Department	Mar 2015: Workflow with EPU Apr 2015: Workflow with Research Department June 2016: slight revision
1.3	**Cooperation/Network**	
	Establish Workflows with centers on GC	Contacts to a few of the centers established, workflows not

	Main Task	Status / Achieved in
		established yet
1.3	**Management: Evaluation**	
	Annual away day (eResearch Alliance team)	Nov 2015: implementation next event planned for spring 2017
	Intermediate evaluation	External Advisory Board 2017 & 2018 (tbd)
	Evaluation	see text
	Decision about continuation of eRA	see text
2	**Strategic Orientation**	
2.1	**Strategic Orientation - Analysis of current state**	
	Service catalogue	Oct 2015: Draft Nov 2015: Published online Update on monthly basis and upon request
	Requirements analysis: Conception of survey	Apr 2016
	Requirements analysis: Conduct survey	started in Jul 2016
	Requirements analysis: Conduct Focus group interviews	Expert interviews ongoing
	Requirements analysis: results	Ongoing
2.2	**Strategic Orientation - Further development**	
	Initiation of new projects: Identify gaps and potentials	E.g., research facilities portal; see text
	Initiation of new projects: Write new proposals	See text
	Expansion of the eRA	Department of Medical Informatics as part of steering group
	Placing of the eRA in the institutional context of the GC	As part of campus strategy, see text
3	**Public Relations**	
	Establishment and Outreach	
	Website	Nov 2015: Official launch continuous revision

	Main Task	Status / Achieved in
	Flyer	Nov 2015: First version printed Feb 2017: Second version scheduled
	Posters	See Appendix
	Committee functions	See text
	Workshop and conference participation	In progress, see text
	Information sessions on GC	By board of directors
4	**Trainings/Education**	
	Draft training material for RDM	Available since 2015 continuous revision
	Conduct trainings on RDM and other topics	Nov 2014: First event Subsequent events upon request
	Develop tool for evaluation of trainings	Feb 2015: First version Aug 2015: Revision
	Evaluation of trainings	Jan 2017
	RDM reference material for eRA website: Development and Publication	In progress; links to resources on the internet available
	Determine demand for other reference material, develop new material	In progress
	Develop online information material for visualization methods and tools	In progress; first half of 2017
	Identification of new topics	In progress, e.g., information events
	Education (within curriculum?)	Integration into curriculum planned for early 2017
5	**Consultation**	
	Consultation for funding applicants on DMP	constantly
	Develop concept for consultation	Apr 2015: Implemented
	Identification of new topics	Continuous process, depending on requests
	Identification of appropriate contact persons for specific eResearch topics	Continuously

	Main Task	Status / Achieved in
	Tool for DMPs: Optimization and ongoing evaluation of usability during development phase	Cooperation with RDMO project, see text
6	**Technical development**	
	PID	In progress, see text
	AAI	In progress, see text
	Image data base: Analyze requirements	GWDG service imeji[41]; also 3D-image database in the context of campus laboratory digitization
	Image data base: Compare alternatives	TBD
	Image data base: Purchase or adapt software	TBD
	Initial set up of the instances and where required user assistance	TBD
	Publication workflow for RD: Analysis of existing publication facilities and criteria	In progress, see text
	Publication workflow for RD: Develop workflow for publication of RD through external RD centers	In progress; partly defined for Dryad and Zenodo (2016)
	Publication workflow for RD: Set up on site facility for publication of RD	In progress, see text

4.2 Plan for 2017-2018

In this section, we present the major goals for the period 2017-2018. A quite recent development is the upcoming Excellence Strategy[42] of the Federal Government. This special program has two funding lines: a) *Clusters of Excellence* for project-based funding in internationally competitive fields of research at universities or university consortia and b) *Universities of Excellence* to strengthen universities as individual institutions or as university

[41] https://imeji.gwdg.de/imeji/

[42] http://www.dfg.de/en/research_funding/programmes/excellence_strategy/index.html

consortia in the long term and further develop their leading international role based on successful Clusters of Excellence.

The second funding line is of particular interest for the eRA, because of the long-term funding. However, since the outcome of this call is not foreseeable, a major goal will be the development of different scenarios for the post-2018 set-up. To apply for additional support by the university, the principle layout about the future development of the eRA should be decided on in the second half of 2017.

The Excellence Strategy will be a major topic for the next two years in terms of consulting and building a sustainable information infrastructure on the GC.

In the first half of the building phase (2014-2016), the focus was on establishing the organizational structure and a initial network across the campus, as well as, developing and implementing an initial service program based on consulting and training offerings.

In Table 4, we present the major milestones for the second half of the project phase. We follow basically the initial plan of activities. However, in the second half, we will accentuate the development and deployment of digital services. This includes the preparation of demonstrators for the products mentioned in Sect. 3.4.1 (i.e., data publication platform, PID service, research-facilities information portal, data management organizer) and intensive interaction with test users (researchers from different disciplines and levels of experience) about functionality and usability. The evaluation of the user stories will then impact the finishing and the details of the subsequent rollout of the products.

An important factor for offering such services successfully under the brand of eRA is the internal support/commitment by the infrastructure providers. Therefore, we will spend some more time on an internal roadshow in the first half of 2017.

We will gradually improve/extend the established offerings, and we will engage in community building across the GC, i.e. to foster the networking among researchers, which

might lead to a Research Bazaar[43] like data/software carpentry conference in 2018. Activities in this area will be:

- Roadshow (faculties, departments, committees, university-wide events)
- Recruiting speakers for the Göttingen Lectures on Academic Information Futures
- eRA brown bag lunch (starting in Feb 17)
- Co-organizing network on Open Science with community driven events like HackyHour[44]

Also in the area of training, we plan to gradually improve our offerings. Activities are:

- Close cooperation with the new campus-wide project "Propädeutika Digitale" to create a series of eLearning modules for students and researchers on digital skills and eResearch. This has a potential for scaling, i.e., reaching a wider audience than face-2-face training sessions.
- Close cooperation with the "Bausteine" project at the SUB to promote digital skills on the GC. One specific measure is to introduce coffee-lectures (first half 2017)
- Introduce regular training events for interested researchers on the GC
- Working out specific content/topics and presentation modes for integration into curricular modules
- Organizing a summer school on data science (Jul 2017)

The External Advisory Board is foreseen to convene for a second time in early 2018. At that point, we can evaluate, how much of the initial recommendations have been implemented and what further steps might be necessary. Over the course of 2018, we anticipate a report from the eResearch Council and a self-evaluation of the eRA, wich we will combine with the report from the External Advisory Board to allow for an informed decision about the future structure of the eRA after the conclusion of the project phase.

[43] Cf., https://2017.resbaz.com/

[44] Cf., https://hackyhour.github.io/Wuerzburg/

Table 4: Major milestones for 2017-18

Date	Milestone	Activities
2017		
Jan 2017	Inaugural meeting of the External Advisory Board	Management, strategic orientation
Feb 2017	Submission of cluster preliminary applications	Consulting
Mar 2017	RDMO demonstrator: small scale rollout to selected individuals and groups on the GC	Developing
Jun 2017	Data repository demonstrator: small scale rollout to selected individuals and groups on the GC	Developing
Early summer 2017	"Internal" roadshow at SUB, GWDG, and UMG-INF concluded	Outreach, networking
Jul 2017	Data Science Summer School together with Göttingen International	Outreach, training
Late summer 2017	Report on evaluation of demonstrators and service concepts and roadshow for Excellence Clusters concluded	Developing
Autumn 2017	Adaptation of eRA structure into post-2018 campus strategy concept	Management, strategic orientation
Dec 2017	Submission of proposals for Excellence Clusters	Consultation, strategic orientation
2018		
Feb 2018	Research-Bazaar-like Conference: Data carpentry, software carpentry, engage local research community	Outreach, training
Feb 2018	2nd meeting of the External Advisory Board	Management, strategic orientation

Date	Milestone	Activities
Spring 2018	Roadshow on GC concluded: tutorials, basic eLearning modules on data management and eResearch ready	Outreach, training
Jun 2018	Detailed post-2018 concept for eRA	Management, strategic orientation
Late summer 2018	Informed decision about the future structure of eRA based on reports by the External Advisory Board and the eResearch Council	Management, strategic orientation
Sep/Oct 2018	Contract of eRA team end	
Dec 2018	Proposal submission for Excellence University	Consulting, strategic orientation
Dec 2018	End of Project and transition into sustainable structure	

5 Conclusion

Based on the insight that sustainable RDM will only become an integral part of the research process if its support is considered as an institutional objective, Göttingen University has instituted a local research data guideline and established the eRA as a dedicated institutional support structure for its implementation. The activities of the eRA are aimed at providing an optimal information infrastructure for research by bundling knowledge about existing IT and information scientific resources, solutions, and experts, and by acting as a central point of contact concerning eResearch.

Joining up the diverse fields of activities, the professional expertise and the excellent technical resources of a computing center and a research library is an important step to build comprehensive, coherent, and sustainable institutional support for RDM and fostering the usage of digital tools and methods on the Campus.

As part of this effort, the multidisciplinary eRA team of currently seven people offers consulting, training and general support for RDM. The alliance of strong infrastructure

partners represented in the eRA provides institutional support for RDM and eResearch services, which offers great opportunities for promoting such research.

Arguably, one of the biggest challenges on a campus is the communication of the availability of existing services and solutions across the campus. Additionally, the right contact for a particular question is often hard to find. The eRA therefore aims to become the central contact point for researchers by exploring synergies between three information-infrastructure providers on the campus: the library, the computing center, and the department of medical informatics. Furthermore, teaming up with the Research Department provides a more comprehensive support along the research life cycle. eRA support thus makes it easier for researchers, institutes or departments to get in contact with the experts and resources they need. Beyond this, the eRA assists the transfer and integration of knowledge and expertise regarding RDM into current research projects. Especially the consulting process for grant proposals is a valuable input for researchers to comply with funder's requirements and the university's data policy.

During the past two years, we achieved a lot of progress in the four areas of activities and diverse fields of eResearch. However, we had to meet some challenges on the way. The level of the researcher's experience in eResearch, and especially data management, varies strongly across the GC. This might in part be due to differences in the individual and discipline-specific research cultures. In some cases, we had to raise awareness for eResearch topics, in other cases the projects already identified requirements that the infrastructure should meet. To better understand discipline- and project-specific needs, a regular contact to the research groups and researchers is necessary. Active participation in projects is the most beneficial approach, as it allows the eRA team to stay up-to-date with current research and to obtain acceptance among the research communities on the campus. This process takes time and, consequently, a considerable amount of resources is required to consult a project and to deal with diverging interests and priorities when it comes to RDM requirements.

Another challenging endeavor is the activity of networking, especially within the SUB and GWDG. What we have learned is that the communication inside the institutions themselves is already rather complex and that it will take further activities to promote the ideas behind the eRA (i.e., finding synergies, joining resources, expertise, services) internally.

Implementing new communication structures and workflows requires time, since it involves the adaptation of established workflows throughout the Göttingen Campus and the establishment of new lines of contact between the eRA and the individual players on the Campus. The process involves top-down and bottom-up components, such as quality assurance and the articulation of specific requirements by researchers.

After having established the RDM quality assurance workflow as part of the internal review process of DFG (German Science Foundation) grant applications, the initial reluctance is gradually giving way to a more open and cooperative atmosphere during the support process.

Among the lessons learned is the importance of addressing the concrete research environment and requirements of young researchers in trainings. They are the vanguards of the digital transformation and of the transformation of individual research cultures and can serve as multipliers in communicating the importance of RDM into the faculties and individual working groups. They can, however, also be the most demanding when it comes to addressing their everyday research needs in trainings. Although we are trying to tailor and adapt our trainings to our target audiences, we found that more effort needs to go into finding suitable examples and assessing the researchers' knowledge and requirements beforehand. Additionally, the eRA will make more generic training courses available via its website, which will provide extensive information on eResearch related topics for individual consultation by researchers.

Since the end of 2014, the eRA has initiated support for about 25 projects of various types (CRC, RTG, and RU) across all disciplines.

Currently, considerable efforts are being invested in a consultation process that is based on the evaluation of individual project proposals. On average, we require about one week per project, depending on the complexity of the project and the familiarity of the researchers with the eResearch related aspects of their project. However, it is envisaged that in the course of time the expertise that the eRA is gaining in this way will be translated into more generic case studies. These can be used to efficiently scale up this kind of research support to the Campus. Consequently, more attention can then be given to the remaining advanced cases.

Success of an initiative such as the eRA strongly depends on its acceptance throughout the Campus. In particular, tangible services have to be offered to researchers. There are two levels of engagement involved: (i) the gathering of support from the departments of the

central information-infrastructure providers, as well as by on-site IT and data-management units; and (ii) the design of products and services that neatly fit into the researchers' workflows. Personal contacts, especially during the build-up phase of the initiative, are extremely important for the dissemination of information.

The communication operates in several directions, for example between the eRA and the researchers. While promoting service offerings, the eRA receives feedback and requirements from the researchers regarding service development. Communication between the eRA and other players (e.g., central administration) will support developing policies and establishing effective administrative workflows. A further consideration in this context is that, since the eRA currently only has the status of a project, related staff turnover carries the risk of losing contacts and knowledge.

When allocating special funds to the development of an eResearch infrastructure for the Göttingen Campus, both the library and the computing center have committed themselves to fund permanent positions for eResearch tasks after the initial phase (Oct 2014 – Oct 2018). The details of the duties and the job specifications, as well as a potential increase in personnel, will be subject to an evaluation by the university towards the end of the project phase, taking the recommendations of the External Advisory Board into consideration.

During the previous months, the eRA has developed a core service portfolio, which is described in section 3, and focuses now on concrete online services for researchers on the Campus (e.g., data repository, research facilities portal, DOI allocation). Still, it is essential to continuously question the demands of the researchers to improve the eRA-services and to identify new needs. This is partly done by analyzing the consultations and trainings conducted by the eRA and will be elaborated by carrying out expert interviews with researchers on campus.

In order to evaluate our service portfolio and the work done so far, we kindly ask you as members of the External Advisory Board to answer us the following questions:

- What is your opinion on the resource planning of eRA within the last two years? Has it been reasonable and productive?
- What is your opinion on the chosen eRA fields of activity? Were they chosen in a constructive and expedient way?

- Do you recognize fields of activity eRA should spend more efforts in/focus on?
- How do you evaluate the performance of eRA within the last two years according to the initial strategic goals?
- Do you think it is possible that eRA will achieve all its strategic goals within the next two years?

Finally, we appreciate any advice to include further activities in our service portfolio or to make our performance more efficient.

6 Appendix

6.1 eRA publications

Articles

Horstmann, Wolfram; Brase, Jan (2016). Libraries and Data – Paradigm Shifts and Challenges, in: *Bibliothek Forschung und Praxis*, 2016, Vol. *40 (*2), 273-277. DOI: http://doi.org/10.1515/bfp-2016-0034.

Dierkes, Jens; Wuttke, Ulrike: The Göttingen eResearch Alliance: A Case Study of Developing and Establishing Institutional Support for Research Data Management. *ISPRS Int. J. Geo-Inf.* 2016, *5*, 133; doi:10.3390/ijgi5080133

Berber, Fatih: Persistent Identifier for Research Data Management, in: GWDG Nachrichten (03/16), p. 6-8

Király, Peter: Metadata Quality in Europeana, in: GWDG Nachrichten (03/16), p. 9-13

Dierkes, Jens; Wuttke, Ulrike: The Göttingen eResearch Alliance: *enhanced*Research for the Göttingen Campus, in: *GWDG Nachrichten* (05/15), p. 14-15.

Schmidt, Birgit; Dierkes, Jens: New alliances for research and teaching support: establishing the Göttingen eResearch Alliance, in: *Program* (Vol. 49, No 4), p. 461-474. DOI: doi:10.1108/PROG-02-2015-0020. The postprint version is available under http://goedoc.uni-goettingen.de/goescholar/handle/1/12119

Project leaflets

Göttingen eResearch Alliance leaflet: Enhance your research! (Version November 2015)

Guides

Handreichung für die Forschungskommission des Senates der Universität Göttingen: Im Qualitätssicherungsprozess betrachtete Aspekte zu Forschungsdatenmanagement und Publikationsstrategie

Posters

Dierkes, Jens: e(nhanced)Research for the Göttingen Campus, DH Summit 2015 (Berlin), 03.03.2015 - 04.03.2015

Dierkes, Jens; Gnadt, Timo: Nachhaltige eResearch-Unterstützung am Göttingen Campus, DigiBib 2016 (Graz), 25.02.-26.02-2016

Conference procedings

Wettlaufer, Jörg; Wuttke, Ulrike: Tagungsbericht: Offene Lizenzen in den Digitalen Geisteswissenschaften, 27.04.2015 - 28.04.2015 München, in: H-Soz-Kult, 09.06.2015, http://www.hsozkult.de/conferencereport/id/tagungsberichte-6014.

Press releases, articles and news items about the Göttingen eResearch Alliance

Göttingen University founds eResearch Alliance (eng.)

Rat für digitale Forschungsmethoden gegründet (Nr. 134/2015 - 03.06.2015)

Ernestus, Heike: Unterstützung in allen Phasen des Forschungsprozesses, in: uni|inform / Ausgabe Juli 2015, S. 3

'Infrastrukturen für Forschung und Lehre' in: Starkes Bündnis. Zehn wissenschaftliche Forschungseinrichtungen bündeln ihre Expertise unter dem Dach des Göttingen Campus, duz SPEZIAL (11/2015), S. 15.

Presentations

"Die Göttingen eResearch Alliance - nachhaltige eResearch-Unterstützung am Göttingen Campus" at ODOK 2016 held by Jessika Rücknagel in Eisenstadt (Austria) on September 28th 2016

"Forschungsdatenmanagement in der Praxis: Erfahrungen aus einem SFB-INF-Projekt und der Göttingen eResearch Alliance" held by Jessika Rücknagel in Frankfurt a.M. (Germany) on September 20th 2016

"Institutional support for research data management - The Göttingen eResearch Alliance" held by Jan Brase in Denver at the SciDataCon 2016 (11-13 September) on September 12th 2016

"Die Göttingen *e*Research Alliance" held by Jens Dierkes to the University's Senatskommission für Informationsmanagement on June 2nd 2016

"Die Göttingen eResearch Alliance - Motivation|Organisation|Angebote" held by Jens Dierkes to the UMG-Bibliothekskommission on May 23rd 2016

"Die Göttingen eResearch Alliance" held by Wolfram Horstmann and Ramin Yahyapour at the universitys Stiftungsrats meeting on March 3rd 2016

"The Göttingen eResearch Alliance: Institutional support for developing data strategies on the campus" held by Jens Dierkes at IDCC 2016 (Amsterdam, 22-25 February 2016)

"Die e-Research Alliance in Göttingen" held by Jens Dierkes at the RDA-Deutschlandtreffen in Potsdam on November 25th 2015

Presentation of the eRA to the UMG research commission at Göttingen University held by Wolfram Horstmann and Ramin Yahyapour on November 2nd 2015

"e(nhanced)Research for the Göttingen Campus" held by Jens Dierkes (SUB internal) in Göttingen June 4th 2015

"e(nhanced)Research for the Göttinen Campus" held by Ulrike Wuttke at GhentCDH &Library Lab meeting in Ghent on May 21st 2015

SUB Göttingen - Abteilung Forschung & Entwicklung - Digitale Forschungsinfrastrukturen | Virtuelle Forschungsumgebungen | Göttingen eResearch Alliance" held by Stefan Schmunk, Sibylle Söring and Ulrike Wuttke on January 19th 2015

6.2 eResearch Council Meetings

Kick-off meeting on 02.06.2015

At the beginning of the meeting the vice president for infrastructures of the university, Prof. Dr. Norbert Lossau, explained the history of origins of the Göttingen eResearch Alliance (eRA). The eResearch Council for the Göttingen Campus should in his view function as linking board between the faculties, institutes and the infrastructure providers at the Campus. Further he emphasised the role of eRA for the next round of the excellence initiative which is expected to stress especially on "digital infrastructure".

eRA supports the Campus in the following aspects

- Bundling of existing capacities and expertise
- Becoming RDM naturally part of best practice for research
- Offer consulting, training and support to researchers at the Göttingen Campus
- Finding service gaps on the campus and propose solutions
- Pooling of experts

Expectations of the Council

- Avoid situations of competition between the existing infrastructure providers
- Establish consulting offers on legal issues
- Propose possibilities to establish workflows for
    - Including data provider in the topic of RDM
    - Gathering and distributing information across the campus
    - Improving the license management all over the campus

After settling expectations and aims towards eRA, the participants used the meeting to figure out the functioning of the council.

2nd meeting on 12.11.2015

After the welcome Dr. Dierkes presented the activities of the eRA since the last meeting and explained the plans for 2016.

- The steering committee has been extended and now the UMG institute for medical informatics is represented in this board.
- There has been an increasing number of consultations, statements and training courses / workshops
- Relaunch of the webpage in November 2015

- Plans for 2016
    - Establish PID-Service for pilot schemes
    - Requirements analysis for the Göttingen Campus and as part of the university strategy
- Introducing the "Campus 2020" concept
    - Prof. Dr. Sporleder presents the ideas for campus laboratories in the Humanities

Dr. Winnige presents the development "Datarama" by the Max Planck Institute for the Study of Religious and Ethnic Diversity.

3rd meeting on 04.04.2016

Dr. Dierkes presented the activities of the eRA and guided the discussion on the following topics:

- One challenge for the next time will be to accompany the funded joint research projects in terms of RDM during the research phase of the project.
- Preparing ideas and possible solutions for a requested publication service for data
- FDM-Tool (a translation of DMPOnline) can be used by eRA. Trying to adapt it to the Göttingen situation
- eRA is working on a large equipment portal in which the council has been interested.
- eRA plans a modular training system which should contain concepts for e-Learning and Train-the Trainer options

At the End of the meeting Dr. August presented the current status of the "Campus Laboratory Advanced Imaging, Microscopy and Spectroscopy.

4th meeting on 26.09.2016

Dr. Dierkes presented the current activities of eRA:

- The research data publication service is under construction. It is already operational but is missing a generic platform and the adaption on individual projects
- Presentation of the Research Data Management Organizer, a tool which is developed in Potsdam and will be tested by eRA
- The portal for large equipment is also under construction. eRA is testing a Swiss solution (http://iris.science-it.ch/landing)
- eRA will submit a proposal within the BMBF-Call "Erforschung des Managements von Forschungsdaten in ihrem Lebenszyklus an Hochschulen und außeruniversitären Forschungseinrichtungen.

- Preparation of a workshop called „Kooperationstreffen Forschungsdaten“ in collaboration with the DINI/Nestor AG Forschungsdaten on 13./14.10.2016
- eRA is involved in the consultation of the planed Cluster for the upcoming excellence initiative.
- In the training and teaching area of eRA it is planned to extend the e-Learning offers especially for Doctoral students.

6.3 Acronyms and abbreviations

AAI	Authentification and Authorisation Infrastructure
AIS	Archaeological Information System
BMBF	Bundesministerium für Bildung und Forschung (Federal Ministry of Education and Research)
CRC	Collaborative Research Center
DFG	Deutsche Forschungsgemeinschaft (German Science Foundation)
DOI	Digital Object Identifier
ePIC	Persistent Identifiers for eResearch (http://www.pidconsortium.eu/)
EPU	Department for Electronic Publishing at SUB
eRA	Göttingen eResearch Alliance
DINI e.V.	Deutsche Initiative für Netzwerkinformation e.V. (German Initiative for Network Information)
GC	Göttingen Campus is an alliance between the university and local non-university research institutions (http://grc.uni-goettingen.de)
GIS	Geographic Information System
GuGW	Geistes- und Gesellschaftswissenschaften (Humanities)
GWDG	Gesellschaft für wissenschaftliche Datenverarbeitung mbH Göttingen
INF	Subproject for Infrastructure within joint research projects
MPI	Max-Planck-Institute
MWK	Lower Saxony Ministry of Science and Culture

PI	Principle Investigator
PID	Persistent Identifier
PubMED	US National Library of Medicine National Institutes of Health
RDD	Research and Development Department at SUB
RDM	Research data management
RTG	Research training group
SUB	Göttingen State and University Library
UMG	University Medical Center Göttingen

6.4 Online information (selection)

- Göttingen Campus – Strong Alliance: http://www.goettingen-campus.de/fileadmin/Documents/Broschuere_Campus_Web.pdf
- Göttingen eResearch Alliance: http://eresearch.uni-goettingen.de
- Göttingen University – Facts and Figures (German only): http://www.uni-goettingen.de/en/24499.html
- The Göttingen Campus: http://www.goettingen-campus.de/