



Archiving of archaeological digital datasets in Slovenia

Current practices

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by

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Executive summary

Archiving of archaeological digital datasets in Slovenia in its historic context is presented. This is author's **subjective view** written either from an *outside* perspective (primary datasets) or from a single-institution-perspective (secondary datasets). The information pertaining to all but ZRC SAZU's own datasets have been acquired through personal interviews, scarce publication and personal experience.

In this text the datasets have been separated into three categories:

- primary dataset,
- secondary dataset and
- registries.

As regards the **primary datasets** a mayor systemic problem of current practice by Slovenian archaeology has been exposed: the complete **absence of systemic archiving of primary digital datasets**.

Several **secondary datasets** created by ZRC SAZU have been available for open access since early 2000s. Number of users is small (LIBERA) and the users benefiting are often not adhering to the clearly stated copyrights (ARKAS). Therefore a great caution must be paid **to distinguish between the stated general interest and the actual interest** in accessing open datasets. In addition, **fair use cannot be expected** unless enforced.

An open access **registry** of Slovenian sites and monuments with GIS interface has been available since early 2000s. It has proven to be a **valuable tool for cultural heritage** management but less so for addressing the non-professional public. It has not been used for research purposes.

Archiving of archaeological digital datasets in Slovenia

Current practices

Introduction

In this paper archiving of archaeological digital datasets in Slovenia in its historic context is presented. This is author's subjective view written either from an *outside* perspective (primary datasets) or from a single-institution-perspective (secondary datasets). The information pertaining to all but ZRC SAZU's own datasets have been acquired through personal interviews,¹ scarce publication and personal experience.

Archaeological datasets, as understood in Slovenian archaeology, can be broadly categorized as primary and secondary. The term *primary datasets* denotes e.g. data recorded during archaeological excavation (field diary, context sheets, geomantic data), field survey or geophysical survey. The term *secondary datasets* denotes data stemming either from an analysis of primary data - e.g. expert pottery analysis, dendrochronology, site analysis - or from analysis of multipurpose data, e.g. lidar data, satellite imagery or aerial photography. *Registries* are described separately as the third category.

Primary dataset

1948 to 2002

Not being the intention of writing up the history of archaeological practice in Slovenia a brief overview of documentation systems for the 1948 to 2002 will be presented. It is based on several exemplary excavations carried out by National Museum of Slovenia (NMS) and the Museum of Gorenjska (MG).

Archaeological excavation of an early medieval cemetery at Bled (*Blejska Pristava*) in 1948 to 1951 was executed by a young and eager team inspired by the post-WW2 *zeitgeist*. In the tradition of the time the center piece of documenting system was archaeological diary. Although it was written in an essayistic form it included explicit description of individual burials. However, due to the presence of a trained geodesist Rudolf Berce *xyz* locations of individual graves in a relative coordinate system were *measured* and noted in diaries. In addition, this was one of the first excavations in Slovenia where an attempt to systematically photograph individual burials on black-and-white film was made; the effort was hampered by the lack of film. The entire archive of excavation - i.e. artifacts, diaries, photographs and post-excavation-produced plans - is kept at the NMS (*cf.* Knific 2008; Pleterski 2008, 27-28).

The same system was adhered to at 1953 excavation by the same team in Kranj (*Parish church in Kranj*). However, when MG re-started the excavation in 1964 *in situ* archaeological drawings were added to the documentation. Albeit somewhat sketchy at first and at 1:20 scale these are among the earliest in Slovenia. During another re-start of the excavation, this time implemented by a new generation of young archaeologist,

¹ I wish to thank Rok Klasinc from Skupina STIK, Boštjan Laharnar from NMS and Gašper Rutar from CPA for selflessly sharing the information.

the *in situ* archaeological drawings were precise works at 1:10 scale (Štular, Štuhec 2015, 34-42). The documentation produced by this excavation, i.e. archaeological diary, *in situ* drawings at 1:10 or 1:20 scale and photographs (contact copies and developed negatives on black-and-white film), remained the standard in Slovenian archaeology until mid 1990s. Although since 1970s individuals were introducing printed forms and photogrammetric documentation of plans this never became a widespread adopted standard.

In the mid 1990s color photographs became a standard addition to the black-and-white ones. More importantly, with the introduction of stratigraphic excavation at this time printed forms made their way into widespread use.

This remained the standard until about 2002. An early exception to the analogue based documentation was digital photography, but for several years it was only used to supplement the analogue photography.

Throughout this period a system was in place where the excavating legal body held the movable finds, i.e. artefacts, until "the analysis was completed". In practice, the latter could – and often did – last indefinitely. The documentation, i.e. analogue archaeological primary datasets, remained permanently in the curation of the excavating legal body. However, excavating legal body was always a public body. Either ZVKD (Institute for the Protection of Cultural Heritage of Slovenia), ZRC SAZU - Institute for archaeology, Archaeological department at the University of Ljubljana or various museums. The latter were more active until 1970s and the former three thereafter.

In practice, therefore, those are the institutions still holding much of the archaeological primary datasets archives from the pre-2002 period. Lately there is a trend to move these archives in the museums holding the respective artefacts and at the same time to digitise (i.e. scan) the archives. This is a slow process, though, that is in the spirit of the 2008 legislation but it is not enforced by it.

2002 to 2008

Nowadays vast majority of digital primary datasets in Slovenian Archaeology is born-digital data stemming from (circa) post-2002 archaeological excavation. Since these datasets are a direct result of the recording practice the practice of digital recording will be briefly described.

In preparation for several big excavations taking place in 2002 in the Krško polje the backbone of the born-digital documentation system of archaeological excavation in Slovenia was created with mayor development taking place until around 2008. Whereas the initial impetus and development for this was done by the Archaeological department at the University of Ljubljana, the development of functioning workflow and its implementation took place within two commercial units, Arhej d.o.o. and Tica sistemi d.o.o. (for the latter see Butina, Klasinc, Zorc 2007). Each company developed its own workflow, each based on proprietary software solutions built on top of Autodesk CAD for geomantic and custom database solutions built within the MS Access environment. Both workflows were being developed simultaneously and in close (intellectual and physical) proximity of each other and hence provide very similar solutions.

The systems being developed in commercial environment (that at the time only financed the excavation but not the analysis and archiving) resulted in data-entry- rather than data-analysis focused systems. In addition the absence of archiving standards has been noted (Novaković et al. 2007, 57).

In this period most excavations were subcontracted to commercial companies and the documentation, as well as the artefacts, was held by those for long periods. By now most have been handed over to the local museums.

After 2008

Nowadays all systems of digital documentation used in archaeological excavations in Slovenia use either the system initially developed within Tica sistemi d.o.o. (grace of the Autodesk CAD add-on being made freeware) or a derivative of one of the two initial systems. As a result the practice of digital recording is more homogenous than that reported in 2007.

In order to introduce the current practice of archiving of archaeological digital datasets in Slovenia it is important to briefly introduce the new cultural heritage legislation passed in 2008² and implemented in practice five years later³. This legislation, amongst other, intended to address the shortcomings noted by Novaković et al. (2007).

It is by no means the intention of this brief overview to analyse the 2008 legislation and its implementation, since a much more in-depth knowledge and analysis would be required. Rather, it is the intention to present a subjective view of the practice – and not the legislation - from the "outside" perspective of the primary data user rather than creator.

The mayor novelties in the 2008 legislation (printed on 60 pages), as regards to the archaeological practice, are:

- a specialized public institution (Centre for preventive archaeology - CPA) maintains a database of all on-going archaeological field research;
- Ministry of Culture issues consent for each invasive and semi-invasive field research;
- conductor of the preliminary/preventive archaeological research intervention can be a non-public legal body;
- archaeological documentation must be handed to the ZVKDS within 6 months,
- entire "archaeological archive" (finds/artefacts and samples, field documentation, and digital datasets) must be handed to a museum (the one appointed in the consent) within 5 years;
- within 2 years the conductor of archaeological research must deliver the final report;⁴
- the sanctions for non complicity can be loosely translated as a temporal loss of the ability to obtain a consent to conduct an archaeological research.

Whereas this legislation is in many ways a notable step forward it has two major shortcomings from the perspective of archaeological datasets archiving:

1. insufficient standardization of the digital data archive⁵ and

² Cultural Heritage Protection Act - Official gazette of Republic of Slovenia, nos. 16/08, with amendments.

³ Rules on Archaeological Research - Official gazette of Republic of Slovenia, no. 3/13.

⁴ The final report must include digital copy of relevant datasets as specified in the Amendment to the Rules (see footnote 3) and must be delivered, above all, to the appointed museum, responsible supervisor (archaeologist-conservator at ZVKDS), CPA and INDOK centre (central repository of data on cultural heritage at the Ministry of Culture).

⁵ The standardization is provided on the top level, i.e. in the Appendices of the Amendment to the Rules (see footnote 3), especially in the description of the archive of archaeological site. The types of data to be

2. museums are currently not equipped to curate digital data.

Ad 1. STIK, an example of internal standard for digital recording

STIK is a direct intellectual inheritor of digital recording system developed within the now defunct Tica Systems (cf. Butina, Klasinc, Zorc 2007).

Digital archive produced by this recording system is based on a permanent folder structure. The simplicity is to ensure steep learning curve (i.e. is quick to be learnt), robustness and OS independency. The recording system is described in broad strokes in an internal white paper.

The folder structure consists of 7 top-level folders loosely translated as:

- Documentation
- Forms
- Photoarchive
- Plans
- Report
- Varia
- Temporal.

Within the *Documentation* folder one finds the Access database holding the description of stratigraphic units, samples and artefacts as well as other small "databases" in the form of MS Excell sheets, e.g. description of photos.

Forms is where templates of paper forms that are to be printed and used in the field are.

Photoarchive is, obviously, where the photos are kept. It is divided in 8 sub-folders, e.g. *Documentary*, *Orthophotos*, *Finds*, etc. Each photo in the *Documentary* folder is individually described in the above-mentioned MS Excel sheet "database".⁶

All of the geomatic data is held within the *Plans* folder. The folder is subdivided into 10 categories that correspond either to the different stages of AutoCAD-based work flow or different types of data. Spatial database is based in Autodesk AutoCAD (and its derivatives) and a proprietary add-on MiniExplorer (Butina, Klasinc, Zorc 2007). Lately, 3D data derived through a photogrammetry workflow has been incorporated.⁷

The remaining folders *Reports*, *Varia* and *Temporal* are self-explanatory.

Ad 2. The weakness of the system

documented are described on the top level (e.g. the work-plan, field diary); in parts the text is specific to the level of file types (e.g. .mdb, .xls or .xlsx for databases). However, as any legislation that aims to be more durable than the current technology, it does not provide a description of the archival methods for digital documentation beyond a directive that all data must be appropriately archived. The shortcoming is therefore not the lack of more precise description of a (time sensitive) digital archiving system but rather the lack of providing means (e.g. an expert body) to prepare and overview such a system.

⁶ This is an example of an input-centric rather than archive-centric system. The reason why MS Excell sheet is used rather than being made a part of MS Access database or even part of EXIF data is the simplicity of multiple similar or equal inputs that the MS Excell offers.

⁷ The ease, with which 3D workflow has been implemented, testifies to the robustness of the recording system on the one hand and on the other hand demonstrates the advantage of a true born-digital system. This is in contrast to most other current practices in Europe that can be described as using digital solutions for an underlying analogue recording system, a system exemplified by the use of manual *in situ* drawing.

The above-described system may appear to be very rudimentary and basic. Since rudimentary and basic also translates into low maintenance, low cost and high robustness it serves the purpose of its creators. Insufficient supporting documentation - especially pertaining to the file formats and file format versions - is the area in need of improvement, though.

The mayor weakness of the system, however, lies at the receiving end: the museums receiving "the archive of the archaeological excavation" are (1) ill-equipped to archive any digital data, (2) often lack the appropriate software, hardware and know-how to even use the data (3) let alone transcribe the data into archival formats. Obviously, the last statement is an oversimplification aimed at exposing the systemic problem: the **complete absence of systemic archiving of primary digital datasets** in Slovenian archaeology.

Plans for the near future

Recently this systemic failure has been recognized by at least one policy making institution, namely The Ministry of Culture. Although this is an early stage the desire is to build a digital datasets repository on top of the modernised "Sites and Monuments" registry (Register nepremične dediščine).

Secondary Datasets

As mentioned, the term secondary datasets is used in this paper to describe the data stemming either from analysis of primary data or from analysis of multipurpose data and are intended to be used for further research.

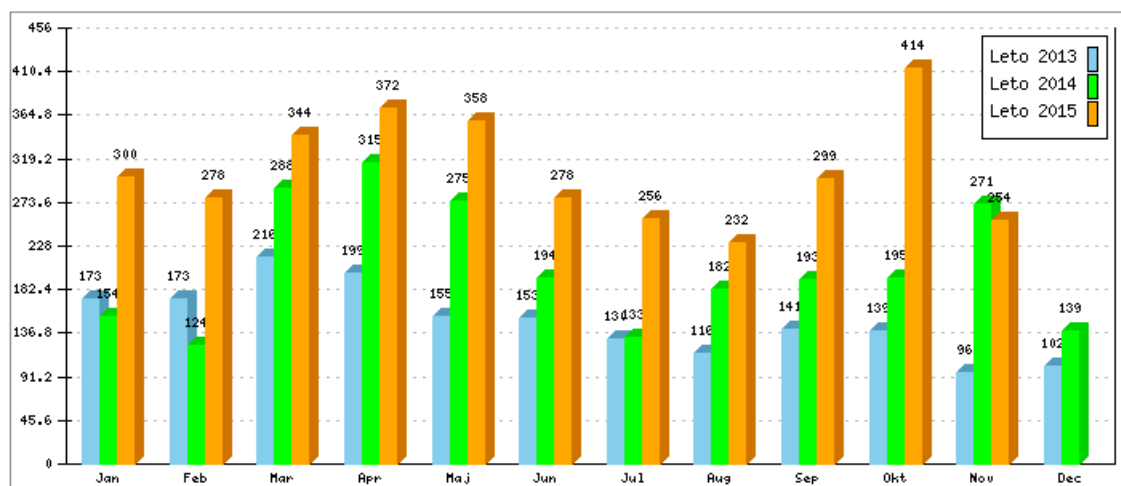
In addition to those also all types of primary data not stemming from archaeological excavations – e.g. archaeological field-walking prospection, archaeological topography, geophysical surveys - are addressed here. Those datasets are handled in the same manner as secondary datasets. The most common reasons for that are smaller amounts of primary data, shorter period between the data acquisition and data analysis and, most importantly, the same people or small groups of people are involved in both data acquisition and data analysis, possibly within a single project.

Filtered and/or recombined secondary datasets

First the datasets comprised of secondary archaeological digital datasets that have been filtered and/or recombined for a specific purpose, i.e. research. In some regards these are similar to registries but are considered secondary datasets since they have been created specifically for use in archaeological research.

All such datasets in Slovenia are curated by ZRC SAZU, Institute of Archaeology.

Arguably the most important dataset in the country is *ARKAS*, Archaeological Cadastre of Slovenia (ARheološki KAtaster Slovenije). *ARKAS* (<http://arkas.zrc-sazu.si>) is an up to date Slovenian sites and monuments database comprised of four subject areas: the first defines the archaeological sites according to place, content and length of time protected, the second the level of research work and protection, the third the sources of information, and the fourth the selected documentation kept by the Institute of Archaeology. The back end has been designed as a relational database in the mid 1990s and its structure remained unchanged. Since early 2000s it also has an online GIS and database front end.



Tracked visits of the *ARKAS* dataset. Blue 2013, green – 2014, Orange 2015. Months on the x axis and No. of visitors on y axis.

The second most extensive dataset is *ZBIVA* (<http://zrcalo1.zrc-sazu.si/zbiva/frameset.php?lang=en>), an archaeological database for eastern Alps and

its surrounding regions in the Early Middle Ages. It primarily holds the data on the sites in Slovenia, Austria, NW Croatia, and NE Italy. The trilingual (Slovenian, English, German) database is assembled from three parts: sites database, graves database and artefacts database. ZBIVA is closely connected with LIBERA (http://zrcalo1.zrc-sazu.si/libera/lang_en/predstavitev.htm), a bibliography database for Early Medieval Archaeology. The back end of ZBIVA and LIBERA are relational databases designed in the mid 1980s and both also have an online front end since 2001.

There is also a dataset stemming from a 1990s project holding data on 6th and 7th century gravegoods *Merowingerzeitliche Grabfunde Mitteleuropas* (http://iza.zrc-sazu.si/AE/Losert_Merowing.html).

A decade and a half of experience with sharing secondary datasets at ZRC SAZU

The datasets with the longest open access online presence at ZRC SAZU are the above mentioned LIBERA and ZBIVA databases. The subject matter addresses an international public, i.e. archaeologist interested in Medieval archaeology of Slovenia, Croatia, (northern) Italy, Austria, Czech Republic, Slovakia and (southern) Germany and the trilingual design caters for this international public.

The on-line access of the LIBERA database has been tracked for the period from 2000 until 2007. After that the tracking option was no longer available to us. In first several years there was very limited access from outside of the ZRC SAZU safe for the reactions to individual endorsements, i.e. mailing lists, lectures and hosting interested researchers. Later on a small but diligent user community about twenty regular users was created by persistent personal endorsement of the LIBERA's author, prof. ddr. A. Pleterški.

In comparison, the *Merowingerzeitliche Grabfunde Mitteleuropas* had no such endorsement. The result is all but no access to the database. It seems that archaeologists prefer to spend days and weeks in the library than half an hour behind a computer.

For this reason we tried a different approach within *The Parish church Kranj Early Medieval Cemetery* project (<http://iza2.zrc-sazu.si/en/programi-in-projekti/the-zupnacerkev-cemetery-in-kranj#v>). Primary dataset, an archive of archaeological excavation, has been published in the form of six ebooks, i.e. digital only publications in PDF format (Štular, Belak 2012a; Štular, Belak 2012b; Štular, Belak 2013; Belak 2013; Sagadin 2014; Belak 2014). The publications are designed as commented facsimile including transcription.

The development of PDF client software in recent years enables an advanced user to use each of these publications as a simple database, in particular as a database of graves. Graves can be searched according to grave number; individual artifacts can be located throughout the cemetery etc. In addition, the authors have received the bibliographical credit. The main reason behind this choice was the above-described experience that led us to believe, that this specific archaeological public still prefers the information being delivered in the book format.

A somewhat different experience is offered by the ARKAS database that is focused on Slovenian only audience. In initial years of its existence it shared the destiny of LIBERA, i.e. it was struggling to generate users outside the ZRC SAZU. In spite of being plagued with technical problems in recent years its use has surged. This can be attributed to a very specific reason: with changes in legislation the data embedded gained commercial value. Namely, before any archaeological excavation takes place a "historic analysis" of the site, i.e. site's biography, must be created. Thus, just as archaeological excavation so did creating the sites biography became a subject of commercial archaeology. As a result

the ARKAS database is exhibiting an increase of access. However, the ARKAS site clearly states its copyright licence being for non-commercial use only. This non approved and hence illegal use continues uninhibited but at least through the personal endorsement certain public institutions have begun to cite the use of ARKAS.

The ZRC SAZU's **long term experience** drawn from these examples is that a great caution must be paid **to distinguish between the stated general interest and the actual interest** (demanding a certain time investment) of archaeologists in consuming the secondary datasets, let alone the primary datasets. This might be brushed off as just a domain / location specific (Early Medieval archaeology in Central Europe) experience. In addition, it might be argued that the described services were simply ahead of its time: the notion of internet as a serious research tool is only just emerging in the last 5-10 years. But is a cautionary tail nonetheless, especially in the view of grey literature being named as the prevailing most accessed type of data at big repositories such as Archaeology Data Service (UK) and Data Archiving and Networked Services – KNAW (Holland).

In addition, **fair use cannot be expected** unless enforced.

"True" secondary datasets

The earliest dataset stemming directly from analysis of primary data has been made publicly available in 1998 (technical update in 2005). It is a database of the graves and artifacts of the Bavarian Early Middle Age cemetery Altenerding (<http://iza.zrc-sazu.si/AE/Zbirka.htm#top>). A short description is accessible on-line and the database in MS Access format with detailed descriptions is available for download. Although the database is in Slovenian language only the content is based on a controlled vocabulary and can nowadays be easily translated even just using online translation methods. The subject matter is one of the biggest and most important sites of its type that is being investigated and re-investigated for a century and a half. Still, since 1998 there were just 2 downloads of the dataset and no documented use.

ZRC SAZU, Institute of Archaeology holds analogue archives with parts of *Digital images of inscriptions from Slovenia* archive being incorporated into the EAGLE Portal (<http://www.eagle-network.eu>). All of the archives are publicised on-line (<http://iza2.zrc-sazu.si/en/zbirke#v>) and are publicly available.

ZRC SAZU also attempted to set up an archive of secondary digital datasets, *e-archive* of the Institute of Archaeology at the ZRC SAZU. The system is comprised of a database (MS Access) that records the files uploaded to the archive and the archive itself. The latter is based on a rigid system of folders and subfolders. However, in everyday the system never took off beyond the initial upload of three projects.

More recently, the Centre for preventive archaeology at the national Heritage office (CPA ZVKD) took advantage of being established anew and has set up a similar archive that is fully operational. Being that CPA is equally involved in producing primary (foremost field-based archaeological assessments, field-walking and excavations) and secondary data (desk-based archaeological assessments) the system is a hybrid between the two. However, the archive is not publicly available nor is it planned to become so in the near future.

The reasons for the absence of sharing of secondary archaeological datasets in Slovenia can most likely be attributed to the same three main challenges identified by ARIADNE's recent survey (Selhofer, Geser 2015):

- the perceived lack of professional recognition and reward for sharing the data;
- the work effort required to prepare data for deposit in a repository;
- a lack of suitable available repositories.

Pleterski - the pioneer behind most of the early attempts of datasets sharing in Slovenia (ZBIVA, LIBERA, Altenerding have been mentioned here) - has recently conducted several interviews with archaeologists based in Central Europe that have been sharing their secondary datasets for years or even decades. Based on that he is adding another reason: the lack of know-how on the most part of researchers to use such datasets remains unchanged until this day. The mutual experience is that **every single user must be trained individually**.⁸ The diminished desire is, obviously, a direct reaction to this.

⁸ Pers. comm.

Registries

There is one on-line registry of archaeological digital dataset, a Registry of unmovable cultural heritage in Slovenia (Register nepremične kulturne dediščine Republike Slovenije). The development of the registry begun in 1991 and in 1996 the first beta version was tested. In 1997 the system got a web-GIS front end, one of the first in Europe. Two mayor upgrades in 2002 and in 2009 were mostly content based in response to the changing legislation (Kastelic 2015, 2; Internet source 1).

The mayor limitation of the registry seen through the eyes of a user in 2015 is the fact that the web-GIS, database viewer and the data pertaining to the cultural heritage management are spread on three different web addresses (respectively: <http://rkd.situla.org>, <http://giskd.situla.org> and <http://evrd.situla.org>).

There are two local registries that need to be mentioned. The first is the registry of primary archaeological research (i.e. excavation, field work etc.) including final reports. It is created and maintained by the above-mentioned CPA. It takes a form of an MS Access database connected to ESRI ArcGIS spatial database and presumably supported by an archive of final reports in PDF format. A desire to make this database publicly available has been expressed and the lack of funds was given as the mayor obstacle. Since it is very likely that this registry will be deployed within the planned repository one is hopeful that it will indeed become publicly available.

The second registry is actually a set of local registries used by Slovenian museums to register artefacts and other museum objects. The history of this began in 1990 when the Ministry of Culture established (a predecessor of) the *Service for Movable Legacy and Museums*. However, the goal of interconnected database of all Slovenian museums was never achieved.

In its stead is a database that has been designed to be used as a local database by individual museum; it was never intended to have neither a public interface nor to enable cross searching between the museums. The database has been developed and is maintained by a commercial company. The museums have been encouraged by the Ministry of Culture to adopt this system for which they pay yearly fee. A serious inadequacy arose when some of the smaller museums wanted to opt out but, reportedly, could not obtain (export) their own data. In essence this means that using public funding a public property is being transferred to a private company to be traded with.

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