
DIG-UM

DIGITAL TRANSFORMATION IN THE RESEARCH ON UNIVERSE AND MATTER

GUIDELINES

CONTEXT

Research in the field of Universe and Matter brings together about 10,000 scientists from German universities and research centers working on astrophysics, astroparticle physics, hadron and nuclear physics, particle physics, accelerator research, as well as research with photons, neutrons and ion beams. What unites these scientists is research at leading national and international research facilities such as accelerators with their experiments and observatories. Big data and the ability to manage the upcoming data avalanche will be a prerequisite for the scientific exploitation of the next generation of research facilities, and thus for transformative or even revolutionary new scientific discoveries.

The Federal Ministry of Education and Research (*BMBF*) supports this basic research under the acronym *ErUM* (=Erforschung von Universum und Materie) and has published the Action Plan *ErUM-Data* for funding digital transformation in basic research [1]. A networking and transfer office, referred to as the *ErUM-Data-Hub*, will support activities aiming at the digital transformation process.

DIG-UM ORGANIZATIONAL STRUCTURE

With the foundation of *DIG-UM*, the *ErUM* scientists constitute a bottom-up organization for synergetic research on the digital transformation. The goal of its collaborative work is the joint implementation of the objectives stated in the community white paper *Challenges and Opportunities of Digital Transformation in Fundamental Research on Universe and Matter - Recommendations of the ErUM Committees* [2]. With the here-described *DIG-UM* guidelines, the organizational basis for the collaborative work is laid down. The *DIG-UM* structure is presented in figure 1 and is detailed below. Note that there will be a strong link to the support provided by the above-mentioned *ErUM-Data-Hub*.

Organization DIG-UM

Overview Board (OB) 8 ErUM Committee Chairs, 1 Resource Provider Board Chair, 1 Spokesperson, 1 BMBF Representative, 1 PT-DESY Representative					
Coordination	Spokesperson / 5 Co-spokespersons	Digitization Board (DB) 1 Spokesperson, 5 Co-spokespersons, 8 Experts from ErUM committees, 1 Resource Provider Representative			Resource Provider Board (RB) 10 Resource Provider Representatives
	Annual Conference of the ErUM-Data Working Groups				
Topic Groups	Federated Infrastructures Coordinators, Experts <i>Compute power</i> <i>Utilization</i> <i>Workflows</i> ...	Big Data Analytics Coordinators, Experts <i>Algorithms</i> <i>Autonomization</i> <i>Control & Preservation</i> ...	Research Data Coordinators, Experts <i>Data models</i> <i>Management</i> <i>Curation</i> ...	User Interface Coordinators, Experts <i>Scientists' questions</i> <i>Developers' work</i> <i>User support</i> ...	Knowledge Distribution Coordinators, Experts <i>Workshops</i> <i>Schools</i> ...

Figure 1: DIG-UM, Organigram Digital Transformation in the research on Universe and Matter

OVERARCHING ASPECTS

The foundation and driving force behind the joint work is the continuously evolving vision that modern digitization will substantially accelerate progress in ErUM basic research. Digitization is a means to an end.

In all decisions, efforts to reach a consensus are paramount. If, in exceptional cases, a consensus decision is not possible, the responsible board will decide by simple majority, abstentions not counted.

REFERENCES

- [1] Federal Ministry of Education and Research, *Action Plan ErUM-Data - from Big Data to Smart Data*, 12-Nov-2020, [Link](#)
- [2] Recommendations of the ErUM Committees, *Challenges and Opportunities of Digital Transformation in Fundamental Research on Universe and Matter*, 29-Apr-2019, Printed at DESY, [Link](#)

OVERVIEW BOARD

The OB has directive responsibility for the DIG-UM consortium. Members of the OB are the elected chairpersons of the 8 ErUM committees, and the chairperson of the Resource Provider Board. These 9 members are entitled to vote. In case of conflicts of interest, participation in votes is not permitted. All representatives have their deputy who replace the representative if they cannot participate. The OB elects its chairperson and deputy chairperson. The OB meets at least twice per year by invitation of the OB chair. Minutes of meetings, excluding confidential information, are made available to the ErUM communities. The DIG-UM Spokesperson, a representative of the BMBF and a representative of PT-DESY are invited to the meetings. In order to ensure that all representatives and their deputies are continuously informed, the electronic flow of information shall always include all deputies of the OB members. The specific tasks of the OB include:

1. Organization of the Spokesperson election: the OB forms a selection committee, which presents its results to the OB. The OB proposes the Spokesperson to the annual meeting. In a secret ballot of those present, the candidate must obtain at least 50% of the votes, abstentions not counted.
2. Changes in the framework conditions of the umbrella organization and amendment of topics are pre-formulated in the OB and require confirmation at the annual conference of the ErUM-Data working groups with at least 50% of the votes, abstentions not counted.
3. Discharge of the Spokesperson and the Digitization Board with regard to important decisions and finances.
4. Appointment of the 5 Co-Spokespersons who are the coordinators of the Topic Groups. Appointment of the 5 deputy coordinators of the Topic Groups.

DIGITIZATION BOARD

The DB is the steering committee for the executive tasks of DIG-UM. This is where the medium-term overarching decisions are made. Each committee sends a representative with expertise in modern digitization to this board. In case of absence he/she has a deputy. The representative and his/her deputy are appointed by the elected committees for a period that does not exceed the committee's term of office. Further members of the DB are the Spokesperson, the five Co-Spokespersons, and the chairperson of the Resource Provider Board. All members are entitled to vote. In case of conflicts of interest, participation in votes is not permitted.

The Spokesperson chairs the DB. A deputy chair is elected by the DB. Meetings of the DB take place as required. Reports by the Spokesperson and the topic coordinators are mandatory. Minutes of meetings, excluding confidential information, are made available to the ErUM communities. To ensure that all representatives are kept continuously informed, the electronic information flow shall always include all deputies. The DB reports to the Overview Board. The DB takes measures that products of general interest to DIG-UM continue to have impact after the end of funding. Examples of such products are contact databases and training concepts, which are created as part of the ErUM-Data-Hub project funding [1].

RESOURCE PROVIDER BOARD

The RB is the board representing the institutions providing computing resources for the ErUM research area. Initially, this includes the 3 Helmholtz centers DESY, GSI, KIT, the Leibniz Institute for Astrophysics Potsdam (AIP), and the university and Max Planck GRID TIER2 centres. The composition of the RB can be amended by the Overview Board. The resource providers nominate a deputy who replaces their representative if the representative cannot participate. Minutes of meetings, excluding confidential information, are made available to the ErUM communities. In order to keep the representatives continuously informed, the electronic information flow shall always include all deputies.

The representatives of the major resource providers (DESY, GSI, KIT, AIP) and the group of TIER2 centers in turn provide the chairperson for 1 year, which results in a 5-year cycle. A deputy chair is appointed by the members of the RB who will take over as a chair in the subsequent period. The chairperson represents the Resource Providers on the Overview Board and Digitization Board. The RB reports to the Overview Board.

SPOKESPERSON

The Spokesperson will chair DIG-UM. The mandate includes the representation of DIG-UM towards science, politics, industry etc. as well as the executive day-to-day work. The mandate is granted by an election procedure for 2 years, re-election is possible. In order to ensure a quick build-up of DIG-UM, a Spokesperson for the 1-year founding phase of DIG-UM is appointed by the Overview Board. From the following phase on, the Spokesperson will be sought by a selection committee of the Overview Board and elected by the annual meeting. The Spokesperson reports to the Overview Board.

FIVE CO-SPOKESPERSONS

They act as the chairpersons of the five Topic Groups and act as a stand-in for the Spokesperson. The 5 Co-Spokespersons are nominated by the Digitization Board and appointed by the Overview Board.

TOPIC GROUPS

A particular challenge for the DIG-UM consortium representing research communities with altogether 10,000 researchers is the heterogeneity of the working groups from the different areas of ErUM. This concerns the size of the experiments and observatories; the amount and type of data; the number of actively participating scientists; the methods used in the areas of data management, algorithms and computing necessary for the success of the experiments; and the level of knowledge on and experience with these procedures. Under these circumstances, substantial improvements and acceleration of ErUM basic research through digital transformation require a suitably working structure that provide opportunities for the ErUM working groups for continuous professional exchange. Following the recommendation of the ErUM Committees [2], DIG-UM constitutes the Topic Groups "Federated Infrastructures", "Big Data Analytics", "Research Data", "User Interface" and "Knowledge Distribution" (figure 1).

TGs offer a forum for communication and cooperation of different working groups interested in aspects of the corresponding topics. Under guidance of the TG chairpersons and deputies (see below), they collect the numerous concepts and ideas from the ErUM communities and help bringing them together into purposeful collaborative projects. Proposals for technical solutions, their implementation and suggestions for prioritization are developed. In doing so, boundary conditions caused by current national (e.g. research infrastructures, universities, NFDI) and international developments are considered (e.g. int. collaboration of large experiments, EOSC). In addition, partners who are interested in the projects and want to actively participate should be identified. In suitable subgroups the partners develop sustainable solutions in the sense of the above mentioned vision for the modern digitization of ErUM. The progress in the implementation of the solutions will be reported and evaluated in the appropriate TG.

Each TG has a chairperson and a deputy. The ErUM groups working within the TG are invited to propose suitable chairpersons to the Digitization Board. After pre-selection by the Digitization Board, the chairpersons and their deputies will be appointed by the Overview Board for a period of 2 years. Chairpersons should be actively involved in the research area themselves. Meetings of the TGs take place as required, usually at least twice a year. The chairpersons report to the Digitization Board on projects, progress and challenges. The TGs are in close contact with the ErUM-Data-Hub [1], exchange general ideas arising in the ErUM working groups, and take advantage of products and support provided by the ErUM-Data-Hub.

ANNUAL CONFERENCE

Every year a conference covering topics related to digital transformation will be organized, with focus on the topics worked on by the ErUM communities. In addition to scientific exchange, the annual meeting takes decisions (related to possible changes in the guidelines of the umbrella organization) and elects the Spokesperson by secret ballot. All scientists in ErUM who are also entitled to vote in the election of the ErUM committees are entitled to vote. Proposals for decisions must be submitted to the Overview Board at least 10 weeks before the start of the conference and must be made available to all communities by the committees at least 8 weeks before the start of the conference. The final version of the proposal for decision should be made available to all ErUM members at least 14 days before the start of the conference.