



Peer Community In Archaeology

Exploring The Role of Archaeological Information Systems in Improving Data Management and Interoperability

James Stuart Taylor  based on peer reviews by 2 anonymous reviewers

Eric Lacombe, Dominik Lukas, Sébastien Durost (2024) The transformation of an archaeological community and its resulting representations in the context of the co-development of open Archaeological Information Systems. Zenodo, ver. 3, peer-reviewed and recommended by Peer Community in Archaeology.

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In response to the feedback provided by the reviewers, the authors have undertaken a comprehensive revision of the manuscript [1]. These revisions have specifically targeted the primary concerns raised regarding the clarity and structure of the argument concerning the transformative impact of Archaeological Information Systems (AIS) on archaeological practices. In my view the revised manuscript now more clearly articulates the distinction between internal and external interoperability and emphasizes the critical importance of integrating contextual information with archaeological data. This approach directly addresses the previously identified need for enhanced traceability and usability of archaeological data, ensuring that the manuscript's contributions to the field are both clear and impactful.

Moreover, the application of the proposed model at the Bibracte site is illustrated with greater clarity, serving as a concrete example of how the challenges associated with documentation and data management can be effectively addressed through the methodologies proposed in the paper. This practical demonstration enriches the manuscript, providing readers with a much clearer understanding of the model's applicability and benefits in real-world archaeological practice.

The authors have also made significant efforts to refine the overall structure and coherence of the manuscript. By making complex concepts more accessible and ensuring a cohesive narrative flow throughout, the manuscript now offers a more engaging and comprehensible read. This has been achieved through careful rephrasing and restructuring of sections, particularly those relating to the T!O model's application and the conclusion, thereby enhancing reader engagement and comprehension.

Alongside these structural and conceptual clarifications, explicit discussion of potential areas for future research, not only acknowledges the limitations of the current study but also highlights the significant potential for digital technologies to contribute to archaeological methodology and knowledge production. As such, the manuscript opens up new avenues for exploration and invites further scholarly engagement with the topics it addresses.

I believe, these revisions address the earlier feedback quite comprehensively, presenting a robust and compelling argument for the adoption of collaborative and technologically informed approaches in the field of archaeology. The manuscript now stands as a strong example of the critical role AIS could/should play in transforming archaeological practices, offering valuable insights into how these kinds of systems might enhance the management, accessibility, and understanding of archaeological data. Through this revised submission, the authors have significantly strengthened their contribution to the ongoing discourse on digital archaeology, demonstrating the practical and theoretical implications of their work for the broader archaeological community. I am happy, therefore to recommend this paper for acceptance.

References:

[1] Lacombe, E., Lukas, D. and Durost, S. (2024). The transformation of an archaeological community and its resulting representations in the context of the co-development of open Archaeological Information Systems. Zenodo, 8309732, ver. 3 peer-reviewed and recommended by Peer Community in Archaeology. <https://doi.org/10.5281/zenodo.8309732>

Reviews

Evaluation round #1

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Version of the preprint: 1

Authors' reply, 06 April 2024

Dear James and both anonymous reviewers,

We want to express our gratitude to all of you for appreciating our paper and providing insightful feedback and constructive criticism. Your thoughts and recommendations have been invaluable in refining the article and to increase clarity and overall coherence.

We have carefully reviewed your comments, discussed your suggestions and adjusted the text accordingly. As suggested regarding the overall manuscript we have engaged with an English-speaking professional in order to produce a more cohesive narrative. We are confident that we have incorporated all your comments to a varying degree. In certain parts we reorganized the argumentation and rewrote entire passages to further comprehension and aid readability.

Although we tended to all comments by each reviewer, for the sake of this response we explain how we addressed your principal criticisms section by section, following the compilation of comments provided by James.

Abstract:

We reorganized and rewrote this section to condense the overall text in order to achieve fluidity and render the contribution's objectives more explicit.

Introduction, Retrotheorization, and Shared Conceptualization:

We rewrote the introduction to some extent by shortening sentences and making the argumentation more stringent. In order to increase comprehension of what is sought to be achieved with the proposed modeling

approach, we shifted the description of the use-case to now appear ahead of the description of the modeling framework. Therefore the content, which sat between "T!O" and "T!O and bdb" is now part of the section "Modeling the organization of knowledge: stratigraphic unit vs. excavation unit," where we highlight the existence of different approaches to implement the concept of "excavation unit," in order to underscore the resulting need for varied modeling approaches up front. By shuffling the sections and shining the spot on the variability of the concept "excavation unit," we achieve a more stringent argumentation and the reader is already focused on a central aspect of the proposed model, which is then introduced in the following section. Aside from this major intervention we reduced the complexity of the sentences overall and reworked the closing statement of the introduction to better bridge into the following sections.

T!O:

As a result of the mentioned overall reorganization of sections before and after the T!O section, the reader is already equipped with a set of concepts of a certain import for the modeling section. While the description of the theoretical background of the model and the technical specificities of the model are difficult to eliminate and a certain investment is required by the reader, we have now created a direct segue into the application of the model to the discussion of our excavation situation. Whenever possible, we added references to our "real-world" use case in describing the specific information seeds and what they are meant to represent. Additionally we have include the requested synthesis to underscore the main elements of modeling and their value for excavation and archaeological reasoning.

Tables and Figures:

Following the modifications to the framing sections within which the figures appear, we specifically redistributed the different parts of figure 3 and 4. Now the partial figures 3A - 3F and 3G - 3H (former figure 4) sit in the headers of a two-column layout containing the text that reflects on these figures. In this way the figures are described by the text right below them and the graphs can be read side by side with the text. As was the case with the text of the framing sections, whenever possible, we added references to our "real-world" use case in the figures - specifically in figure 2, now showing the wording of what the seeds are supposed to represent.

Conclusion:

We reworked the conclusion completely and paid attention to the previous issues of sentence complexity and ease of comprehension.

In regards to the two suggestions to examine possible weaknesses and limits of our approach by applying the model on another use-case and/or conducting a T!O analysis on a non-compliant dataset, we need to take the third option. While we agree with the potential benefit of including another use-case or a non-compliant dataset, the addition would not necessarily aid clarity of comprehension, but would surely add to the length of our contribution, which is already substantial at this point. Moreover, the presented use-case is not an already T!O-compliant case per se, but the application of the model here shows its general usability for modeling the processes involved. In any case we will be conducting further work by applying the model at other excavation projects and it will indeed be interesting to see how the model can provide transparency on the methodological differences.

We hope we have addressed your criticisms to an extent that the contribution can be recommended for publication. We are confident that these changes have significantly improved the paper, and we are grateful for your guidance and support throughout this process.

We have uploaded our revised version to the Zenodo preprint server (<https://doi.org/10.5281/zenodo.8309732>).

Thank you once again for your inspiring reviews. Please let us know if there are any further adjustments or revisions you would recommend.

Best wishes,
Dominik Lukas

Decision by [James Stuart Taylor](#) , posted 10 January 2024, validated 10 January 2024

The transformation of an archaeological community and its resulting representations in the context of the co-development of open Archaeological Information Systems

The paper under review explores the transformative journey of Archaeological Information Systems (AIS), emphasizing collaboration in the archaeological process to enhance system design. It underscores the challenges in managing and publishing archaeological data, particularly the lack of distinction between internal and external interoperability and the absence of traceability in data publication. The proposed model suggests distinguishing internal and external interoperability and augmenting data with contextual information, addressing these challenges effectively. While the abstract effectively introduces the topic and findings.

The title, abstract, and introduction are commended by the reviewers for clarity, presenting supported findings, and building on relevant research. Reviewers also felt that the introduction articulates the study's motivations well, emphasizing the holistic approach needed in the publication of archaeological knowledge. The methods and analysis are generally deemed clear and replicable, with a positive view of the TIO model's application at Bibracte as a case study, illustrating the evolution in documentation and data management. The retrotheorization section effectively links with the introduction, highlighting the incompleteness of archaeological datasets and proposing a shared modeling approach. Reviewer 2 specifically acknowledges the paper's valuable exploration of AIS evolution and its impact on archaeological organizations, highlighting the dialectic tension between continuity and discontinuity. The dual sense of interoperability and the TIO framework, based on Lupasco's energy logic, are praised for analyzing archaeological knowledge production.

However, both reviewers suggest that the overall structure and clarity of argument could be strengthened. For example the section on "TiO: Modeling the organization of knowledge at Bibracte" introduces an innovative model for managing archaeological excavation datasets, which, while informative, could benefit from slight modifications for better accessibility, including clearer introductions to new concepts and enriching figures with labels and examples.

In the modeling section, the promising results are noted, especially in the optimization of the production chain at Bibracte through the implementation of a new information system. In the end the reviewers felt that the conclusion's significant contribution lies in recognizing the potential of digital technologies in addressing methodological challenges, raising critical questions about integrating technology into archaeological practice without compromising intellectual control.

I have tried to extract and list below the key recommendations for improvement, centred mainly upon issues of structure and clarity which can be summarised as follows (but do please refer to their original text for guidance):

Abstract:

- Condense and synthesize certain concepts in the abstract for better reader engagement.
- Restructure the last paragraph of the abstract to improve comprehension with shorter sentences.

Introduction, Retrotheorization, and Shared Conceptualization:

- Emphasize and explicitly present research questions summarily in the introduction for enhanced clarity.
- Improve sentence clarity in paragraphs, particularly in complex subordination (e.g., paragraph 93-97).
- Strengthen the closing statement in the last paragraph of the introduction for a more impactful conclusion.

TiO: Modeling the Organization of Knowledge at Bibracte:

- Generally try to modify the text for better accessibility, including clearer introductions to new concepts.

- Reviewer 2 wonders if it is possible to explore possible weaknesses and limits in the model structure and its implementation elsewhere (this is not a deal breaker for me as recomender - but might be worth consideration)
- Consider conducting a TIO analysis on a "non-TIO compliant" dataset for comparative insights (again possibly beyond the scope of the current paper - but maybe something to consider in terms of 'further work/future direction - again not a deal breaker!).
- Include a synthesis in the last paragraph to highlight the main elements of modeling both excavation and archaeological reasoning.

Tables and Figures:

- Provide more descriptive captions for figures and clarify their interpretation within the text (especially focusing upon figure 3&4).

Conclusion:

- Consider rephrasing the conclusion to improve text structure and flow, particularly addressing long sentences.

Overall Manuscript:

- Conduct language review for improved coherence and flow, including edit paragraphs and rephrase sentences for better comprehension; this should help to develop a more cohesive narrative throughout.

Reviewed by anonymous reviewer 1, 27 October 2023

General comments

The article presents a valuable study on how collaboration in all aspects of the archaeological process can enhance the design of Archaeological Information Systems.

The authors effectively highlight the challenges in current modes of managing and publishing archaeological data, particularly the non-distinction between internal and external interoperability and the lack of traceability in the publication of archaeological excavation data.

To overcome these issues, the authors propose a model where internal and external interoperability are distinguished, and the data are completed with contextual information on the who-does-what, why, and how of research.

The abstract, while informative, could benefit from some brevity. The identification of the problem and the research questions are clear, though emphasizing them in the introduction would enhance the paper's clarity. Throughout the manuscript, there's room for some editing. Long sentences with multiple subordinates often hinder the reader's comprehension. Refining the paragraphs and rephrasing sentences will make the valuable scientific contribution more accessible. Language review could enhance the reading experience. The text sometimes feels disjointed, making it a bit challenging to follow.

Abstract

The abstract successfully introduces the topic and main findings. To improve reader engagement, it could be condensed, and certain concepts could be synthesized. The last paragraph of the abstract, with its lengthy sentences and subordinates, could be restructured for better comprehension.

Introduction, Retrotheorization and Shared Conceptualization

The introduction aptly articulates the motivations behind the study, emphasizing the need to consider all aspects in the approaches to the publication of archaeological knowledge. While the research questions are evident, explicitly presenting them in a summarized manner within the introduction would enhance clarity.

The section "Retrotheorization and Shared Conceptualization" effectively connects with the introduction, depicting the problem (the incompleteness of archaeological datasets), introducing relevant concepts (ontology and its evolving meaning), referencing related research, and outlining the paper's goal through the proposed shared modeling approach.

Some paragraphs could be rephrased for better comprehension, such as paragraph 93-97, where complex subordination may make the main message less clear. A more impactful closing statement in the last paragraph could highlight the paper's most important elements.

TiO; Modeling the organization of knowledge at Bibracte

This section introduces an innovative model for the management of the archaeological excavation dataset, which is illustrated with images. While informative, the text could be made more accessible with slight modifications and clearer introductions to new concepts. Descriptive captions and extended explanations should accompany figures. Simplifying some sentences and avoiding excessive subordination would enhance the reader's grasp of the main concepts.

The section "Modeling the organization of knowledge at Bibracte" describes the case study where the new model will be applied, summarizing the evolution in documentation and data management due to the introduction of digital innovations. The issues of the current situation are illustrated, and a possible solution is presented through the employment of an open-source software model and tools within the upcoming SIMOIS project and by applying the retrotheorization anticipated in the previous sections.

TiO and bdb

This section describes the application of the TiO model, primarily referencing Figure 3. The figure consists of six frames, each illustrating the steps that model the archaeological process. Despite the figure and the description of each step, the text is challenging to follow. Enriching the frames in the image with labels and examples for clarity is recommended. The structure of the text could be improved to ensure consistency in subject and object.

The last paragraph, to be more effective, could include a synthesis of what is presented in the section to let the reader catch the main element of the modeling of both excavation and archaeological reasoning. In line with what is recommended for Figure 3, also Figure 4 should be enriched with labels and a caption that helps the readers understand it.

Tables and figures

It is advisable to provide descriptive captions for figures and clarify their interpretation within the text.

Conclusion

The conclusions summarise and bring together the main elements presented in the paper, providing a final comment on the choices made within the project presented. Some rephrasing is needed to enhance the text's structure and flow, as there are a few long sentences that may appear disconnected (lines 522-527).

Reviewed by anonymous reviewer 2, 15 December 2023

Review of "The transformation of an archaeological community and its resulting representations in the context of the co-development of open Archaeological Information Systems".

General overview

The paper delves into the dynamic evolution of Archaeological Information Systems (AIS), influenced by a myriad of human, technical, endogenous, and exogenous factors. The ever-expanding array of digital tools not only facilitates the organization of information for understanding site transformations but also instigates transformations within the organizations managing such data. The digital methods' impact is characterized by a dialectic tension between continuity and discontinuity, leading to persistent reorganization.

The paper identifies a dual sense of interoperability in recording and publishing research data: "internal interoperability" involving data retrieval and transformation within the primary recording system, and "external interoperability" linking final data with existing data for future research exploitation. Methodologically, the

TIO (Transformation, Information, Organization) framework, based on Lupasco's energy logic, is employed. Lupasco's logic expands conventional binary logic by acknowledging contrasting movements of heterogenization and homogenization, treating their conjunction as a dynamic equilibrium source. TIO is used to analyze archaeological knowledge production by modeling excavation processes, discourse establishment, and institutional processes, offering insights into necessary parameters for organizing and recording archaeological data, providing the case of Bibracte as a real world implementation

The paper is extremely interesting albeit very technical in its theoretical approach. While the results in Bibracte are clearly exposed (see below), it lacks an analysis of possible weaknesses and limits in the model structure as well as in the implementation of the proposed model elsewhere. I would recommend it for publication.

Title/abstract/introduction

Does the title clearly reflect the content of the article? YES

Does the abstract present the supported findings of the study concerned and no other? YES

Does the introduction clearly explain the motivation for the study? YES

Is the research question/hypothesis/prediction clearly presented? YES

Does the introduction build on relevant recent and past research performed in the field? YES

Retrotheorization and Shared Conceptualization, TIO

Are the methods and analysis described in sufficient detail to allow replication by other researchers? YES

The presentation of the model is clear. The idea of tailoring Lupasco's approach to the archaeological knowledge is interesting and the dynamics behind the concept of information seeds seem promising for a new, enlarged framework. Personally I would have appreciated a TIO analysis of a "non TIO compliant" dataset in order to have comparison with Bibracte.

Modeling the organization of knowledge at Bibracte, TIO and bdB

The results of the model are very promising. The work made on the thesauri and vocabularies, especially, shows how the ongoing efforts at Bibracte are optimizing the production chain through the implementation of a new information system, highlighting the integration of human, technical, and digital resources.

Conclusion

The analysis delves into the challenges posed by traditional dissemination methods and explores the potential of digital technologies in revolutionizing archaeological discourse.

A significant contribution of the article lies in its recognition of the potential of digital technologies to address methodological challenges. The authors argue that the archaeological community, while benefiting from digital solutions, should not be confined to tools conceptualized outside its intellectual realm. This raises critical questions about epistemological compatibility and practical feasibility, challenging the discipline to integrate technology without sacrificing mastery over the tools employed.