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Archeofinds. A Geodatabase for the Archiving, Management, and Analysis of Ancient World Artifacts †

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Abstract: The reconstruction of ancient civilizations requires the analysis of the material manifestations that have come down to us. This complex process involves the collection, comparison, and joint analysis of multiple types of data that can benefit from the availability, accessibility, and implementation through the collective contribution of digital datasets structured and homologated, according to shared standards. Archeofinds is a geodatabase specifically designed to provide support for the processes of information generation and sharing, produced through the collection, management, and contextualized analysis of multiple types of data, relating to multiple classes of ancient world artifacts.

Keywords: cultural heritage; PostgreSQL; PostGIS; geodatabase; material culture; archaeology

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1. From Research and Educational Activities to Shared Knowledge (DM)

Heading the Italian Institute of the National Research Council for eight years, working in different national and international contexts for the knowledge, protection, and enhancement of cultural heritage and, at the same time, teaching through an academic chair in "Methodologies for the study of artisanal productions in the classical world" represents an advantage in understanding and evaluating the importance of the use of increasingly refined technologies and methodologies in the study of the material documents of the ancient civilizations [1,2].

At the same time, the sense of responsibility towards the community for which, in the final analysis, any research and teaching activity is carried out, requires a concrete contribution both to the sharing of the results achieved and to the design of solutions that can be usefully put at the service of those who are working in the same field and with the same purpose.

This is the idea that emerged through many reconnaissance experiences, archaeological excavations, and technical analyses of buildings and monuments, carried out over the years, in addition to the great care taken to define and apply unitary documentation methodologies, which are capable of ensuring not only accuracy and quality but also the results that, despite the obvious diversity of the goals and contexts of investigation, can be widely used and reused for cognitive purposes.

Archeofinds was born from the desire to find an answer to this need. The database was initially conceived as a tool to support researchers and students in the activities that lead from the documentation of stratigraphies and materials found during an archaeological excavation, through data analysis, to suggesting a historical reconstruction. However, the possibility represented by the availability of data that come not only from extremely different chronological and cultural excavation contexts but also from different types of study and research activities, from the reconnaissance to the re-examination of archive data, has stimulated a broadening of perspectives and, consequently, the fields of application. The importance and awareness of the essential role played by context in the strategies of

archiving and analysis of the archaeological record has become a constant throughout the entire evolutionary process of Archeofinds [3].

Currently, the database allows the archaeological record to be managed in an integrated manner and in the entirety of the connections that link it to the context, despite the extreme variability, which are determined both by the heterogeneous nature of the data themselves and by the countless factors that different documentation strategies and methods may involve, especially in the presence of archival data or data from previous research. The possibility of finding and comparing descriptions, drawings, photographs, and 3D models of archaeological data that are extremely diversified by type of investigation (from reconnaissance to excavation), by research context (from urban to suburban areas), and by different geographical, chronological, and cultural contexts, constitutes the main peculiarity of Archeofinds. The site is currently accessible remotely to the researchers of the ISPC-CNR of Catania and the students of the chair of University of Catania. However, the possibility of and appropriate solutions to make the contents available for consultation are being evaluated, with a future development of opening to external contributions.

2. From Archaeological Data to Historical Reconstruction. Reflections on the Contribution of Data Management (AM)

To simplify, the entire process of archaeological–historical research could be included in the terms of data collection and interpretation in the sense of historical reporting [4]. The traditional process of typological classification, which is enriched and clarified by the contribution of archaeological sciences, is essentially based on a constant process of comparison between chronologically, functionally, and typologically known productions and the specimens that the archaeologist finds during their many research activities. Therefore, in the delicate phase of transition, which involves the attribution of meaning to the data, another important element, in addition to the quality and rigor of the documentation processes, is the availability of comparative data. The availability of reference data, as an example, considering the classification and study of a ceramic artifact, makes it possible to accurately compare the morphological–dimensional aspect of the material used, through the color of the surfaces and the mixture or the aspect that it assumes in the fracture, is fundamental. However, anyone who has gained experience in the study and classification of artifacts knows well how this delicate process of attribution becomes extremely complex and uncertain when the terms of comparison are constituted by a corpus in which the conventional graphic representation of a specimen, in its elevation and section, is accompanied by a synthetic description of the morphological characteristics and, sometimes, of the material, in which the only element of objectivity is generally represented by the use of Munsell codes for the indication of the chromaticity of the surfaces and mixtures. In the rare cases in which descriptions and drawings are supplemented by the use of photographic documentation, this is made useless by black and white images, which was the norm in old publications. While color images are very useful, for example, the documentation of mixtures is limited to significant cases to contain printing costs.

The advent of digital technology can represent, as is well known, a solution to many of the limitations that affect the processes of analysis and study of the artifacts of the ancient world, and of which we have few examples. In this sense, digital technology can provide a useful contribution since it can represent a valid alternative to the traditional forms of publication on printed paper; it is naturally exempt from the limitations of space and printing costs, with benefits in terms of quantity and quality of information, the cost-effectiveness of research, impact, and environmental sustainability. In addition, the use of digital technology becomes extraordinarily important when creating databases capable of archiving, managing, and recovering potentially unlimited documentation, both in terms of quality and quantity [5].

A Database Management System makes the data collected available for any analysis process; in this way, they are easily and immediately accessible, without time or space limits, to a potentially infinite number of users or contributors. This has the advantages of reducing the time and cost of creating and managing archives, with positive effects on

the quality and quantity of the data collected; in particular, this makes possible the use of external contributions in many of the delicate phases of control and implementation.

To make this happen, a series of simultaneous events must occur, among which we to mention three, whose importance is considered fundamental. In particular, it is necessary that:

- the traditional processes of documentation of historical–archaeological research activities should be based on criteria and standards shared at a national level, which should be respected by all those involved in the research process in various ways and should be demanded by the competent authorities at the peripheral level and accompanied by the immediate transmission of copies of the documentation to the appropriate central authorities, who are responsible for the cataloging of cultural heritage throughout the country;
- the documentation process should be redesigned and completely digitalized, with a process that reflects the new excavation data on the old documentation that in various ways overflows the archives and deposits of superintendencies, universities, and research organizations;
- the databases must be designed and created capable of operating in conformity with shared criteria and standards, ensuring free access to and consultation of the documentation and, at the same time, providing the possibility for the community to give its contributions to certain implementation and verification processes, and the free re-use of the data collected.

Only in this way can the potential represented by the digitization and computerized management of archaeological data produced by historical–archaeological research have an impact on the processes of historical reconstruction. The availability of numerous data, structured according to unified and shared criteria, will facilitate the interpretative process, making it possible to refine, clarify, and make less subjective the complex phase of knowledge by comparison, on which most of the archaeological classification process is based. At the same time, the same data can successfully provide the basis for starting automatic information analysis projects, based on machine learning and artificial intelligence techniques. The exponential growth of data produced by a highly integrated archaeological research, supported by the contribution of a wide range of disciplines, makes it increasingly necessary to use analysis tools that support the researcher in the interpretation process.

These considerations expressed previously were made taking into consideration the Italian context. As is well known, although the need for a single catalogue of cultural heritage and material evidence is a necessity that is recognized and established previously by the national legislation of cultural heritage, much work still needs to be done, especially regarding the archaeological heritage. The ICCD, the Italian Institute for Catalogue and Documentation, since its establishment in 1975 has carried out an extraordinary and complex work on the definition of shared cataloguing standards and norms. The first scheduling models for the management of archaeological documentation processes, elaborated and made available to the scientific community at the beginning of the 1980s [6], have been the object of a revision that began in recent years and is still in progress [7,8]. Among the objectives pursued in this revision work, the efforts undertaken for the digitalization of the cataloguing tools are extremely important. This has required the redefinition of editing criteria and the identification of suitable export formats. These are requirements to make it possible to fully integrate them into SigecWeb, a computerized management platform specifically designed for the archiving and unitary management of catalogued assets [9]. This admirable and fundamentally important process should, however, be accompanied by a double effort. The first should involve the entire cataloguing process entrusted to peripheral bodies (superintendencies, museums, parks, etc.), requiring respect and support, with appropriate financial and infrastructural allocations, not only for recent and new acquisitions, but also for the past, whose quantity and, consequently, importance remains largely to be ascertained. It is precisely the cataloguing of archival documentation that could represent a major challenge, due to the extreme variability of methodologies and

techniques that characterize it, which must be combined with a high percentage of data gaps caused by the passage of time or by the accidental loss of accompanying documentation. At the moment the entire process of cataloguing, implementation, and consultation of the SigecWeb database is limited to officials of the central and peripheral bodies of the Ministry of Cultural Heritage; a second effort should be made to open up the entire process of documentation, consultation, and use of the data to the entire community, adopting and integrating open access or open data strategies with appropriate differentiation based on specific characteristics [10].

3. Archeofinds. A Geodatabase for the Management of Historic and Archaeological Data (AM)

The structure of the Archeofinds database could be summarized in three different elements: humankind; the context seen in its natural and anthropic components; and the material products of human actions in space and time. From an original project, whose purpose was essentially to provide a series of tools for archiving, managing, and analyzing an archaeological excavation activity, Archeofinds has progressively amplified its range of application, collecting and building on the results achieved in multiple research activities, in which the archaeological method has been applied to the understanding of historical processes in extremely different contexts: from the survey of a vast area, aimed at studying the logic of settlement and exploitation of resources, to the evolution of a multilayered urban organism; from the production setup for the manufacture of ceramic artifacts to the seaside location for fishing and fish processing, sometimes ending up with the study of contexts that were surveyed in previous decades or the last century, in which, sometimes, the lack of direct evidence can be made up only by the material found and by an extremely variable amount of notes collected during the excavation. The common thread that holds together the extreme variety of products and material manifestations of human action is certainly the context, the only one that, despite the variability that characterizes its elements, persists, playing at the same time the role of scenario, resource, or limit of human action.

The humankind in Archeofinds is, therefore, seen and described in its function as an actor, in the meaningful sense of 'the one who acts' by making objects and attributing meaning. Humanity, in this way, can be as much the artisan who produces or decorates a ceramic artifact, as the architect who has designed a building, as the notary who has drawn up a contract of sale, or the archaeologist who carries out archaeological excavation and draws up the documentation. Human action, as defined in Archeofinds, consequently takes many forms: the investigation, whether performed with noninvasive tools or topographic survey and the construction of a building or an intervention of restoration, maintenance, or destruction.

If any human action produces concrete results, among these the archaeological artifact assumes a prominent position within the Archeofinds database. The exact documentation, structured on different levels of investigation, has been given the highest attention also due to the wide range of digital resources (texts, documents, drawings, photographs, 3D models, audio and video resources), which the database allows to relate to each archived record. All the aspects that are useful not only for an exact description of the historical and cultural values of each artifact but also those relating to production processes (materials, mixtures, inclusions, manufacturing techniques, coatings, craftsmen) can be managed with precision and supported from time to time by the use of a set of digital and multimedia resources that are considered particularly helpful for exploiting the data acquired, making them effective tools for comparison and study. This structure has been designed so that it can be easily implemented with the integration of new classes and types of artifacts (Figure 1).

Figure 1. Archeofinds. Some types of data relating to archaeological artefacts managed through the database.

The constant attention to the context in the case of the archaeological find is expressed in different ways. The first relationship, which is the most obvious, is the one that links any find to the area in which it was found, which can be expressed through information relating to the spatial articulation (sample, areas, sectors, squares) of the excavation and its stratigraphic profile (Us, Us−, Us+). From the area of discovery, the attention to the context can be extended to take into consideration the reference to ancient or modern structures. The first ones are generally found through the same excavation activities from which the single archaeological finds originate (USM, USR, archaeological evidence, and relative subarticulations, etc.), while the latter (historical or modern buildings, infrastructures, etc.) often constitute a fundamental component of the modern reference scenario. The last level concerns the archiving of all the information that refers to the context of conservation or display of the individual find or artifact (box, shelf, deposit).

What has been illustrated constitutes an example, among the many possible, of the types of data and relations that Archeofinds allows to be archived, managed, and analyzed. From this example, however, it should become clear that the efforts made to create a highly unified structure could offer multiple advantages in the context of various uses: from research to management and from planning to the protection and enhancement of extremely varied and diversified contexts (Figure 2).

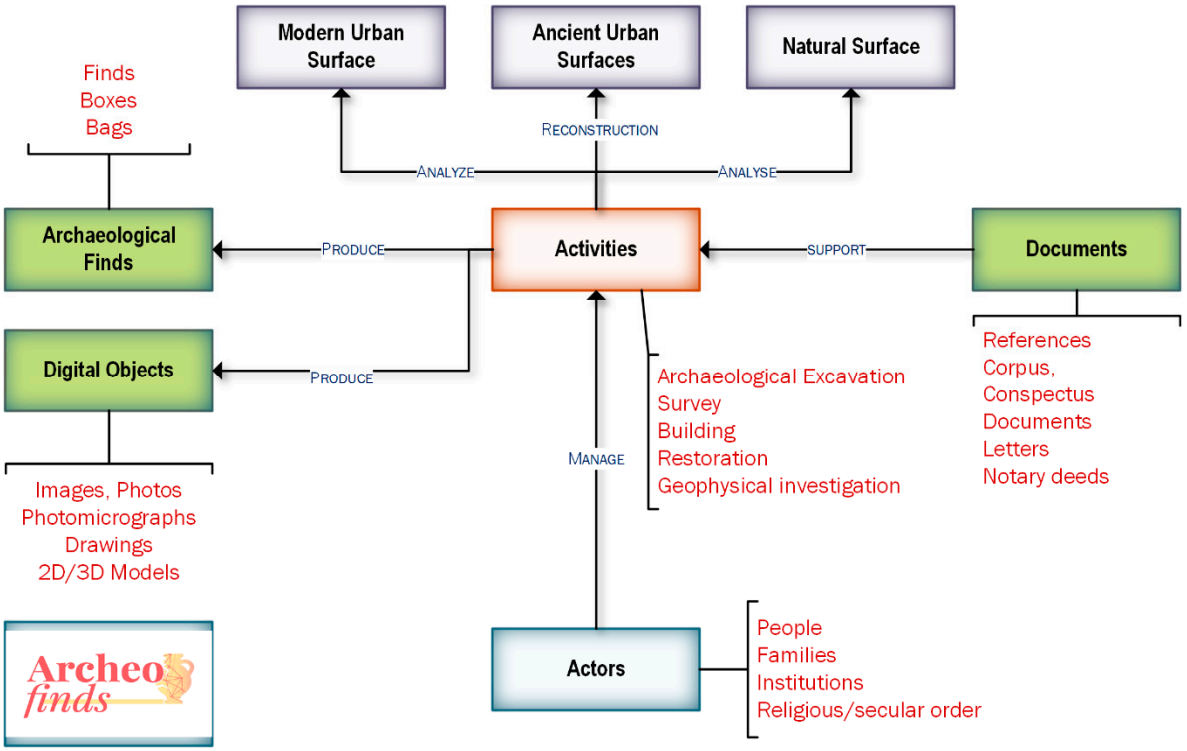

Figure 2. Archeofinds. Main database modules.

4. Archeofinds. Technical Aspects (AM)

An essential feature of Archeofinds is certainly the close link between the descriptive component and the spatial data. Therefore, for the structure of Archeofinds to maintain its unitary characteristic, it was decided to use a geodatabase, which would offer the possibility of archiving and managing descriptive data together with their spatial references. For many reasons, the choice fell on PostgreSQL, an open-source Object Oriented Relational Database Management System [11] that not only represents an extremely reliable and mature product but also allows, through the PostGIS extension, complete control of the spatial data [12].

The entire structure of Archeofinds has been designed and realized in a way that is capable of operating modules that can be used independently or strongly integrated. This guarantees, at the same time, simplicity of use, versatility, and the possibility of implementation. In such a structure, the management of "archaeological finds" described previously, constitutes a module that can be used independently or, for example, with others that are responsible for the management of "excavation" data or those describing the context of conservation or exhibition of the finds. According to the same logic, special modules offer tools for the description and management of the investigation context in the infinite variations that oscillate between the extremes of a natural or highly urbanized landscape. A modular structure also takes on the "human" component and the different types of "interventions" through which humans operate within a given context. The administration of documentary data, through which it is possible to attribute bibliographical or other references within the database, is also designed in modular terms. Finally, a module allows the management of chronological data according to unitary logic.

Being a relational database, the structure of Archeofinds is currently composed of 458 tables, belonging to four different types. A first distinction is represented by the presence or absence of spatial data. While some tables contain only descriptive data, others are equipped with a spatial extension, the choice of which among the different types of features provided by the PostGIS extension (point, polyline, polygon, multipoint, multi polygon, etc.) depends on the particular nature of the archived data. The different types

of tables for managing terminological vocabularies and relational indexes complete the different types.

In the design of a database, the structuring of the individual tables is a crucial element, together with the definition of reciprocal relations, indices, and primary and secondary keys [13]. Working in this field means dealing with issues relating to the definition of fields, which involve decisions on discretization, the choice of the most appropriate types of data, and the standardization of individual elements. These issues are not at all taken for granted and are capable of heavily influencing the result, with repercussions also in terms of the actual usefulness of the database [14]. This becomes even more important when the data have to be formalized to the historical–archaeological heritage, whose description and formalization are significantly influenced by different methodologies, specializations, experiences, and research traditions [15]. In this delicate process, which cannot be described in detail here, the respect and adherence to the scheduling profiles drawn up by the ICCD gained great importance, they were adopted and respected in terms of denomination, type, and extent of data, whenever possible. The same was true for the use of vocabularies whose terms were written making wide references and in full adherence to the terminological tools developed by the ICCD. On the one hand, this has ensured a high degree of compatibility, at least for the indispensable fields, between Archeofinds and the filing system developed by the ICCD. On the other hand, it has left open, in many cases, many questions that have been resolved by initiating a process of selection and analysis of the answers provided to similar questions and problems, in the context of the most important and significant experiences conducted both at a national and international level.

Developed in PostgreSQL version 11.11, Archeofinds currently is based on a server of the ISPC-CNR of Catania, and its access, consultation, and implementation are regulated by special credentials, which differ in the identification of different types of users with different privileges (administrator, research, student, guest, and contributor). Originally developed as a research and educational training tool, it currently has two different front-end interfaces. The first one, suitable for the management and consultation of geospatial data, is possible through Qgis and a GUI specifically created through QT. The second one uses Microsoft Access as a frontend interface and a connection to the database via an ODBC driver. This second solution, suitable for the insertion and consultation of data without spatial extension or whose immediate visualization is not necessary, is particularly useful for all those who are not particularly familiar with GIS software, while the versatility and immediacy of the insertion masks made possible by Microsoft Access provide valid support (Figure 3).

Archeofinds has undergone extensive revisions in the three years since an initial prototype was completed at the end of 2018. The current version, which has been through a long testing phase, offers excellent guarantees of robustness and reliability. Based on these results, a project was recently launched to implement a front-end interface that would allow access, consultation, and, if necessary, implementation of the data directly via a browser. This constitutes a first step towards the objective of sharing the tool with a wide audience, consisting of researchers, scholars, students, or curious people, who may be interested in consulting the data contained in the platform (Figure 4).

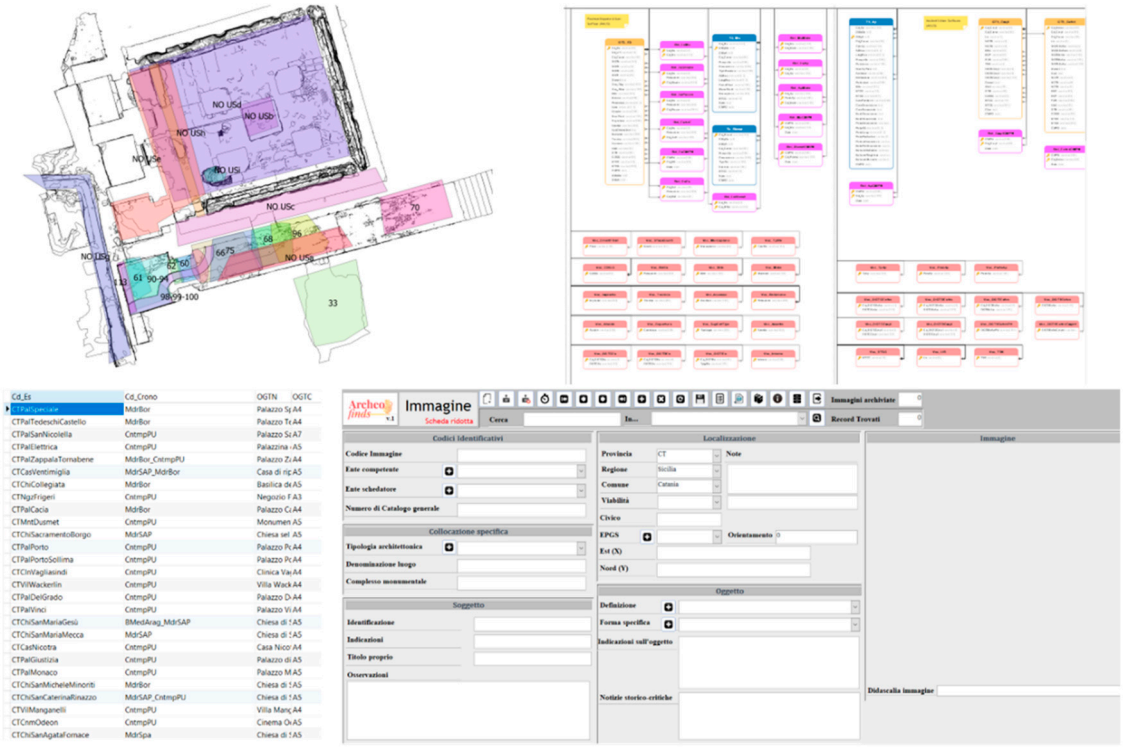

Figure 3. Archeofinds. Clockwise from the top right corner: physical model of the database; an example of the data entry forms; dataset; and graphic features.

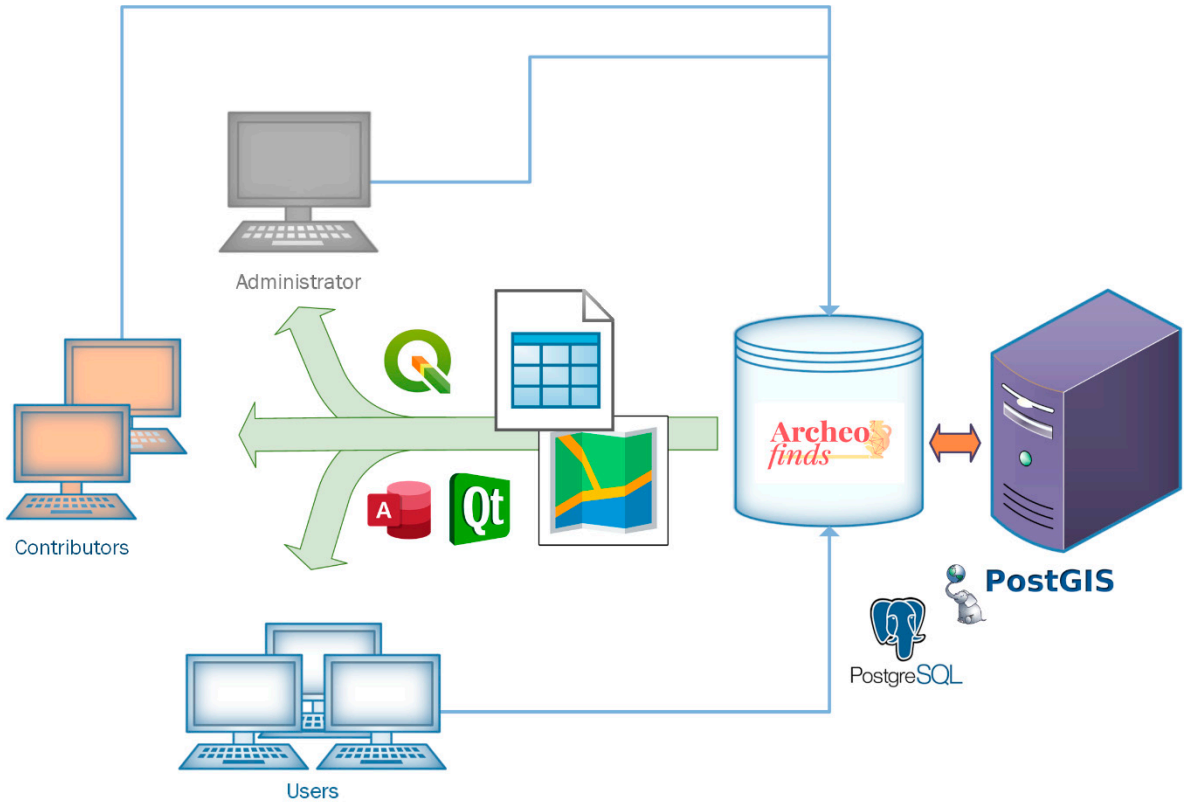

Figure 4. Archeofinds. Client/Server architecture.

5. Dataset (AM)

Archeofinds currently contains collections of data from extremely diverse research projects and study contexts. These include data from:

- OpenCiTy research project [16]. A research project on urban archaeology was carried out in recent years by a research group of the former IBAM-CNR in the city of Catania. The project aimed to create a unitary, reliable, and up-to-date knowledge base on the historical–archaeological heritage present in the specific urban context, which would be useful as a support to study and research activities, as well as to protection and enhancement actions.
- Santa Venera al Pozzo (2015–2018 excavation campaigns) [17,18]. These are data related to the research and archaeological excavation activities conducted in agreement with the Regional Archaeological Park of Catania and the Aci Valley in the site of Santa Venera al Pozzo (CT) through the combined activity of researchers of the ex IBAM-CNR and students of the University of Catania. The site is of particular interest since it represents the mid-eastern slope of Etna and the surrounding hinterland in the North of Catania, the only example of a productive site and resting place along a long chronological period from the Hellenistic period to the late Imperial age.
- Lab Archeofish [19], a research project carried out in agreement with the Soprintendenza ai BB. CC. AA. of Syracuse, as part of a CNR Joint Lab. The project, which is still ongoing, involves an international research group from the Spanish University of Cadiz and researchers from ISPC-CNR in the archaeological excavation of a fishing and fish-processing site located in the administrative territory of the Municipality of Portopalo di Capo Passero (SR).
- Investigation activities and study of old excavation contexts carried out in agreement with the Soprintendenza ai BB. CC. AA. of Syracuse, by the students of the Chair of "Methodologies for the study of handicraft production in the classical age" as part of their MA degree theses. Over the years, the research projects have taken as their references different production contexts, which were active in Syracuse in the Hellenistic–Roman period (Villa Maria, Vigna Cassia, Santa Lucia) [2,20].

6. Conclusions (DM)

The extreme variability of the contexts of study that can be seen behind the brief and rapid description given previously is the result of intense research and teaching activities carried out in recent years, in close synergy between the former IBAM-CNR, the Chair of "Methodologies for the study of artisanal production in the classical world" at the University of Catania as part of a wide range of collaborations with institutes, Italian and foreign universities, and superintendencies.

The diversity of geographical, chronological, and functional contexts behind this variability, far from constituting a limitation, represents an extraordinary opportunity for knowledge, on the condition that we succeed in transforming the complexity behind the heterogeneity and variability into a method of deeper investigation.

This is the direction in which Archeofinds is heading, through the unitary and integrated collection and control of data, the management of complexity, promoting that knowledge by comparison on which, as mentioned, most of the processes of analysis of the material manifestations of past civilizations are based.

The facility with which it is possible to access the database in extremely diversified contexts, the advantage represented by multiuser implementation methods, and the speed of the data extrapolation and sharing phases, have made Archeofinds a powerful working resource.

Further choices will have to be made soon with particular regard to the possibilities of external access and consultation of the platform, issues that are closely related to the definition of the logic of the eventual use and reuse of the data. These issues are closely related to the definition of the possible use and reuse of the data, from open access to open data, without neglecting the potential already widely and efficiently used in many foreign

crowd-sourcing experiences applied to the documentation processes of cultural heritage. These are nontrivial challenges and decisions that affect the very essence of research, from its social function to its cost-effectiveness and future sustainability. These are challenges that will have a profound impact on the structure itself and on the way of comprehending Archeofinds, but which we want to face because we are convinced that these are tools capable of offering a greater contribution to the knowledge of our past and the training of future generations of scholars.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

References

1. Malfitana, D. *A Decade for Centuries. 10 Year of Unlocking the Past by the Institute for Archaeological and Monumental Heritage*; Monografie dell'Istituto per i Beni Archeologici e Monumentali del Consiglio Nazionale delle Ricerche: Catania, Italy, 2014.
2. Malfitana, D.; Cacciaguerra, G. *Archeologia Classica in Sicilia e nel Mediterraneo. Didattica e Ricerca Nell'esperienza Mista CNR e Università. Il Contributo delle Giovani Generazioni. Un Triennio di Ricerche e di Tesi Universitarie*; Monografie dell'Istituto per i Beni Archeologici e Monumentali del Consiglio Nazionale delle Ricerche: Catania, Italy, 2014.
3. Carandini, A. *La Forza del Contesto*; Laterza: Milano, Italy, 2017.
4. D'Andrea, A. *Documentazione Archeologica. Standard e Trattamento Informatico*; Archeolingua: Budapest, Hungary, 2006.
5. Mazzaglia, A. *La Necropoli di Porta Nocera a Pompei e il Sistema Informativo del Pompeii Sustainable Preservation Project (PSPP). Soluzioni Informatiche per la Conoscenza, l'Analisi e la Gestione del Dato Archeologico*; Monografie dell'Istituto per i Beni Archeologici e Monumentali del Consiglio Nazionale delle Ricerche: Catania, Italy, 2019; pp. 120–142.
6. Papaldo, S.; Angle Zuretti, G. *Rapporto Sull'attività di Catalogazione in Italia. Anni 1970–1987*; Istituto Centrale per il Catalogo e la Documentazione: Roma, Italy, 1987.
7. Mancinelli, M.L. *Nota Introduttiva alle Normative per la Catalogazione dei Beni Archeologici-Luglio 2015*; Istituto Centrale per il Catalogo e la Documentazione: Roma, Italy, 2015.
8. Moro, L.; Mancinelli, M.L.; Negri, A. Il ruolo dell'ICCD Nella Diffusione dei Modelli Descrittivi del Patrimonio Archeologico. *Archeologia e calcolatori* **2017**, *9*, 35–46.
9. Mancinelli, M.L. Sistema Informativo Generale del Catalogo: Nuovi Strumenti per la Gestione Integrata Delle Conoscenze sui beni Archeologici. *Archeol. E Calc.* **2004**, *15*, 115–128.
10. Auriemma, R. *La Democrazia della Conoscenza. Patrimoni Culturali, Sistemi Informativi e Open Data: Accesso Libero ai Beni Comuni?* Forum Editrice: Udine, Italy, 2017.
11. Homepage of Postgresql. Available online: https://www.postgresql.org/ (accessed on 26 September 2021).
12. Homepage of Postgis. Available online: https://postgis.net/ (accessed on 26 September 2021).
13. Atzeni, P.; Ceri, S.; Fraternali, P.; Paraboschi, F.; Torlone, R. *Basi di Dati*, 5th ed.; McGraw-Hill Educational: Milano, Italy, 2018.
14. Mazzaglia, A. Il Progetto OpenCiTy. La banca dati. In *Catania. Archeologia e Città. Il Progetto OpenCiTy. Banca Dati, GIS e WebGIS*; Malfitana, D., Cacciaguerra, G., Mazzaglia, A., Eds.; Monografie dell'Istituto per i Beni Archeologici e Monumentali del Consiglio Nazionale delle Ricerche: Catania, Italy, 2016; pp. 235–238.
15. D'Andrea, A. Discretizzazione e modello dati nei sistemi GIS. *Archeologia e Calcolatori* **2001**, *12*, 337–342.
16. Malfitana, D.; Cacciaguerra, G.; Mazzaglia, A. *Catania. Archeologia e Città. Il Progetto OpenCiTy. Banca Aati, GIS e WebGIS*; Monografie dell'Istituto per i Beni Archeologici e Monumentali del Consiglio Nazionale delle Ricerche: Catania, Italy, 2016.
17. Malfitana, D.; Cacciaguerra, G.; Mazzaglia, A.; Leucci, G.; De Giorgi, L. Produzioni e insediamenti nella Sicilia orientale in età romana e tardo antica. Nuovi dati dalle ricerche nell'area archeologica di Santa Venera al Pozzo (Catania). *Rei Cretariae Romanae Fautorum Actae* **2018**, *45*, 331–339.
18. Malfitana, D.; Mazzaglia, A.; Gravagna, S.; La Causa, G.; Leonardi, C.; Leonardi, R.; Lizzio, I.; Politano, C. Santa Venera al Pozzo (Statio Acium): Un progetto di ricerca multidisciplinare tra cultura materiale, produzioni, economie. *Herom. J. Hell. Rom. Mater. Cult.* **2020**, *9*, 9–74.
19. Bernal-Casasola, D.; Malfitana, D.; Mazzaglia, A.; Diaz, J.J. Le cetariae ellenistiche e romane di Portopalo (Siracusa). Primi studi da ricerche interdisciplinari. *Herom. J. Hell. Rom. Mater. Cult.* **2021**.
20. Malfitana, D.; Cacciaguerra, G.; Mazzaglia, A. Archeologia dell'artigianato e produzioni nella Sicilia romana. In *Multa per Aequora. Il Polisemico Significato della Moderna Ricerca Archeologica. Omaggio a Sara Santoro*; Cavalieri, M., Boschetti, C., Eds.; Presses universitaires de Louvain: Louvain, Belgium, 2018; pp. 207–239.