



InterPARES 2 Project

International Research on Permanent Authentic Records in Electronic Systems

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Digital Moving Images – Altair4 di Roma. A
Multimedia Archaeological Project: *The
House of Julius Polybius*

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Table of Contents

A. Overview of Case Study	1
Introduction.....	1
Scope of the case study.....	1
Altair4.....	1
B. Statement of Methodology	2
Methodology used by Altair4 for the House of Julius Polybius.....	2
Technological context.....	2
C. Addressing the 23 Core Research Questions	3
D. Answers to the Domain and Cross-domain Research Questions	9
Domain 1 Research Questions:.....	9
Domain 2 Research Questions:.....	10
Domain 3 Research Questions:.....	11
Policy Research Questions:.....	11
E. IDEF0 Activity Model	12

A. Overview of Case Study

Introduction

This is the final report for case study no. 09 of of the InterPARES 2 Project. The study analyzed the way a small moving images company created a moving-images product. It was presented at the InterPARES 2 international team meeting in Rome in December 2002.

The goal of this case study was to detail the creation of a multimedia product, the *House of Julius Polybius*, created Altair4, a small company based in Rome. This study enables comparisons to be made with the product creation activities of big cinema and television firms.

Altair4 Multimedia employs industrial design methods to create websites and information aids for museums and similar cultural institutions. The creative personnel of Altair4 all have applied arts backgrounds with different specializations, including computer graphics and television directing. Different disciplines and methodologies are combined with multimedia technology to create new tools for communication. A passion for art and history has influenced the choice of subjects Altair4 has addressed in the last few years. While not disdaining forays into the worlds of animation and television, the company has focused increasingly on promoting and popularizing cultural and artistic heritage. As a result, Altair4 has produced a large number of three-dimensional archaeological reconstructions for museums, television broadcasts and interactive, educational compact disks.¹

Scope of the case study

The case study examines the creation of an educational product from the an archeological reconstruction site at Pompeii, destroyed in 79 AD by eruption of Vesuvius, namely the reconstruction of the House of Julius Polybius. Altair4 was commissioned to undertake this project by the Graduate School of Humanities and Sociology at Tokyo University, which used the product for a touring educational exhibition.

Altair4

Altair4 is a private company run by Pietro Galifi and Stefano Moretti, who have artistic and architectural backgrounds, and Alessandro Furlan, who comes from a television broadcast background. The company employs a secretary, 3D artists, 2D artists, and software programmers. None of the staff have specific training or responsibility for archiving the digital material and the task is generally performed by the secretary.

Altair4's services are available nationally and internationally. It clients include Soprintendenza per i Beni Ambientali e Architettonici di Roma, Istituto dell'Enciclopedia Italiana, UNESCO, TAV Treni Alta Velocità S.p.A, Réunion des Musées Nationaux – Parigi, Centaur Systems, Ltd., National Geographic, USM, Walt Disney Interactive.

¹ Further information on Altair4 products is available on their Web site at <http://www.altair4.it>, checked 4 August 2007.

B. Statement of Methodology

The case study has been completed by the staff of Altair4 with the Italian National Archival Association.² Isabella Orefice, President of the Italian National Archival Association, met with and interviewed the management and staff of Altair4.³ The meetings and interviews were designed to assess Altair4's experience in the artistic field and to understand their production methods. While the Altair4 staff considered the characteristics of quality, accuracy, and authenticity of their records in developing the project, long-term preservation of the created digital entities was not considered. Altair4 staff do not have the archival training necessary to preserve their digital material over the long-term. Nevertheless Altair4 saves 90% of the digital entities it creates by making a backup of created documents at the conclusion of a project.

Methodology used by Altair4 for the House of Julius Polybius

The extraordinary innovations produced by information technology have only added to the existing tradition of archaeological reconstruction. From Palladio, by way of the French Academy's *Envois des pensionnaires*, the same concepts and approaches are still maintained today even though watercolors have given way to pixels. It is crucial to understand that what information technology has added to the existing tradition is the increasingly interdisciplinary nature of the work.

Based on visual and spatial perception, virtual reality created by modern information technologies in the archaeological field can effectively communicate complex data to a vast audience. It is interesting to contrast the characteristics required of those who prepare virtual reconstructions with those of archeological researchers. If the two specializations could be combined a direct flow of data from the reality to the virtual reality would be possible. It would appear difficult, however, to achieve the qualitative results of those who have made virtual reconstruction their specific profession.

Technological context

Altair4 began modeling the villa, i.e., creating the digital entities to represent its structure, from the front and proceeded to the interior. This approach followed the course of the archaeological excavation.

Digital photographs were taken of all the walls. The photos were processed and restyled. The three-dimensional model was generated by the system through a hierarchical organization of points, lines and polygons. This data was associated with sets of spatial coordinates and relational properties, including physical characteristics, modes of reflection, and light absorption.

² During the last two years the Italian National Archival Association has organized a national working group of experts in the field of moving images, including: Luce Institute, the National Experimental Centre of Cinemathography of Rome, the Bologna Cineteca, the Audiovisual archive of the Worker and Democratic Movement, RAI TV, The National Museum of Cinema of Turin, to address archiving issues, including those raised by digital technologies.

³ Ms. Orefice also chairs the InterPARES 2 Project's European Team, and participates as a member of that Project's working groups assigned to the Artistic Domain (Focus 1). The organizational structure of the InterPARES 2 Project is available at <http://www.interpares.org>, checked 4 August 2007.

The completed model of the house was also used in the production of an educational film, commissioned by Tokyo University for the exhibition *Pompeii and its Inhabitants*. The purpose of the film is to take spectators back in time, showing the House of Julius Polybius as it was in 79 AD and the scientifically correct succession of catastrophic events that led to its destruction. The sequence of the eruptive phases of Vesuvius and their effects on the villa were reconstructed with the aid of a team of volcanologists. In order to make the relationship between the reconstruction and what remains of the house today still clearer, animated sequences were produced that fade between the virtual model and processed photographs taken at the time of excavations. By projecting photographs onto congruent three-dimensional models, it is in fact possible to restore the third dimension and obtain realistic camera movements.

Altair4 created a virtual reconstruction of the greatest possible authenticity and accuracy, as defined by the participating archeologists, botanists, mathematicians and volcanologists.

C. Addressing the 23 Core Research Questions⁴

1. What activities of the creator have you investigated?

All the steps involved in the creation of a virtual reconstruction of the House of Julius Polybius in Pompeii, based on excavations by archaeologists, for Tokyo University.

2. Which of these activities generate the digital entities that are the entities of your case study?

The creation of a virtual reconstruction included house modeling, object and furniture modeling, and texture realization.

3. For what purpose(s) are the digital entities you have examined created?

The digital entities were created to “virtually” reconstruct the original structure using modern information technologies. The resulting product would be used for teaching archeology. In more general terms, these entities reflect Altair4’s interest in promoting and celebrating our cultural and artistic heritage. The knowledge and experience from these projects is consistent with the wide range of 3D archaeological reconstructions developed for museums, TV and interactive CD-ROMs.

4. What form do these digital entities take? (e.g., e-mail, CAD, database)

The digital entities are comprised of computer files containing textual and numeric data, e-mail, images, vectorial data, and sound.

⁴ The InterPARES 2 Project developed a common set of 23 core research questions for all case studies.

4a-4b. What are the key formal elements, attributes, and behaviour (if any) of the digital entities? What are the digital components of which they consist and their specifications?

3D Studio Max modeling and rendering software was used to create .MAX and .3DS vectorial files. Adobe Photoshop was used to create and manipulate .PSD, .TGA, .TIF, .BMP and .GIF files created with to obtain pictorial textures. Tree Storm software was used in the virtual reconstruction of the garden.

4c. What is the relationship between the intellectual aspects and the technical components?

The relationship between the intellectual aspects and technical components is close because the former are necessary to begin assembling the technical components into a virtual reconstruction of the villa, not least because a physical reconstruction of the villa was made recently.

4d. How are the digital entities identified (e.g., is there a [persistent] unique identifier)?

A file-naming convention is used to identify the digital entities and is followed by all those involved in manipulating a file. Folder names include the project name/file object name/number of version and the last version file object name/final version.

4e. In the organization of the digital entities, what kind of aggregation levels exist, if any?

Files are organized in directories and sub-directories. Files are aggregated by project, which is reflected in the naming convention.

4f. What determines the way in which the digital entities are organized?

The workflow needed to produce the reconstruction determines all the processes. The entities are passed from one group to the next for manipulation.

5. How are those digital entities created?

In modeling the entities representing all the components of the villa, Altair4 began from the front entrance and proceeded to the interior. This approach followed the course of the archaeological excavation.

Digital photographs were taken of all the walls. The photos were processed and restyled. The three-dimensional model was generated by the system through a hierarchical organization of points, lines and polygons. This data was associated with sets of spatial coordinates and relational properties, including physical characteristics, modes of reflection and light absorption.

5a. What is the nature of the system(s) with which they are created? (e.g., functionality, software, hardware, peripherals, etc.)

The software used is identified in the response to question 4b, above. Five dual-processor workstations were used, augmented by four dual-processor Athlon AMDs in the most demanding phases of the rendering

5b. Does the system manage the complete range of digital entities created in the identified activity or activities for the organization (or part of it) in which they operate?

Yes.

6. From what precise process(es) or procedure(s), or part thereof, do the digital entities result?

See the IDEF0 activity model for this case study in Section E.

7. To what other digital or non-digital entities are they connected in either a conceptual or a technical way? Is such connection documented or captured?

The images were initially created on paper and then transferred to digital form by means of 3D Studio Max software.

8. What are the documentary and technological processes or procedures that the creator follows to identify, retrieve, and access the digital entities?

The creator uses a file naming convention, detailed in the response to 4d, above.

9. Are those processes and procedures documented? How? In what form?

There are no formal or written procedures.

10. What measures does the creator take to ensure the quality, reliability and authenticity of the digital entities and their documentation?

The version number confers authenticity on the digital entities. The quality and reliability of the digital entities are assured if the digital entity can be used to complete the next stage of work. At the system level, reliability is conferred by daily backups, which protect against corrupt files.

11. Does the creator think that the authenticity of his digital entities is assured, and if so, why?

The creator believes the authenticity of the entities is assured once they are saved in the project folder.

12. How does the creator use the digital entities under examination?

The use of the digital entities also involves definition of the intellectual property rights. The DVD for the House of Julius Polybius project was produced on contract for Tokyo University, which intended to use it for a conference, a travelling exhibition, and for teaching purposes. Other Altair4 products for sale are used for promotional and marketing purposes.

13. How are changes to the digital entities made and recorded?

The digital entities are always identified on the basis of the name/type of path, indicated in the answer to question 4d, which also includes version numbering. Once the final version is approved, 90% of all the entities contributing to its creation are preserved. Altair4 employs the “Where is it” program to organize backup copies of the digital entities. In order to use these copies, it is necessary to know the filename, path, and approximate date of production.

14. Do external users have access to the digital entities in question? If so, how, and what kind of uses do they make of the entities?

The head of the Altair4 marketing and advertising department permits external use of parts of the digital entities for promotional purposes.

15. Are there specific job competencies (or responsibilities) with respect to the creation, maintenance, and/or use of the digital entities? If so, what are they?

Creating the digital entities requires 3D artists, 2D artists, a software programmer, an editor, and a producer. A secretary files the paperwork but possesses no specific archival skills.

16. Are the access rights (to entities and/or systems) connected to the job competence of the responsible person? If so, what are they?

Members of the Altair4 staff have unrestricted access to the digital entities so that the creative process is not hampered.

17. Among its digital entities, which ones does the creator consider to be records and why?

Altair4 has not considered whether the digital entities created are records. Because these entities are all necessary for the final product and are all made or received and set aside during the process of the creation of the final product, they have key characteristics of records. However, Altair4 saves only an estimated 90% of the digital entities created. Selection is made on the basis of importance and similarity, e.g., where two versions are practically identical, only one is saved.

18. Does the creator keep the digital entities that are currently being examined? That is, are these digital entities part of a record keeping system? If so, what are its features?

There is no recordkeeping system. Altair4 uses the “Where is it” program to reorganize and retrieve digital entities. In order to use them, it is necessary to know the filename, path and approximate date of production.

18a. Do the recordkeeping system(s) (or processes) routinely capture all digital entities within the scope of the activity it covers?

[No response to this question was provided.]

18b. From what applications do the recordkeeping system(s) inherit or capture the digital entities and the related metadata (e.g. e-mail, tracking systems, workflow systems, office systems, databases, etc.)?

[No response to this question was provided.]

18c. Are the digital entities organized in a way that reflects the creation processes? What is the schema, if any, for organizing the digital entities?

[No response to this question was provided.]

18d. Does the recordkeeping system provide ready access to all relevant digital entities and related metadata?

[No response to this question was provided.]

18e. Does the recordkeeping system document all actions/ transactions that take place in the system as regards the digital entities? If so, what are the metadata captured?

[No response to this question was provided.]

19. How does the creator maintain its digital entities through technological change?

Altair4 has not considered the long-term preservation of digital entities. Finished products are duplicated on media, i.e., CD, DVD, and have a large circulation.

19a. What preservation strategies and/or methods are implemented and how?

There are no preservation strategies or methods being implemented.

19b. Are these strategies or methods determined by the type of digital entities (in a technical sense) or by other criteria? If the latter, what criteria?

See above.

20. To what extent do policies, procedures, and standards currently control records creation, maintenance, preservation and use in the context of the creator's activity? Do these policies, procedures, and standards need to be modified or augmented?

While there are some policies that control the workflow of record creation and quality, once the file has moved on, there are no preservation policies, procedures or standards except for preparation of global backups.

21. What legal, moral (e.g. control over artistic expression) or ethical obligations, concerns or issues exist regarding the creation, maintenance, preservation and use of the records in the context of the creator’s activity?

There are legal obligations set out in contracts as well as those pertaining to copyright.

22. What descriptive or other metadata schema or standards are currently being used in the creation, maintenance, use and preservation of the recordkeeping system or environment being studied?

There are no standards for creative activities. Since Altair4 uses no recordkeeping system, no reference is made to standards of description or indexing.

23. What is the source of these descriptive or other metadata schema or standards (institutional convention, professional body, international standard, individual practice, etc.)?

[No response to this question was provided.]

D. Answers to the Domain and Cross-domain Research Questions

Domain 1 Research Questions:

1.1. What types of documents are traditionally made or received and set aside (that is, created) in the course of artistic, scientific, and governmental activities that are expected to be delivered online? For what purposes? What types of electronic documents are currently being created to accomplish those same activities? Have the purposes for which these documents are created changed?

Altair4 is a private small company that creates different kinds of documents including photographs, architectural drawings, text, images, e-mail, databases, vectorial, audio and sound files. These documents are used to build multimedia artistic products, such as the one that is the object of this case-study. The purpose of this work is to “virtually” reconstruct the original structure using modern information technologies. The resulting product would be used for teaching archeology. In more general terms, these entities reflect Altair4’s interest in promoting and celebrating our cultural and artistic heritage. The knowledge and experience from these projects is consistent with the wide range of 3D archaeological reconstructions developed for museums, TV and interactive CD-ROMs.

1.3. What are the formal elements and attributes of the documents generated by these processes in both a traditional and a digital environment? What is the function of each element and the significance of each attribute? Specifically, what is the manifestation of authorship in the records of each activity and its implications for the exercise of intellectual property rights and the attribution of responsibilities?

They are historical and iconographic documentation, photographs, architectural drawings, text, image, e-mail, database, vectorial, audio and sound files. The formal elements and attributes of the digital entities are: 3D Studio Max modeling and rendering software was used to create .MAX and .3DS vectorial files. Adobe Photoshop was used to create and manipulate .PSD, .TGA, .TIF, .BMP and .GIF files created with to obtain pictorial textures. Tree Storm software was used in the virtual reconstruction of the garden.

The manifestation of authorship in the records, the implications for the exercise of intellectual property rights and the attribution of responsibilities are all decided by the three heads of Altair4. All the staff members of the project have access to all the documents created during the production process.

1.4. Does the definition of a record adopted by InterPARES 1 apply to all or part of the documents generated by these processes? If yes, given the different manifestations of the record's nature in such documents, how do we recognize and demonstrate the necessary components that the definition identifies? If not, is it possible to change the definition maintaining theoretical consistency in the identification of documents as records across the spectrum of human activities? In other words, should we be looking at other factors that make of a document a record than those that diplomatics and archival science have considered so far?

The definition of a record adopted by InterPARES 1 applies to all the documents generated by these processes. They are all made or received and set aside during the process of the creation of the final product. No factors that define a record, other than those that diplomatics and archival science have considered so far, were identified.

1.7. How do record creators traditionally determine the retention of their records and implement this determination in the context of each activity? How do record retention decisions and practices differ for individual and institutional creators? How has the use of digital technology affected their decisions and practices?

Altair4 saves an estimated 90% of the digital entities created. Selection is made on the basis of importance and similarity, e.g., where two versions are practically identical, only one is saved. Altair4 has not considered the long-term preservation of its digital entities. Finished products are duplicated on media, i.e., CD, DVD, and have a large circulation.

Domain 2 Research Questions:

2.1. What does record reliability mean in the context of artistic, scientific and government activities? To what extent can the electronic records created in the course of each type of activity be considered reliable and why? What requirements on their form and controls on their creation would make us presume that they are reliable?

The quality and reliability of the digital entities are assured if the digital entity can be used to complete the next stage of work. At the system level, reliability is conferred by daily backups, which protect against corrupt files.

2.4. On what basis can the records created in the course of each activity be presumed authentic? How, in the absence of such presumption, can their authenticity be verified?

The version number confers authenticity on the digital entities. Authenticity is assured because the records are daily saved in the project folder.

2.11. What legal or moral obligations exist regarding the creation, use and preservation of the records under investigations?

There are legal obligations set out in contracts as well as those pertaining to copyright.

Domain 3 Research Questions:

3.1. How do the appraisal concepts, methods and models developed by InterPARES 1 for the administrative and legal records created in databases and document management systems apply to the appraisal of the records of artistic, scientific and government activities resulting from the use of the technology examined by InterPARES 2?

3.2. How do the preservation concepts, methods and models developed by InterPARES 1 for the administrative and legal records created in databases and document management systems apply to the preservation of the records of artistic, scientific, and government activities resulting from the use of the technologies examined by InterPARES 2?

The appraisal and preservation concepts, methods and models developed by InterPARES 1 do not apply to the appraisal and preservation records of this case study. Altair4 is a small company that does not have a recordkeeping system, although 90% of the its digital entities are saved. The “Where is it “ program is used to retrieve digital entities.

Policy Research Questions:

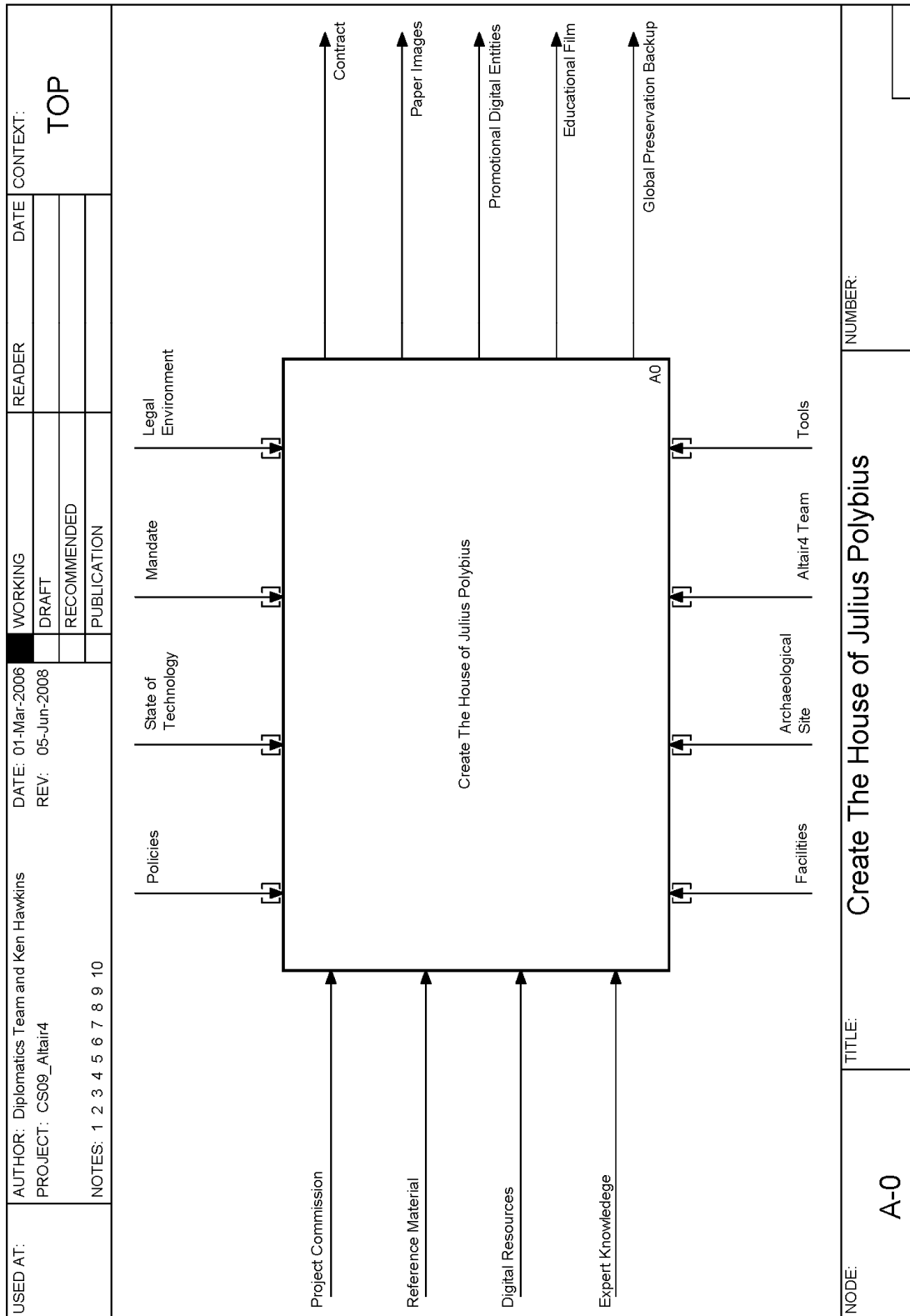
1. To what extent do policies, procedures, and standards currently control records creation, maintenance, preservation and use in each focus area? Do these policies, procedures, and standards need to be modified or augmented?

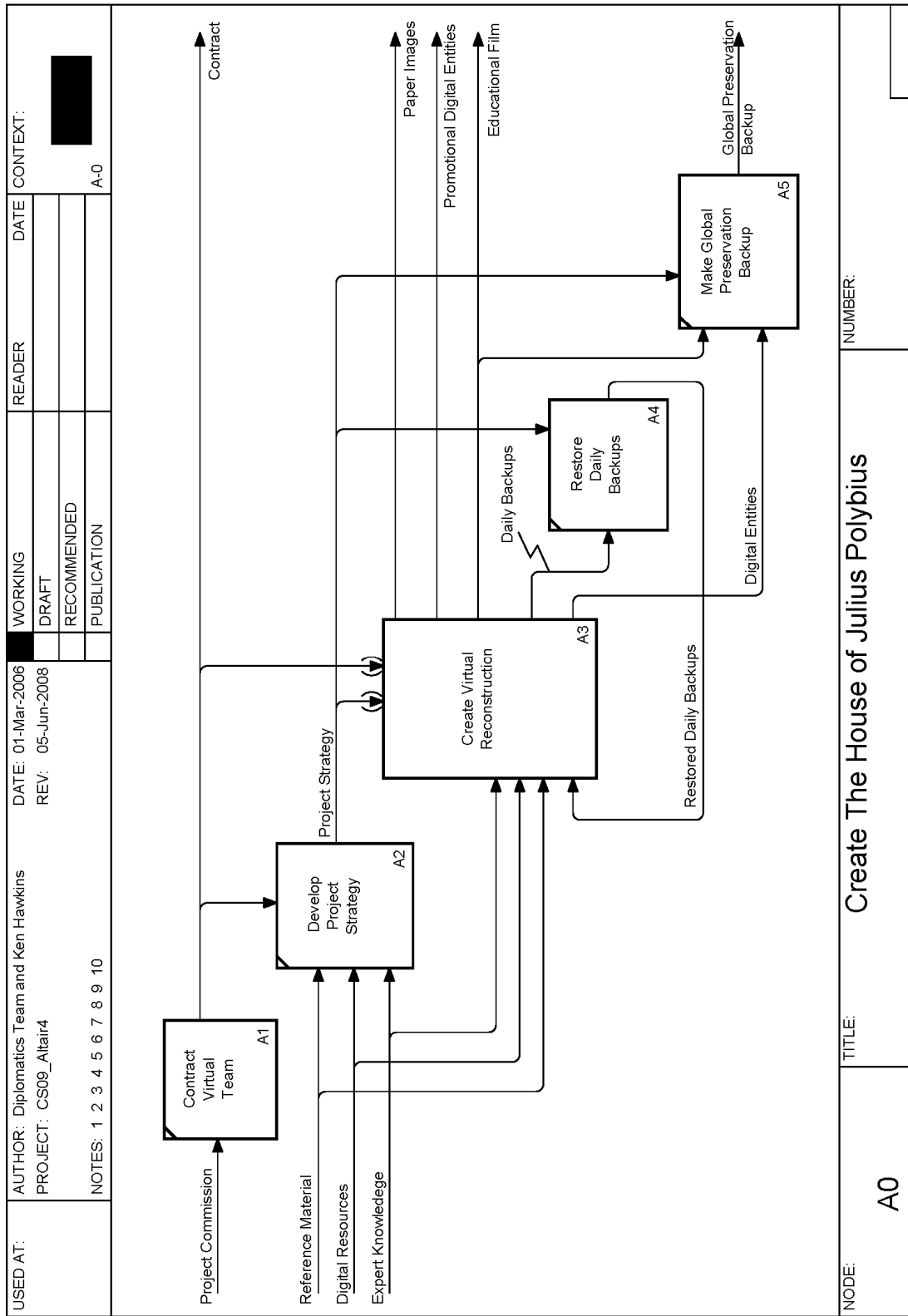
While there are some policies that control the workflow of record creation and quality, once the file has moved on there are no preservation policies, procedures or standards, except for preparation of global backups. Altair4 has not considered the long-term preservation of digital entities. Finished products are duplicated on media, i.e., CD, DVD, and have a large circulation. It has happened that Altair4 could not use some digital entities after their creation because the hardware had changed. No standard or common migration of the documents was adopted.

4. What legal or moral obligations exist regarding the creation, maintenance, preservation, and use of the records of artistic and scientific activities?

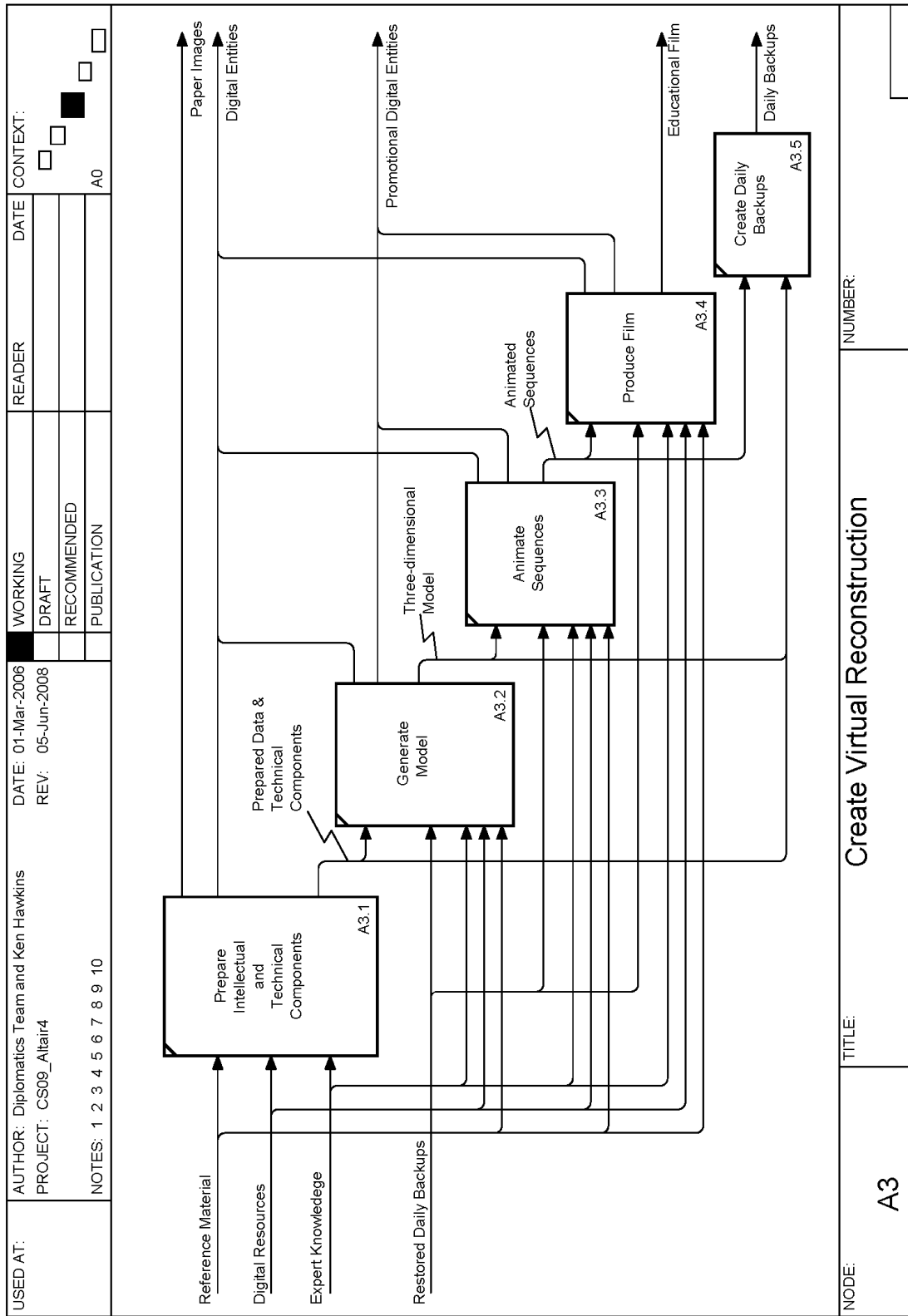
There are legal obligations, including those pertaining to copyright, set out in contract.

E. IDEF0 Activity Model





<p>NUMBER:</p>	<p>TITLE: Create The House of Julius Polybius</p>
<p>NOTE: A0</p>	<p>NUMBER:</p>



Create Virtual Reconstruction

NODE: A3

NUMBER:

CS09(1) - Altair4 di Roma, Activity Definitions (20060516)			
Activity Name	Activity No.	Activity Definition	Activity Note
Create The House of Julius Polybius	A0	To contract virtual team, to create virtual reconstruction, and to make global backup.	
Contract Virtual Team	A1	To contract the virtual reality team capable of creating a reconstruction of the greatest possible historical authenticity and accuracy.	
Develop Project Strategy	A2	Devise the project management and development plan based on the requirements of the contract and the project objectives.	
Create Virtual Reconstruction	A3	To prepare intellectual and technical components, to generate the model, to animate sequences, and to produce the film.	
Prepare Intellectual and Technical Components	A3.1	To gather, prepare and/or transform (e.g., analogue to digital) historical and physical data required to virtually reconstruct Julius Polybius' House.	Data includes architectural drawings, audio files, historic and iconographic documentation, expert knowledge, and photographs that are the images of the pictorial walls (and/or frescos) at the archaeological site.
Generate Model	A3.2	To generate a three-dimensional model in order to create the film the House of Julius Polybius.	
Animate Sequences	A3.3	To create camera movements that appear realistic by fading between the virtual model and three-dimensionally processed photographs.	
Produce Film	A3.4	To produce the final version of the House of Julius Polybius.	
Create Daily Backups	A3.5		
Restore Daily Backups	A4	To replace, restore and/or augment current versions of digital entities with previously backed-up versions.	
Make Global Preservation Backup	A5	To make a global backup of 90% of the digital entities contributing to the final, approved product for preservation purposes.	

CS09(1) - Altair4 di Roma, Arrow Definitions (20060516)		
Arrow Name	Arrow Definition	Arrow Note
Altair4 Team	The virtual reality team formed by Altair4 personnel consists of archaeologists, botanists, mathematicians, volcanologists; staff consists of the art director, coordinator, production director, the scientist, the editor, 3-D and 2-D artists, and consultants.	Altair4 is made up of three partners: Pietro Galifi, Stefano Moretti, and Alessandro Furlan.
Animated Sequences		
Archaeological Site	The archaeological site of the house of Julius Polybius at Pompeii, Italy, which was destroyed in 79 AD by the Mt. Vesuvius eruption, formed the basis of the model for the production.	
Contract	The agreement between Altair4 and members of the virtual team.	
Daily Backups	Versions of current digital entities that are backed up [onto CD-ROM and/or DVD?] on a daily basis.	
Digital Entities	Digital documents created in the course of the creation of the House of Julius Polybius.	These include text, image, e-mail, database, vectorial, audio and sound files.
Digital Resources	Existing digital resources, such as audio and image files, which are used during the project.	Note: The case study leaves the impression that the project only creates digital resource materials, such as audio and image files; however, this seems unlikely.
Educational Film		
Expert Knowledge	Field-specific knowledge and expertise of the various Altair4 team members that helps facilitate creation of the House of Julius Polybius model.	
Facilities	Physical space and infrastructure needed to facilitate Altair4 activities.	
Global Preservation Backup	The corpus of digital entities comprising the final, approved product that have been selected for preservation and burned onto CD-ROM and/or DVD.	
Legal Environment	Governed by contract law and copyright.	
Mandate	Altair4 has a mandate to represent cultural heritage through the multimedia reconstruction of archaeological sites.	

CS09(1) - Altair4 di Roma, Arrow Definitions (20060516)		
Arrow Name	Arrow Definition	Arrow Note
Paper Images	Drawings rendered on paper media that are subsequently digitized using a scanner and 3D Studio Max software.	Note: It is unclear from the case study report what actually becomes of these paper documents (i.e., whether they are destroyed after being digitized, or saved for future reference/use).
Policies	Policies used by Altair4 that control the workflow of record creation and quality.	
Prepared Data & Technical Components	The intellectual and technical components that form the model, including digital photographs of all pictorial walls of the archaeological site.	
Project Commission	The commission received by Altair4 to create the House of Julius Polybius.	
Project Strategy	The overall management and development plan for the project.	
Promotional Digital Entities	Digital entities, or parts of digital entities, distributed to external users by the Altair4 marketing and advertising departments for promotional purposes.	
Reference Material	Historic, iconographic, archaeological and other documentation that is used as reference material during the project.	Note: The case study leaves the impression that the project only creates historic and iconographic documentation; however, this seems extremely unlikely. Hence, it is also included as a top-level input.
Restored Daily Backups	Versions of daily backups of digital entities that are restored due to: (1) loss or corruption of current versions, (2) desire to roll back to previous versions (i.e., replace current versions), and/or (3) desire to augment current versions with previous versions.	
State of Technology	The availability and/or capability of technology at any given time.	
Three-dimensional Model	The three-dimensional model of Julius Polybius' house.	
Tools	Technology, equipment, supplies and other similar resources used to facilitate Altair4 activities.	

