Project plan:

ADED-PROJECT

Background/Relevance

There is an increasing demand to improve the availability of research and source material/data produced by public institutions, including universities, for researchers, policy makers and the general public. The primary objective of this project is to increase the accessibility of archaeological and scientific documentation through a common e-infrastructure. This infrastructure created through the Archaeological Digital Excavation Documentation (ADED) project will ensure access to geo-tagged digital documentation created through surveys and excavations of archaeological sites in Norway.

Archaeological excavations document (pre-)historic, human habitats, monuments and artefacts. An important part of this documentation pertains to the methods and techniques used during the excavation. Moreover, as part of the excavations artefacts and other finds are removed from the excavation site and documented and preserved as part of museum collections. It is of vital importance that all this information and data on the sites, the monuments and the artefacts are stored, maintained and presented in a coherent and easily available fashion.

The majority of excavations in Norway are rescue excavations undertaken in connection with road constructions and other large development projects. These excavations are primarily carried out by the university museums and the Norwegian Institute for Cultural Heritage Research (NIKU). However, over the next few years the counties will carry out an increasing number of smaller excavations, mainly directly associated with surveying undertaken in the primary phase of development projects. The documentation from surveys conducted by the counties is in varying degrees archived at Riksantikvaren, at the museums, or locally at each county. ADED will address this fragmentation of information storage, and ensure that all excavation documentation is available as open data, and through a joint web interface together with existing resources for accessing artefacts and images. This initiative is part of an ongoing policy to provide access to archival material that only a select few previously had access to. In this manner the project will meet society's request for more openness and easier access to material, resources and research, as expressed in St. Meld. 23 (2012-2013) *Digital agenda for Norge*.

The university museums administrate the primary documentation from archaeological fieldwork in Norway, and have the responsibility to keep this information for future generations; maintaining the collections as an important resource on behalf of the society. This substantial amount of archive material is the foundation for all archaeological research on early Norwegian history. Over the last ten years the analogue documentation techniques are being replaced by digital documentation. There are now large amounts of

publicly funded digitally born documentation that should be made available for researchers, students and the general public.

The museums' archives are comprised of excavation reports, survey documentation, plans, drawings, maps, and information from the public concerning artefacts and ancient monuments. A large portion of this documentation is in paper form and dates as far back as the end of the 1700s, while the most recent is in a digital format. These archives, as well as being fundamental for archaeological research, function as a resource, a knowledge bank, for cultural heritage management. This project will concentrate on one aspect of this material – the digitally born excavation documentation.

The management of this material requires a sustainable infrastructure, enabling proper procedures and ensuring joint access to the material. Each of the five university museums, with archaeological archives, has their own local archives related to a designated geographical area. Joint routines for the documentation born digital through archaeological excavations are not yet in place. ADED will address this, building a system where excavation documentation is included in the digital museum archives.

The common e-infrastructure for the university museums in Norway is managed by the MUSIT partnership. MUSIT develops and maintains the e-infrastructure and joint database solutions for the university museums of Norway. One of the results of this partnership is the decision to use the survey program *Intrasis* as a common platform and standard for archaeological field documentation. NIKU and RA have taken part in the development of this standard. NIKU uses the *Intrasis* platform, and the documentation produced by NIKU is archived at the museums. Artefact information and images resulting from the excavations carried out by NIKUare directly entered into the MUSIT databases by NIKU..

Photographic documentation as well as the final preparation of drawings is now digital. A digitized version of the university museums' archaeological artefact collections were made available online in 2009 (http://www.unimus.no/arkeologi/forskning/). It contains artefact descriptions, high-resolution images, and geo-tagging. The proposed new e-infrastructure will link the geographical data from the excavations with the artefact collections, thereby creating a comprehensive and unique research resource with information about Norwegian prehistory and Middle Ages

Main Goal

The primary objective of this project is to increase the accessibility of archaeological and scientific documentation through a common digital infrastructure. This will create new opportunities for quantitative and qualitative research as it opens up new venues to existing resources. Together, the Norwegian university museums have a large number of archaeological digital datasets that span different periods, domains and regions. There are approximately 150 excavations every year in Norway, and the research potential in the accumulated presentation of these excavations is enormous. There is a growing demand among researchers for complete excavation documentation and easily accessible overview of sites that indicate the type of structures (houses, graves) that have been documented. Unfortunately, the potential for research based upon this documentation is still constrained by the difficult access to this material and the non-homogenous archiving procedures.

ADED will amend this. Through ADED researchers will be able to compare structures from different excavations and be able to undertake larger quantitative analysis than has

hitherto been possible. ADED will migrate data and facilitate studies across separate excavations.

Each university museum in Norway is responsible for the excavations taking place in its district (there are five districts). Traditionally, there has been a tendency that archaeological research has been limited to one museum district. Projects that have taken into account material from several museum districts, like the Hardangervidda project, or the collaboration between the museums in Bergen and Oslo concerning the Aursjøen hydroelectricity plans, are exceptions. There are a number of reasons for this. When more information becomes digitally available joint projects will be greatly facilitated and easier to implement across the museum districts. The many Early Iron Age houses that have been found at rescue excavations throughout Norway since the early 1990s are examples of documentation stemming from different excavations that should be compared and analysed as a whole. Through the proposed e-infrastructure and interface to all the digital documentation, a new arena will be developed that opens up for a greater depth of interregional research into our national heritage. Furthermore, when research into Norwegian (pre-)history is presented as a whole, it enables comparison with similar research conducted in neighbouring countries.

Cultural heritage management in Norway is another prime supplier of information used for research. Both the Norwegian Institute for Cultural Heritage Research (NIKU) and the Directorate for Cultural Heritage (RA), will be included as important contributors to the project, and will be among the primary users of this digital resource. This project will not only benefit those working within cultural heritage management in the counties, NIKU and RA, but the incorporation of their data into the interface will allow for a greater transparency and availability of data for research. Additionally, the interface will contribute to a more effective work management and at the same time give a better knowledge base for decisions made concerning Cultural Heritage. Once published as open data, it can be presented through several internet portals, at the museums, RA and elsewhere.

Current status

Archaeological research documentation, which is fundamental for all archaeological research, is stored in the museums' archives, often in paper format.

Previous digitization projects in Norway have digitized parts of these archives. Through the Documentation project (1991-1997) and the Museum Project (1998-2006) the museums of Oslo, Bergen, Trondheim and Tromsø were able to convert their written artefact catalogues into digital form, and to scan large amounts of analogue images. During the same period, the museum archives in Bergen and Trondheim have digitalized and made available letters, reports and other types of written documentation.

The museums and NIKU are using the MUSIT infrastructure to archive and publish digitized artefact descriptions and photographs. As a result, as of august 2018 more than 750,000 images and more than 1.4 million entries from the archaeological artefact database are online (http://www.unimus.no). ADED will significantly augment the existing resources by linking the existing information on artefacts to digital excavation documentation, survey documentation, etc., giving researchers, students and the public better access to a well of information about Norwegian archaeological research and

Norwegian history, thus increasing the quality and quantity of research and source material.

The last few years has seen an increase in digital documentation. Digital photography has replaced analogue photo documentation, and excavation surfaces are documented by total stations (TPS), geopositioning systems (GPS) and photogrammetry, with the data being presented and analysed in GIS-programs. The large increase in the number of available photographs is partly due to the publication of geo-tagged excavation photographs as part of the excavation documentation.

All the museums and NIKU record their digital excavation data with *Intrasis*, a program developed for archaeology by the Swedish National Heritage Board (www.intrasis.com). In Norway *Intrasis* was used for the first time in connection with the excavations at Kaupang in Larvik, Vestfold (Kaupangundersøkelsen 2000-2003). *Intrasis* is an application using ArcGIS as map engine. One of the main reasons for choosing *Intrasis* is that it saves the files as shape files, which is a widely used map format. The routine for long time storage at the Museum of Cultural History, University of Oslo, is to extract data from *Intrasis* and store this information as geodatabases in shape and SOSI format (www.statkart.no/Standarder/SOSI/) on dedicated university servers.

The main object of the ADED project is to capture the information produced by *Intrasis* and related software (TPS, GPS, photogrammetry) used during excavations, link it to existing information residing in the MUSIT infrastructure and present all this in a form that enables coherent and comprehensive overviews of related information.

The necessity for dissemination and re-use of archaeological excavation data is discussed internationally, and there are several European initiatives, with aims similar to ADED, working towards enabling easy access to archaeological data. The ARIADNE project (http://www.ariadne-infrastructure.eu/) brings together and integrates existing archaeological research data infrastructures to allow researchers to use the various distributed datasets, and new and powerful technologies, as an integral component of the archaeological research methodology. The Museum of Cultural History (KHM) signed a cooperation agreement with ARIADNE, and is partner in the following ARIADNE plus project which allows the opportunity to take part in the European infrastructure for archaeology.

KHM has recently accepted an invitation from the Archaeological Data Service (ADS) in York, England to join the proposed COST Action *Saving European Archaeology from the Digital Dark Age* (SEADDA). This COST Action has been proposed through an awareness of archaeologists in Europe to archive and disseminate their data and the fact that most countries have no acceptable repositories for such data. There are countries with available options, but barriers to deposit, use, and re-use persist. The proposed COST Action will focus on knowledge transfer and the creation of a best-practice network to support the widening of archiving options for archaeological data, and to better facilitate dissemination and re-use.

ADS is also responsible for the OASIS project (http://oasis.ac.uk/) which is working to provide deeper and richer access to excavation results (http//:ads.ahds.ac.uk/). In the Netherlands, DANS is responsible for EDNA – the e-depot for Dutch archaeology (http://www.dans.knaw.nl/en/content/categorieen/projecten/edna-e-depot-dutch-

archaeology). OASIS and DANS function as repositories that give access to excavations as separate units. Riksantikvarieämbetet in Sweden has started the project Digital Archaeological Processes (DAP) to compile an overview of existing digital archaeological excavation documentation, and to create a system for long time storage and dissemination.

Norway, unlike other countries, has the advantage that archaeological excavations have been conducted by very few institutions and is strictly regulated. The documentation obtained from excavations, along with the artefacts are stored and managed by the university museums. This situation is now changing somewhat in that counties will be responsible for more excavations in the coming years. We are just in time to establish routines for the data flow and to have an operational e-Infrastructure that ensures that all relevant information is stored and distributed in a common and sustainable way (fig. 1).

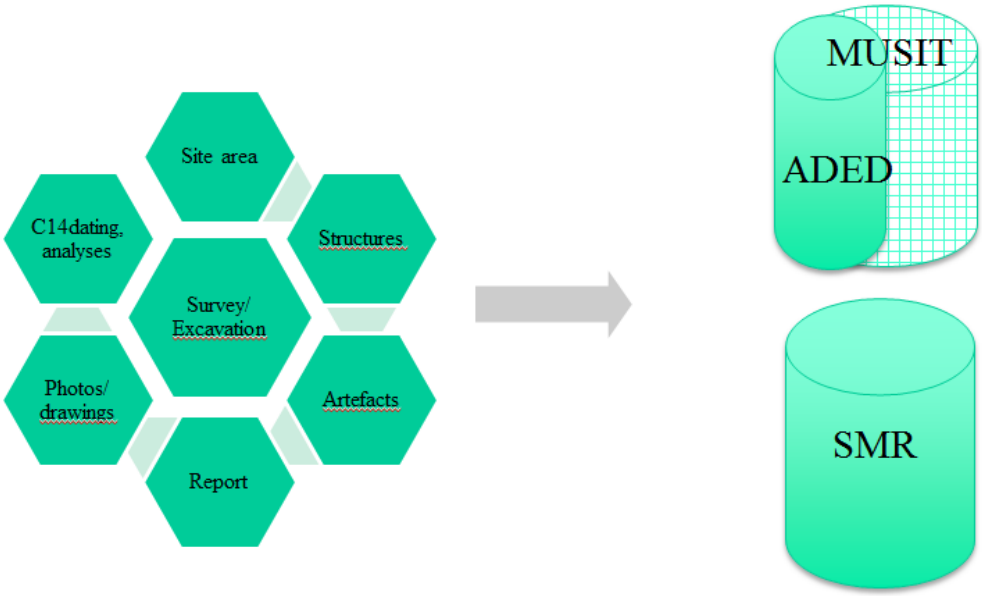

Fig. 1. Flow of data collected at archaeological surveys and excavations from counties, NIKU and museums to ADED integrated in MUSIT and to the Sites and Monuments Record, Askeladden.

Milestones

The ADED project is divided into ten work packages. Some of these will run simultaneously. The end of each package is considered a milestone within the project. For details about the packages see the chapter Work plan, time-schedule and deliverables**.** The last package will be the ongoing and future maintenance of the database after the project ends and therefore falls outside the other milestones.

Timeframe and consumption

The project period is from the 2nd of January 2018 to the 31st of Mars 2021. The project coordinator is employed from the 13th of august 2018 and this is when the actual work within the project starts. The members of the work-, reference and steering groups are all contributing to the project at specified and specific timeframes. These are discussed more in the chapter Work plan, time-schedule and deliverables. The project leader oversees the process and clocks hours in the project when necessary.

Place for implementation and area requirements
The work within the project will involve the university museums, Vestfold and møre and Romsdal counties, NIKU and the RA. The Project management is based in Oslo at KHM. All area requirements for management and meetings in Oslo is covered by existing premises at KHM. The work at the other institutions will take place at the offices of those involved.

Involved parties in the project

Project owner:	KHM
Project leader:	Espen Uleberg
Project coordinator:	Jakob Kile-Vesik

Steering group:	Asbjørn Engevik, UM, Asbjorn.Engevik@uib.no
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	Erik Kjellman, TMU, erik.kjellman@uit.no

Partners and cooperation
The partners in the project are the university museums of Norway responsible for archaeological excavations, MUSIT and the Directorate of Cultural Heritage (RA). The museums are responsible for archiving documentation from archaeological excavations While RA is responsible for the national site and monuments register, *Askeladden*. RA has recently developed a new infrastructure for *Askeladden,* and is working on new web interfaces for accessing the register. MUSIT is the museum's cooperation to create common data systems.

The ADED e-infrastructure will eventually be included in the MUSIT e-infrastructure for the university museums. The material and experiences gained in ADED will contribute to Norway's work in ARIADNE, the proposed COST action and the Nordic cooperation to make archaeological data FAIR (Findable, Accessible, Interoperable and Re-usable).

The Museum of Cultural History, University of Oslo will be responsible for the coordination of the project. The long term plan for KHM and the MUSIT partnership is to establish an e-infrastructure for the university museums that are both sustainable and which gives easy access to all the information and documentation produced by the museums related to archaeological excavations. ADED will be an important addition to the system established and managed by MUSIT.

Each partner in the project will be responsible for the datasets they produce including making them available for inclusion in the ADED infrastructure.

Project management and organisation
The Museum of Cultural History, University of Oslo, has an established group of people implementing and developing digital archaeology.

The museum has used digital excavation documentation for more than twenty years, and is a major partner in the national cooperation to develop database systems for the university museums in Norway. This has been done through several consecutive projects since 1992, and continues today as part of the MUSIT collaborative partnership. The leader of the coordinating group for Cultural history in MUSIT, and the leader of the forum for field documentation in MUSIT are both employed at the Museum of Cultural History.

The project management will build on the existing cooperation developed within MUSIT (Fig. 3). The development within the project will be anchored in the MUSIT forum for field documentation and the MUSIT coordinating group for cultural history. Vitenskapsmuseet, NTNU, (VM) is not a partner in the project, but is included in the discussions through VMs participation as observer in the steering and reference groups. The outcome of the project will be available for all MUSIT partners.

The project will report twice a year to ADEDs steering group. The project leader will also function as secretary for the steering group. The steering group includes the university museums and RA. Deviations from the original plan will be discussed and handled by this group. The reference group for the project will include the university museums, RA and NIKU. One external representative will be included to broaden the knowledge base of the group. (Fig. 4 and 5)

After the project period, the e-infrastructure will be incorporated into the MUSIT framework-infrastructure, and be managed as part of the common infrastructure for the university museums. MUSIT has an annual budget of approx. NOK 10 mill.

The work in WP05 and 07 will be carried out at the partner museums. Each museum will be responsible for the normalization (WP05) and migration (WP07) of its own set of data. Funding for this work will be distributed to the museums according to how many digital excavations they reported by end of October 2017 (Fig. 2).

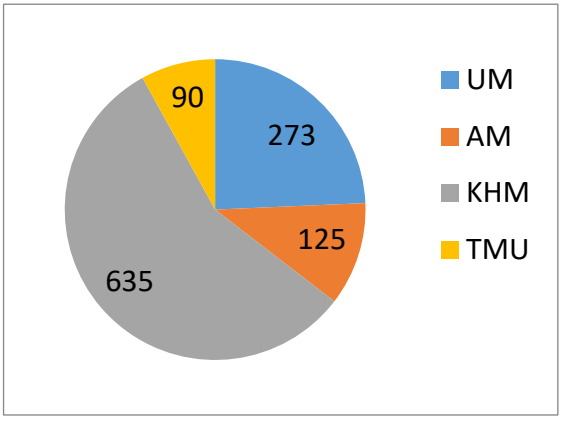

Fig. 2. Number of excavations reported by the end of October 2017.
UM Bergen University museum of Bergen
AM Arkeologisk museum, University of Stavanger
KHM Museum of Cultural History, University of Oslo
TMU Tromsø museum - The University Museum , The arctic university of Norway -

MUSIT – the organization

NHM - Museum of Natural History, University of Oslo
UM – The University Museum, University of Bergen
TMU – Tromsø museum - The University Museum
UM – Bergen University museum of Bergen
AM – Arkeologisk museum, University of Stavanger
KHM – Museum of Cultural History, University of

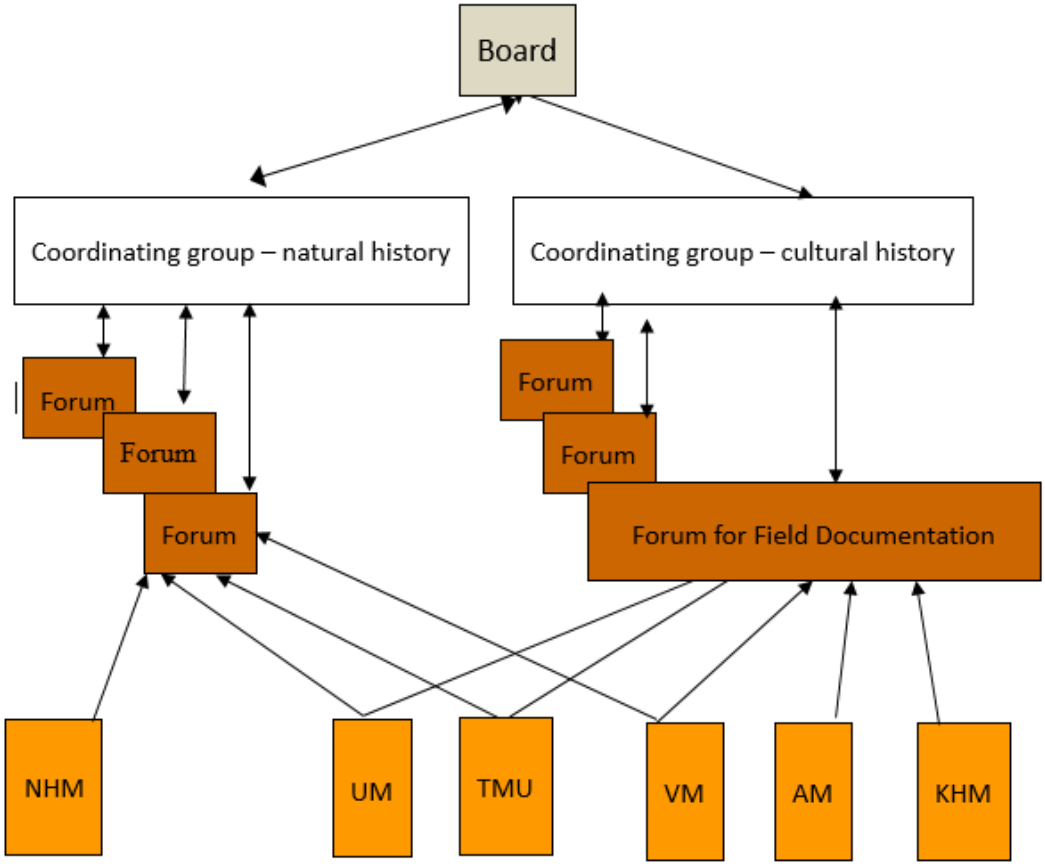

Fig. 3. The chart shows the MUSIT organization. The Norwegian university museums cooperates in MUSIT to create common database systems for the university museums. The board consists of three representatives from the museums and one external representative. Inaddition, the leader is elected from one of the the universities.

ADED– the partners, steering and reference group

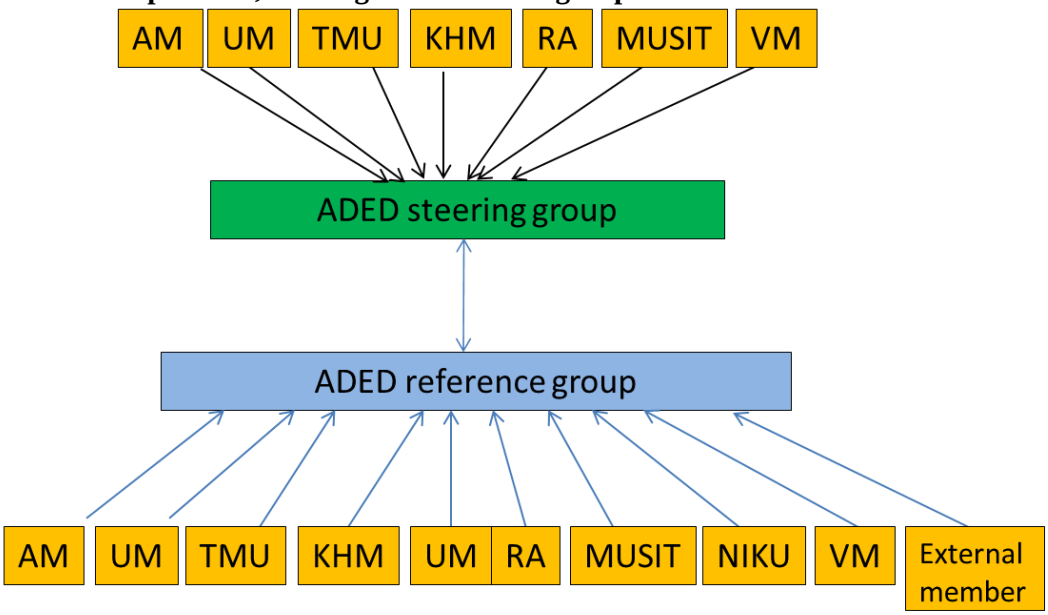

Fig. 4. The figure illustrates the connection between ADED's steering group and reference group and MUSIT's Coordinating group and Forum for Field Documentation. ADED's reference group will include one external representative.
UM Bergen University museum of Bergen
AM Arkeologisk museum, University of Stavanger
TMU Tromsø museum - The University Museum , The arctic university of Norway
KHM Museum of Cultural History, University of Oslo
NHM Museum of Natural History, University of Oslo
NIKU Norwegian Institute for Cultural Research
RA Directorate for Cultural Heritage

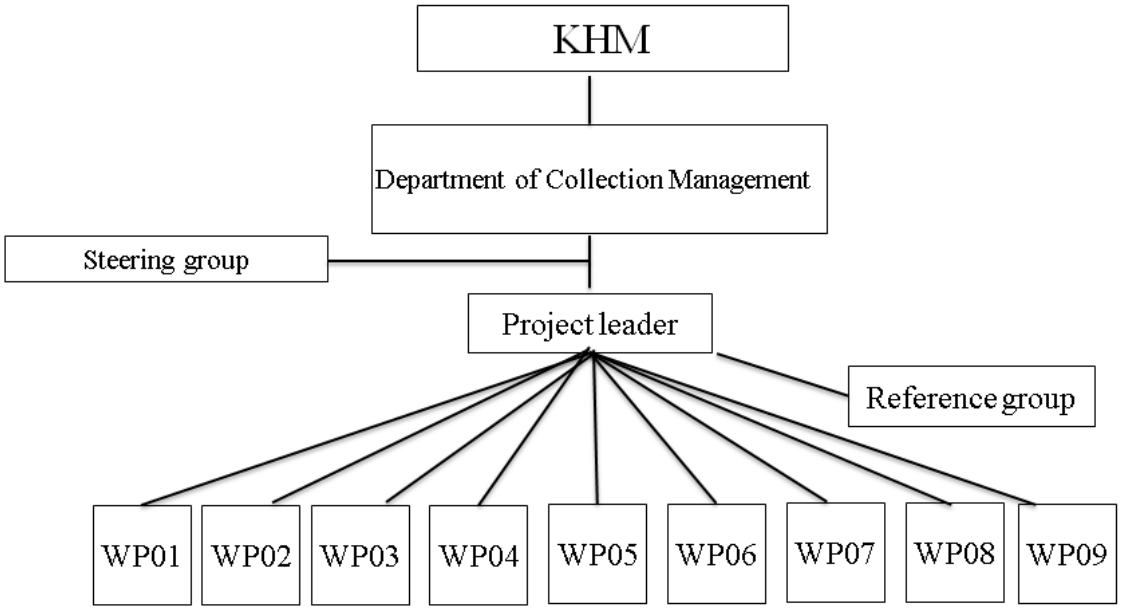

Fig. 5. Organization chart for ADED.

Work plan, time-schedule and deliverables

The work in the work packages will take place within two years and eight months, until the end of March 2021. The annotation of the data presupposes understanding of archaeological field documentation. It will therefore be necessary to employ people with this kind of knowledge, i.e. field archaeologists. The project will employ archaeologists, specialist of CIDOC-CRM modelling, system developers with good knowledge of GIS and database technology and a developer responsible for dissemination, including web-based search technology, web design and API development. The main portions of this work will be carried out at KHM. In WP05 and 07, annotation and migration, each museum will be responsible for its own field documentation data. Project funding for this work will be distributed according to the number of digital excavation projects at each museum.

Separate work packages will be responsible for different parts of the project. To develop the infrastructure and follow the work in the project period, seven meetings for the project partners are planned in the reference group where VM is observer. Two meetings will be held within the first six months, and then there will be one meeting every half year in the remaining project period.

The first project period, until the end of 2018,will focus on data modelling of the infrastructure, including establishing the data flow between the counties, the Directorate for Cultural Heritage (RA) and the museums. It will build on the existing standards developed by the forum for field documentation in MUSIT, where also RA is represented, and through ongoing work and development of IT architecture in MUSIT. The data model will be updated throughout the project, as MUSITs new IT-architecture is still being developed. This CIDOC-CRM model will also provide a basis for international data distribution. As part of the work, a set of core metadata for archaeological excavations will be established. One of the outcomes is to define the type of documentation that shall be stored at RA and the museums.

The system and web developers will work closely with the archaeologists to ensure that the e-infrastructure is in tune with the data and standards adopted in the project, including the implementation of geodatabases and GML or SOSI repositories for the geographical information. During this phase, existing excavation data will be annotated and prepared for migration, and later migrated to the e-infrastructure. At the same time, links to other parts of the MUSIT infrastructure and RAs *Askeladden* will be established. The WPs of annotating, migrating and publishing will run simultaneously to ensure that the work packages are coherent and that the end result will be excellent.

During the final stage of the project, semi-automatic routines for converting new excavation data will be established, and the remaining digital excavation data made available for the project will be converted and migrated to the infrastructure.
A major challenge will be the variability in the existing digital excavation documentation. Common standards have not existed very long. In addition, more recent excavations may need to adjust the documentation standard to the situation at the actual site. The first priority in ADED is to migrate all projects since 2011, and then older projects will be converted.
Since project administration was employed from august 2018, the time schedule has been restructured. The project coordinator is employed until the end of March 2021. The activities within the first quarter will be completed in the first autumn quarter. The activities can be finished within the project period by employing more people.

	Timeplan (quarter)										
Activity	**18-3**	**18-4**	**19-1**	**19-2**	**19-3**	**19-4**	**20-1**	**20-2**	**20-3**	**20-4**	**21-1**
WP01 Project management											
Administration of WP01											
1. project board meeting											
1. reference group meeting											
2. reference group meeting											
2. project board meeting											
3. reference group meeting											
4. reference group meeting											
3. project board meeting											
5. reference group meeting											
4. project board meeting											
6. reference group meeting											
5. project board meeting											
7. reference group meeting											
6. project board meeting											
WP02 EStablISH core data for the excavation documentation											
Administration of WP02											
Preparation for meeting											
1. meeting											
Preparation for meeting											
2. meeting and finalizing											
WP03 Describe dataflow (Counties, Riksantikvaren, museums)											
Administration of WP03											
Establish working group, RA, museums, two counties											
1. meeting											
First draft, preparing next meeting											
2. meeting											
Second draft											
Hearing											
3. meeting, finalizing											
WP04 Implement ADED's geodatabase for storage											
Administration											
Describing functionality											
Establish geoserver with testenvironment at UiO											
First version running on testenvironment											
DOFFIN											
Signing contract with developer											
First version implemented											
Final version implmented											
WP05 Annote and prepare data for migration											

Administration											
Establishing group											
Detailing the annotation work											
Each museum delievering detailed plan for the work											
Launch of annotation work - workshop											
Annotation work - regular reporting											
WP06 Establish interface for uploading new data											
Administration											
Detailing the work at KHM and external developer											
Meeting with innkjøpsavdeingen, UiO											
DOFFIN											
Signing contract with developer											
First version implmented											
Testing and uploading data											
Final version implemented											
testing and accepting delievery											
WP07 Data migration											
Administration											
Establishing working group											
Introducing the solution - workshop											
First projects migrated to ADED											
Continued migration - regular progress reports from the museums											
WP08 Webinterface for open data											
Administration											
Detailing the delievery											
Meeting innkjøpsseksjonen											
DOFFIN											
Signing contract with developer											
First version of the Open Data Webinterface in test environment											
Frist version of the Open Data Webinterface online											
testing and accepting delievery											
WP09 Integration in MUSIT's data model											
Administration											
Establishing group											
Signing contract with participants (EDD, DS)											
Seminars											
Description of CIDOC CRM data model											
Continued attention to integration of ADED in MUSIT											
WP10 Vedlikehold etter prosjektperioden											

Fig. 6. Time-schedule for the work packages.

WP	Description	Responsible	Participants	1000 kr
WP01	**Project coordination, announcements** Museum of Cultural History (KHM) will be responsible for project coordination and announcements.	KHM		550
WP02	**Establish core metadata for digital excavation documentation** WP2 lead by KHM started as the museums' contribution to ADED and as part of the work on the new MUSIT IT-architecture. Existing datasets are evaluated, and a set of core meta data that shall be imported from the different separate excavations into the common geodatabase will be defined.	KHM	AM, UM, TMU, VM, RA, MUSIT, NIKU	440
WP03	**Describe the data flow - Counties, NIKU, RA, Museums** WP03 is led by KHM. The counties are responsible for the initial archaeological surveys that also can include smaller excavations. WP03 shall describe best practise for the documentation and outline how this information shall be archived and integrated with documentation from the sites and monuments record *Askeladden* and the MUSIT infrastructure.	KHM	AM, UM, TMU, VM, RA	330
WP04	**Implement repository/geodatabase** WP04 is led by KHM. The geographical excavation documentation shall be archived and published through a common map-based web-interface. External consultant will be engaged to implement the repository	KHM	RA, DS, External consultants	4950
WP05	**Annotate and prepare data for migration** KHM will lead and coordinate WP05. Each museum will be responsible for annotating and preparing its existing excavation projects for migration. Funding is distributed proportionate to the reported number of digitally documented excavations.	KHM	KHM, AM, UM, TMU, VM	2400
WP06	**Establish interface for uploading new data** KHM will lead WP06. The interface for uploading new data will be developed by external consultant. This includes handling import and data conversion of different geographical projections.	KHM	MUSIT, RA, KHM, AM, UM, TMU, VM, DS	2500
WP07	**Data migration** KHM will lead and coordinate WP07. Each excavation project will be archived in the repository, and the core metadata described in WP02 will be migrated to the common storage solution (e.g. geodatabase). This storage solution will contain information about all archaeological excavations in Norway. System developers working for MUSIT at DS will be engaged in this process.	KHM	MUSIT, KHM, AM, UM, TMU, VM, DS	640
WP08	**Open Data Web interface** The data shall be accessible as open data. It will be possible to harvest data base from a map-based interface, and the data can be exported in different geographical projections.	KHM	RA, AM, UM, VM, TMU, Ext.cons.	2500
WP09	**Integration with MUSITs data model.** The data model shall be related to MUSITs data model. This will ensure seamless and coherent connections between the digitally documented structures, photography's, drawings, analyses and excavation reports. Specialists of CIDOC-CRM will be engaged in this work.	KHM	DS, EDD	2415
WP10	**Maintenance** The results from ADED will become part of the MUSIT infrastructure, and maintained as part of this.	MUSIT	MUSIT	

Fig. 7. Description of work packages.

Description – Implementation of measures

The proposal concerns an important addition to the MUSIT e-infrastructure. ADED is an extension and further development of the digitizing work initiated by the archaeological university museums in 1991. The results from ADED will in this way be linked to other elements of the current MUSIT e-infrastructure, primarily artefacts, images and archival material already digitized.

The data flow and link to RAs *Askeladden* will be an important part of ADED. The infrastructure will be electronically accessible through map-based web interfaces. It will give a wider basis for continued cooperation within the ARIADNE project, and interchange with the COST-action SEADDA will be mutually beneficial.

The resources for data storage, computing and dissemination networking will be incorporated into the MUSIT infrastructure in due course. The current infrastructure already developed within MUSIT has enabled researchers, as well as others, to make simultaneous queries into the artefact databases from all five university museums with archaeological collections. Results from new excavations and recent research are added to the present e-infrastructure in the form of new artefact descriptions and more images of artefacts and excavated structures. ADED will provide the vital geographical context information for the excavated artefacts that has so far been lacking. This in turn can be linked to the GIS based information in the cultural heritage management system *Askeladden,* and will benefit both administrative and research practices in archaeology.

ADED will, in addition to collecting and connecting inter-related information, introduce new and improved search and browse facilities to archaeological research data. Web-based interfaces will link archive material with textual information and high resolution images of artefacts. By collecting, connecting, and presenting the excavation documentation with databases and archives from the five participating institutions as one large digital repository, ICT-based methods will enable new research questions to be asked.

ADED is in this way both nationally and internationally extending good practices for dissemination of digital information within the humanities, building on, and enhancing the e-infrastructure of MUSIT, and creating new content and opportunities for archaeological research. Experience from ADED will also be beneficial to the initiative within the European Open Science Cloud (EOSC) to make Nordic archaeological data FAIR (Findable, Accessible, Interoperable, and Re-usable).

To obtain an updated overview of the material and the challenges ADED will face, the first part of the project will be to further develop metadata standards for archaeological excavations and their uses at the five museums. The infrastructure required to digitize, store, handle, and manage the material is already in place through MUSIT. What is needed is a new e-infrastructure to allow easy and simultaneous access to the material at the museums and RA, and to allow a seamless integration with the other elements in MUSIT.

ADED will not only make individual projects ready for downloading. It will also structure and merge the documentation to facilitate overall queries and analyses. The modelling, based on CIDOC-CRM (www.cidoc-crm.org/), will establish a core of information that can be extracted from the separate projects within archaeological digital documentation.

Impacts of the Research Infrastructure

The research infrastructure will give national access to digital excavation data. Archaeological excavations are documented digitally, and a common interface is necessary to release the full research potential in this vast material. The Museum of Cultural History, University of Oslo (KHM), has used digital documentation since the 1990s and is leading in this field in Norway. Approximately 50 percent of excavations carried out in Norway each year are conducted by KHM. Over the last years, digital documentation has become standard at archaeological excavations at all of the university museums and NIKU; KHM alone has now digital field documentation from 635 excavations. The partner museums together have 1096 digitally documented excavations.

The proposed ADED e-infrastructure will make this material available for research, and will make data, both as basic individual datasets and agglomerated sets, available and thus inspire new forms of research. ADED will, as an integrated part of MUSIT, open qualitatively new arrays for research, give new opportunities for comparative national studies allowing researchers to see and examine relations between archaeological structures, artefacts, regional areas, and landscapes to come to light.

There is a growing interest in landscape archaeology where digital maps, presented and analysed in GIS, is an important tool. Through this, the creation of distribution maps, the plotting of finds and sites on maps, has regained its importance in the archaeological research. The recent availability of ever more geographical data, like the newly released LIDAR data and the new height model for Norway, opens new venues for understanding the earliest part of Norwegian history. As a result of the MUSIT collaboration, distribution maps can now be made on the fly when the artefact bases are queried in internet, and basic data can be downloaded to be used in individual GIS projects (www.unimus.no). With the results of ADED, map based Exploratory Data Analysis, a testing different combinations of datasets at different scale levels, will give new insights. Trying new constellations on a map is an effective way to scrutinize old hypotheses and create new ones. ADED will make the contexts, the important relations between artefacts and structures, available for map-based analysis.

The interest of georeferenced data and landscapes is also reflected in the increasing importance of spatial humanities. Spatial humanities will be supported at the University of Oslo through the hub-node-structure HumGIS. HumGIS is lead by KHM, and has a budget of NOK 1,4 million over the next three years. The joint efforts of ADED and HumGIS will contribute in a major way to innovative research in spatial humanities in Norway.
The ADED infrastructure will also give the general public access to archaeological information. Publishing this as open data gives the opportunity to incorporate this in works of scientific as well as popular importance. Archaeological data can be used to increase local knowledge of the oldest history and also give a deeper and richer understanding for local populations as well as tourists.

Plan for access and use, data and knowledge management
The research infrastructure will be part of the available resources for archaeological researchers and archaeologists working within Cultural Heritage Management. The content is from publicly financed excavations and will therefore be freely available. It will be possible to download datasets and to access datasets online.

All the datasets will also be published as open data, and will be available from the webpages of MUSIT, the archaeological museums and *Askeladden*. The project will

establish a website at www.khm.uio.no for information and updates about the project. This webpage will also give access to uploading and downloading excavation data. The number of visits, uploads and downloads will be registered. In this way it will be possible to visualize the numbers and geographical distribution of users of the infrastructure.

KHM is also leading *HumGIS*, a hub-node-structure for GIS in the humanities at the University of Oslo. *HumGIS* is funded by the eInfrastructure council at UiO, from money dedicated increased used of IT in science at UiO. The funding is NOK 1,4 million for the period 2017 – 2019. *HumGIS* and ADED will cooperate, and ADED will be a substantial source of open data for research in the field of spatial humanities.

The results and discussions generated through ADED will contribute to the proposed COST Action SEADDA (Saving European Archaeology from the Digital Dark Age), and also be presented at national and international conferences such as Computer Applications in Archaeology (CAA). Papers presented at CAA can later be published in peer reviewed proceedings.

Museum of Cultural History is also participating in a Nordic initiative within the European Open Science Cloud (EOSC) to make archaeological data FAIR (Findable, Accessible, Interoperable and Re-useable).

The infrastructure will be maintained by MUSIT after the project period. The estimated cost is rather low, because it will be included in MUSIT's maintenance schedule. MUSIT has an annual budget of NOK 10 mill for development and maintenance.

Progress measurement
Progress in the project shall be measured according to the progress plan including the different work packages and the established success criteria mentioned here below.

Success criteria

1. All Intrasis projects can be queried and downloaded
   Achieved when the Intrasis-projects reported by end of October 2017 are available through ADED
2. Other excavations documented digitally can be queried and downloaded
   Achieved when other projects reported by end of October 2017 are available through ADED
3. The interface for uploading new projects functions well
   Achieved when new projects can be uploaded and uploading in ADED is a part of excavation projects at the museums.
4. A large number of participants (museums, RA, counties)
   Achieved when all museums, RA and more than half of the counties store their data according to the data flow described in WP 03.
5. Datasets are downloaded from ADED
   Achieved when dataset are downloaded. The queries and downloads will be monitored,

Risk management

Risk	Probability	Effect	Value	Action
Unexpected complexity in early datasets	1	2	2	Detailed description and definition of metadata
Complex datasets from urban excavations	3	1	3	allow for complex stratigraphy in the data model
Reduced county involvement	2	2	4	Clear agreements at project start
Slow progress	1	3	3	Good reporting system
The infrastructure is not used as expected	1	3	3	User friendly user interface. Clearly stated expectations that data shall be available
Lacking agreement on data flow description	2	2	4	The participants in the WP must have a well defined mandate from their institution
The infrastructure is not used by expected number of counties	2	2	4	Introduction program, well designed user interface
Low integration in the MUSIT database system	1	3	3	Close contact with MUSIT at the beginning and during the project
Low progress on the new IT-architecture in MUSIT	2	2	4	Close contact with MUSIT during the project. The data in ADED can be uploaded and published independent of the other MUSIT modules

Fig. 8. Table of risks.

Staff and budget

The project will employ a project coordinator full time and a CIDOC-CRM specialist part time until the end of March 2021. External consultants will be engaged to build the core GIS functionality. The project leader will work within the project as needed. During the project period, the infrastructure will use Linux servers and Windows servers for ArcGIS-server.

Partners in the project will contribute with expertise and participation in the meetings. Staff at each partner museum will be engaged in adapting and migrating their own GIS-projects to ADED as outlined in the work packages.

WP/Quarter	2018-3	2018-4	2019-1	2019-2	2019-3	2019-4	2020-1	2020-2	2020-3	2020-4	2021-1	
WP01	185	190	190	190	190	190	190	190	185	185	185	2070
WP02	90	95										185
WP03	100	100	25									225
WP04			300	900	900	900	900	900				4800
WP05			250	250	250	250	250	250	250	250	250	2250
WP06					480	480	480	480	480			2400
WP07					80	80	90	90	90	90	90	610
WP08						400	400	400	400	400	400	2400
WP09	150	250	150	150	150	100	100	100	100	75	75	1400
SUM WP1-9	**525**	**635**	**915**	**1490**	**2050**	**2400**	**2410**	**2410**	**1505**	**1000**	**1000**	**16340**
Unforeseen	35	35	35	35	35	35	35	35	35	35	35	385
TOTAL	**560**	**670**	**950**	**1525**	**2085**	**2435**	**2445**	**2445**	**1540**	**1035**	**1035**	**16725**
WP10												400
												17125

Fig. 9. Budget by quarter.

At the end of the project, the running and operation of the infrastructure will be organised and managed by the MUSIT partnership ensuring the longevity of the established infrastructure. The cost of running the infrastructure is low because it will be part of the infrastructure managed by MUSIT. The MUSIT partnership has an annual budget of ca. NOK 10 mill.

The money that can be transferred to other expenses because of the late start can be used to employ more people. This staff can speed up the last work packages and in this way complete the project goals as planned.

The infrastructure will be freely available for all interested parties.

Ethical perspectives

There are no problematic ethical aspects with this project.

The infrastructure will make publicly funded research available for researchers and the general public. All partners adheres to ICOMs Code of Ethics for museums. In case the treatment of human remains needs special concern, , the Norwegian National Committee for human remains, *Skjelettutvalget - Nasjonalt utvalg for vurdering av forskning på menneskelige levninger,* will be consulted.