FACULDADE DE CIÊNCIAS SOCIAIS E HUMANAS
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Digital Storytelling for Archaeology:
Unveiling the Story of Castro do Zambujal in 20th and 21st Centuries Visual Media Formats.

Guida Paola Silveira Casella

Tese de Doutoramento em Media Digitais

Tese apresentada para cumprimento dos requisitos necessários à obtenção de Grau de Doutor em Media Digitais – Conteúdos Audiovisuais e Interativos, realizada sob a orientação científica do Professor Daniel Alves do Departamento de História da Faculdade de Ciências Sociais e Humanas da Universidade Nova de Lisboa.

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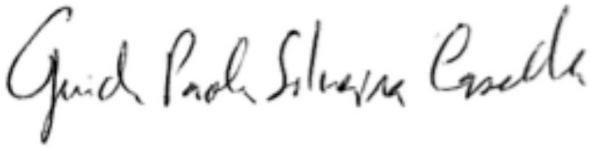






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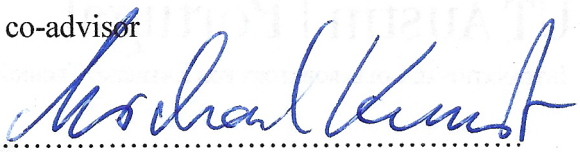
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Abstract

This thesis examines the communication of Archaeology, historically and comparatively, via analogical and digital *media*. The research question is how digital technology, as the main way of accessing information today, is impacting the tradition of *storytelling* and pictorial representation of the past. The principles of *interactivity, multimediality* and *connectivity,* applied to the communication of Archaeology, both remediate and innovate older *media* formats, bringing innovative approaches that engage the public through *edutainment*.

Drawing from literature in Heritage Studies, Museology, Museography, Visual Culture and Digital *Media*, we analyze the communication of the archaeological site Zambujal (Torres Vedras, Portugal) between 1946 and 2018. In order to understand the role of the digital *medium* in communicating cultural heritage we will review the state of the art in digital museography and develop a prototype for a virtual exhibit to tell the story of Zambujal, using the web documentary genre of *digital storytelling* as a framework.

The growing demand for digital content in museography is giving rise to new research needs, allowing theorization and experimentation of new forms of communication in Archaeology. Visitor's studies have shown that the use of digital *media* in museums enhances learning and provides rich and engaging experiences. But our study proposes to understand the role of *storytelling* in Archaeology historically, situating the digital *medium* as the most recent approach in a long tradition. In this way we reinforce the thesis that the perception of the past reflects the cultural condition of the society that produces it.

Keywords: digital humanities, digital storytelling, virtual museography, archaeology and *media*, visual methods in archaeology, public archaeology.

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Glossary of terms

Analogue Media
Forms of representation using analogue surrogate media (paper, photography, film, tridimensional model, etc) as oposite to Digital Media.

App
Short designation for Application – or program – that can perform actions using digital media.

Digital Media
Media that preciously existed in analogue media (paper, fim, radio transmission, etc) now can be converted into digital media using digital binary code and represented as an image or sound via a variety of devices (computers, mobile phones, tablets).

Digital Storytelling
Term used to refer to several formats of communication using digital media.

Hyperlink
A word, phrase or image highlighted in the computer display that when chosen (clicked upone) connects to another document or part od the document.

Human-computer interaction (HCI)
Field of study concerned with the interaction between human and machine in order to develop design processes that make computers easier to use.

Interactive Digital Narrative
A narrative composed using interactive digital media (usually combining text, image, film, graphic design and interactivity).

Interactive Documentary
A non-fiction narrative genre using interactive digital media.

Interface
A place where a combination of hardware and software allow the the interaction between a human and a machine.

Storytelling
The act of telling stories in an engaging and emotional way.

Virtual Museum
A web site or interactive narrative that aims to communicate Museum content.

Virtual Exhibit
A web site or interactive narrative organized like an exhibit.

Webdocumentary
An interactive documentary displayed on the Internet.

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Introduction

General Introduction

Research Setting

"Castro do Zambujal" or "Zambujal"[1] is a Copper Age archaeological site in Torres Vedras, Portugal, located 50 Km northeast of Lisbon. It was discovered in 1932 by a local man called Leonel Trindade and following an archaeological survey and it was declared National Monument in 1944. Zambujal is an important fortified settlement situated at the top of a hill, facing west. At the bottom of the hill runs the Ribeira de Pedrulhos, a tributary of River Sizandro, which flows to the Atlantic Ocean, 10km away. The settlement was occupied by Early Chalcolithic, Bell Beaker and Bronze Age cultures, hence dated between c.2850 BC and c.1750 BC. During this period of about one thousand years, a system of four concentric defensive stonewalls was altered five times, indicating five different defense strategies. These walls are still preserved today up to 4 meters high in some parts of the archaeological site. The material culture suggests a population of farmers, handcrafters of pottery, metal (copper), wood and textiles who maintained long distance commercial contacts with other Mediterranean and Atlantic cultures.

This site is known worldwide because of its size, quality of materials, and good state of conservation. It has been systematically excavated and surveyed by teams of archaeologists from the German Archaeological Institute (G.A.I.) since 1964. An archive comprising hundreds of drawings, photographs, sound and video recordings produced across a 70-year time span (1946-2018), constitutes a genuine example of how an archaeological site can promote scientific literacy. A multitude of publications, reports, popular magazine articles, TV documentaries and exhibitions, reflect the *culture conditions* of each period (from the 1940s to 2018).

More recently, the adoption of digital *media* in all stages of research (from

[1] Firstly classified as Monument of Zambujal (1944), then Castro do Zambujal (2012), the most correct name is Zambujal, because "Castro" means "citadel" and is usually applied to Iron Age sites (c.1200-200 BC), while Zambujal dates from the Copper Age (2850 BC).

data collection, analysis and interpretation, to the dissemination of archaeological information to scholars and to the general public) clearly illustrates the topic of this research: changes and continuities in archaeological communication via analogical and digital *media*.

The archaeological site of Zambujal is a representative case study of archaeological communication through time. Its archive includes communication examples such as general science and culture publications from the 40s and 50s (*Brotéria,* 1946; *Badaladas,* 1954-55); scientific publications and magazine articles from the 60s (*Madrider Mitteilungen,* 1965*; O Arqueólogo Português,* 1969) and a multiplicity of *media* produced from the 1990s until today (exhibitions, TV documentaries, scientific publishing such as *Madrider Mitteilungen* (1996) and *O Arqueólogo Português* (2001, 2002, 2011) and digital publishing exploring new formats and platforms. According to the archaeologist Michael Kunst current director of the excavations and co-supervisor of this thesis, Zambujal was among the first Portuguese sites concerned with fostering public engagement with the archaeological excavations and research. "*Zambujal exhibitions were pioneer in Portugal in the 1960s, and its 1991 exhibition served as reference to other site exhibitions, like Leceia in Oeiras*"[2]. Zambujal is also renowned as an archaeological field school where three generations of academics from Portugal, Spain and Germany acquired experience in excavation.

During the writing of this thesis, two important events were instigated to communicate Zambujal: the first, was the thematic exhibition presented in 27th May 2016 at the Museu Municipal Leonel Trindade (MMLT) in Torres Vedras, entitled "Histórias do Zambujal: 50 anos do Instituto Arqueológico Alemão em Torres Vedras" [Stories of Zambujal: 50 years of the German Archaeological Institute in Torres Vedras] for which we participated in the curation and development of content and constituted a real life scenario for our research project; the second was a project of valorization of the monument to make it visitable by the public, funded by local city hall and EU funding (Programa Operacional Regional do Centro – CENTRO 2020), in collaboration with Direcção Geral do Património Cultural and the German Archaeological Institute, presented in 1st December 2018.

[2] M. Kunst, personal communication, 2013.

We participated in both projects, with the production of digital content for the exhibition and with a digital project management of the virtual museography of Zambujal, which will open to the public on the 1st December 2018[3]. The context of developing the exhibition allowed us an exceptional research environment. We were responsible for organizing the content and to participate in the exhibition layout and script, and at the same time we collected media for our empirical study. The development of a virtual exibit for iPad as a practical component of our research evolved in dialogue with the preparation of the exhibition always making choices and iterating according to the changes that occurred during the process. It was only after the exhibition was settled in 2016 that our prototype could be concluded, as part of our doctoral research funded with the FCT doctoral grant.

After the success of this exhibition, and because our PhD research in *Digital Storytelling for Archaeology* was acknowledged by the Museum of Torres Vedras as an important contribute to contemporary Heritage valorization, we were invited to make the Project Management of Zambujal open air Museography. For us, this was a commercial project that resulted from what we've learned during the PhD research. Being a professional project we don't include it in the thesis, nevertheless it is available for visit and the application "Zambujal Audio Guide" (a native application for iOS and Android) is available for free download in the Google Play and Apple Store[4]. The concept behind this Audio Guide is that the visitor can hear voices from the past while he moves along the open-air archaeological site. In five location points (where we also developed information panels) the mobile app offers five soundtracks with sound landscapes and the voice of five different characters that address the visitor directly. Our role in the project was to create the visiting tour identifying five points of interest, create textual and visual content to provide in these points, both in printed panels, printed map, and braille inscription and to create audio content to be delivered in the mobile app (whose architecture and content we also had to provide). We wrote the script the actors voice recording, selected and edited audio adding background sounds, and delegated to a programming company the technological development of the app. This location-based mobile experience was a concrete output of this research and a proof of the value of Digital Storytelling for Archaeology.

[3] Available in http://storyplaces.eu/zambujal/.
[4] Available in App Store https://itunes.apple.com/us/app/zambujal-audio-guide/id1318293600?mt=8 and Google Play https://play.google.com/store/apps/details?id=pt.cmtvedras.audioguiadozambujal&hl=en

Motivation and Context

While writing this thesis, I found this picture by chance in my family album. It shows a group of people visiting an archaeological site in northern Portugal in the 1930's. The houses of this Iron Age settlement, Citânia de Briteiros[5] (c. 200B.C.) are restored reconstructions[6] made to provide visitors (who promenade amused in the background of the picture) with a better understanding of what this settlement might have looked like in the past.



Fig.1) Black and White photograph of my grand grandparents visiting the archaeological site Citânia de Briteiros in 1933.

In the foreground, three figures pose around a Christian cross that contrasts with the original site[7]. In our photo, the cross reflects the spirit of Portuguese Nationalism during the "Estado Novo" regime (1926-1968) with its emphasis upon

[5] Discovered by Francisco Martins Sarmento in 1875.

[6] The two great cycles of excavation and restoration are due to Martins Sarmento between 1875-1889 and Mário Cardoso between 1930-1950.

[7] Christian crosses can be found near prehistoric settlements in Portugal, Ireland and other countries symbolizing the religious conversion of a pagan site.

religion, family and authoritarian ideologies.

Facing the camera, the man standing in the foreground is Antonio Silveira, my great-grandfather. The woman below in the middle is Guida Branca de Sousa, my great-grandmother. The woman on the right has not been identified by any of my relatives to whom I showed the picture. The absence of a name or a narrative connected with this figure reminds us that if we do not tell stories about places, people or objects, they just fade away. Similarly, archaeological sites and museums have *storytelling* at their core as an essential asset to the legacy that they are supposed to preserve.

When my great-grandparents visited Citânia de Briteiros in August 1933, they certainly did not imagine that almost a hundred years later, the same kind of promenades in archaeological sites would most likely be accompanied by personal mobile devices with interactive digital *media* content. At the time, radio broadcasting in Portugal was still in an experimental stage and television was yet to be invented. The following decades of the 20th century saw a long chain of technological innovations that would greatly affect the way we tell stories. The story of this photo interweaves with the history of society itself.

This thesis addresses public communication of archaeological sites through time, comparing the uses of analogical and digital *media*. When choosing an historical perspective to look at the topic of virtual museography I've enroled as researcher in IHC (Instituto de História Contemporânea) of FCSH-UNL and our research proposal was approved by the Doctoral Programme in Digital Media (specialization in Interactive Content Creation) from the UT Austin_Portugal Digital Media Colab (CoLab - International Collaboratory for Emerging Technologies)[8], a prestigious Doctoral Programme focused on the creation and analysis of interactive artefacts, oriented towards practice-led research approaches.

My motivation to do research in this field derives from my perception as a practitioner in archaeological visual communication that the digital turn is a reality hence the need for a continuous professional development. Since 1998 I have been working with archaeologists as a graphic artist and surveyor. I have applied my

[8] CoLab - International Collaboratory for Emerging Technologies http://utaustinportugal.org/

artistic and professional skills to aid their record of the excavations and the artifacts preparing scientific illustration and infographics for scientific publications, and producing educational material for public communication. In the course of the last twenty years I have noted the adoption of digital technology in all phases of archaeological research and communication to the public. My motivation was also fostered by a need to prepeare my students to the future. I teach visualization techniques to Archaeology students, and believe they need to be prepared to use innovative digital tools but also need to recognize the traditional techniques and the uses of image in Archaeology. Also, as a researcher, this doctoral thesis fits in my interest in the visual culture of science (in particular Archaeology). After a fine arts degreee in Painting, I did a Master in Arts in Archaeological Illustration, studying the image of Archaeology in the 19th century and how the ruins were depicted by antiquarians in a picturesque manner sharing a visual language with representatins of ruins in the Arts. The reproduction technologies of the 19th century, namely etching prints, strongly influenced the visual language we still use today in archaeological illustration (black and with drawings using shading through little dots, a technique known as *stippling*, which despite new digital techiniques and 3d scanning or photogrammetry, is still preferred in scientific publishing). I am concerned on how technology affect visual culture the conventions used in visual science communication and to contribute to critically think about what we are doing in the practice of making the past accessible.

My first interest in researching Digital *Media* in the context of Archaeological Communication was to address Serious Games, but soon I found in the field of Interactive Documentary the elements I could use to apply interactive digital technology to create non-fiction communication in Archaeology in a more effective way. What I suggest in this thesis is that the Interactive Documentary format is a useful framework to complement archaeological site's web presence. Digital Storytelling as an approach to address the archaeological site's life history as opposed to the traditional archaeological reconstructions (much explored with digital technology in a field known as Virtual Archaeology) enables Archaeology communicators to use archive material and the story of the archaeological research itself as the main narrative focus, being more aligned with non-fiction reporting than just communicating the interpretation of the site itself.

Problem Statement

The digital turn in archaeological communication: identifying research needs

The actual paradigm shift regarding digital communication gave rise to new creative and professional models of producing, distributing and funding digital publishing. This shift demands reflection and understanding, in order to contribute to future communication strategies and foster the adoption of digital technology in heritage mediation.

Prior to the 1990s, all the communication in Portuguese museums was made solely with analogical *media* such as printed publications, information panels and three-dimensional models. Gradually, by the turn of the millennium, museums adopted digital technology, and with it, public expectations and behaviours changed creating the need in institutions to provide increasingly new and innovative solutions driven by technological trends imposed by the market.

First, people started using the Internet to search general information about museum opening hours, to buy tickets, to look up what was the current exhibition, or eventually to browse a database of museum objetcs in the collection. In this web 1.0 paradigm, museums were using digital media just as if using other mass media, in a one-way communication model, basically as providors of usefull information. In a second moment, with the web 2.0 phenomenon (that allowed a two way communication) visitors were able to post comments in the museum pages, and later, with the proliferation of social networking, they gained confidence to participate in wider conversations with other visitors, or post their own opinions in blogs or social media.

With the widespread of the smartphone, came the mobile phenomenon. People were accesing content online on the go, they increasingly started using the phone embedded camera to produce and share visual content about their visit in posts and comments. As newer versions of smartphones incorporating GPS services and faster internet access allowed new uses for the hardware, an explosion of software applications provided by museums in the App Stores, competing over the most

creative ways of bringing the meaning of collections into the pockets of the visitor. Interactive tables and instalations in museums also contributed to develop in the visitor a literacy in navigating interactive narratives, and play around with these new formats for museum content delivery.

The launch of the iPad in 2010 and similar tablets, generalized people's literacy in navigating interactive narratives. The iPad became a new way of accessing rich content using gestures on the screen, virtually eliminating the keyboard as interface. Although we believe the smartphone was a more disruptive technological change allowing Internet acess on the go, and the tablet almost was a bigger version of a smartphone, we recognize the potential of the iPad as a tool to provide digital publishing about Archaeology, somewhere between the desktop experience (where the willingness to interact with cultural content has a self enrichment goal, a learning goal) and the mobile phone experience (more associated with practical needs such as map orientation, or to check museum opening hours). In between these two modes of interacting with screens, the iPad invites to leisure experiences, where informal learning finds an optimal environment to thrive. This is one of the reasons why during our research we developed a virtual exhibition for iPad as a mode of making Digital *Storytelling* for Archaeology.

Technological advances are fast. If in the beginning of our research, iPad was a novelty, now the focus might be in other platforms. For the museum field in the moment 3D immersive narratives in Virtual Reality using glasses are much more innovative than iPad publishing. That is why we choose to focus not only in the technology, but also, and fundamentally, in the narratives underlying the interactive experience, promoting an historical approach to the use of media in Archaeology, where the digital toolkit is only the more recent tool in a long tradition of storytelling.

As this *digital revolution*[9] became widespread, a state of permanent *media* consumption led to a growing demand for content production. Beyond the technological innovations and behavior changes that derive from it, people still have the need to create and listen to stories. The common ground between all these

[9] This *digital revolution* actually marks a break with the traditional communication system, changing the very structure of communication itself and producing new behavioural codes - see the impact of social *media* in people's lives, as mediation and validation of the social experience.

disparate forms of communication is storytelling: narratives and meaning. Narratives constitute the cultural core of which society is made of. With the new digital tools available, new opportunities for *storytelling* are flourishing, and the context of cultural heritage communication is no exception, exploring it with innovative approaches.

The possibility of creating and distributing content to so many people individually through the Internet and various mobile devices, offers the chance for museum professionals to work in new engaging, playfull and very creative ways, at the expense of the need of constant updating, demanding new professional qualifications and skills. We can imagine inside secular public institutions or in institutions with less funding, there will be a digital divide. I reiterate the importance to focus on the experience and in the meanings underlying the communication circumstance as a way of overcome the limitations usually connected to the lack of resources to create the most innovative approaches. Therefore, it is so necessary to understand in detail the characteristics of the "now not so new" digital *medium* and the ways in which people interact with it, as what they really take home, what they really learn, and how to make heritage meaningful to them.

My approach in this research is to look not only to the technological layer involved in the cultural shift derived from the digital society, but look at behavioural changes. Nowadays we see the museum visitor who wants to identify himself with a code of communication that is in line with his culture conditions, where digital *media* have a strong prominence. For many years, people interacted with analogical *media* (e.g., museum panels, leaflets, catalogues) and were familiar with it. What happened now in a relatively short period of time (30 years since the 90s) is that there was a clear transition to a new paradigm where people expect to receive narratives in new formats, where texts are shorter[10]; images are used profusely; video, sound and interactivity are integrated.

The emergence of new communication codes both in visual display and in interaction behaviour is a topic that needs to be assessed from a bigger picture

[10] See Victoria and Albert Museum's *Gallery text at the V&A - A Ten Point Guide*, published in 2013. http://www.vam.ac.uk/__data/assets/pdf_file/0009/238077/Gallery-Text-at-the-V-and-A-Ten-Point-Guide-Aug-2013.pdf

perspective. I believe it is the responsibility of researchers to make accessible to a larger number of people the work of theorists in digital *media* that focused not in changes in technology, but in changes in social practices. Our research consolidates and reunites a selection of authors and concepts that we consider usefull to understand the phenomenon of virtual museography.

Despite all the enthusiasm regarding technological innovation we need also to be aware of the pitfalls. Digital software requires continuous updating and investment in new hardware resulting in financial costs that are often beyond the budgets of most Portuguese museums. Nevertheless, we must recognize that the use of digital *media* has become synonymous with innovation and engagement of new audiences, constituting an important factor for museums' sustainability whose role is to preserve, study and communicate knowledge to the community. Our position will be to focus on the use of digital *storytelling* as a way to create added value that do not compete, but complements the traditional offer of exibitions and publications.

The present research addresses this problem from two perspectives: on the one hand by looking back historically at traditional (pre-digital) practices in archaeological communication, critically questioning the role of narrative and traditional *media* in scientific knowledge and in museum presentation repertoires, and on the other hand by looking forward to the future of interactive narrative as a way of telling archaeological stories, through the development of a virtual exhibition prototype.

By connecting traditional and emerging practices, this thesis hopes to contribute to the field of virtual museography and create a scalable framework that can be applied to other archaeological sites. While archaeologists are not trained in public communication, digital creators are not familiar with the way archaeologists address and produce knowledge about the past. Our aim is to fill this gap and contribute towards a better understanding of the boundaries of Archaeology as a discursive practice, exploring creative possibilities of narratives using digital *storytelling* and map the *plethora* of new tools available for virtual archaeological museography.

Science visual communicators, scientific illustrators, infographics designers and more recently, digital *media* specialists, need to fully understand what

archaeologists want in order to provide the best solution to improve scientific communication. Whether communicating for scientific publishing or to the general audience, the professional communicator must understand the diferences in language (scientific Vs popular writing), and adapt the form to the specified target audience. This thesis has the aim of being an interface between archaeologists and designers.

Visitors to archaeological sites are becoming more frequent today, as people tend to be increasingly driven to visit cultural and natural heritage sites, self-motivated for learning and leisure experiences. The visitors of archaeological sites are in general well informed and demand access to accurate yet accessible information. To meet the needs and expectations of this kind of audience, science communicators must use appropriate texts and language, acknowledging that scientific writing is not the ideal means to communicate with the general public, hence the language must be adapted to the specific target audience. Today's audiences need emotional connection, something that captivates their attention and relates to their own experiences without sacrificing scientific accuracy. In this *edutainment* environment, *storytelling* can play an important role.

From manuscript correspondence, to published illustrated books, through exhibitions, TV documentaries and series, and more recently the Internet, Archaeology uses *media* to study, analyze and communicate results of the study of the human past. Digital *media* are simply the latest in a long line of *media* used by archaeologists to communicate their work.

In a time when we try to name and characterize generations (Generation X, Millenials, Golden Generation, etc) we would like to propose we are all "middle generations" and we are responsible of making the bridge between the younger and the older generations. In this line of thought the utmost goal of this thesis is to serve as an interface between two generations, one that was born after the digital revolution, and uses prolifically digital media, but doesn´t know the world before the widespread of computers, and the other that assisted to the adoption of digital technology but doesn´t fully understand its potential, still uses much analogic media, and eventually is suspicious about the liability of the digital environment.

Aim and Research Questions

The main aim of this thesis is to provide reference points and vocabulary for archaeological communicators to understand and use digital *storytelling*, acknowledging its potential for science communication. To achieve this objective we survey emerging modes of presenting Archaeology and Heritage with digital *media* and conduct a practice-led research developing a prototype of a digital interactive narrative to communicate an archaeological site.

In order to understand the value of *storytelling* in Archaeology, this research focuses on how archaeological sites communicated before and after the adoption of digital *media,* using the Copper Age site of "Zambujal" as a case study.

Our research project began by contacting the archaeologist Michael Kunst, director of the Zambujal excavations, in order to establish a protocol for studying the archival *corpus* used to communicate the site since its discovery until today. The analisis of this archive has two aims; first, to identify narratives and the *media* that support them from an historical perspective, second, to question the impact of digital *media* in this practice.

The research study then shifts towards the topic of digital museography, where we start by mapping and characterizing current applications of digital *storytelling* in museums, and then focusing in the study of virtual exhibitions in terms of interface design and narrative structure with the aim of informing the development of an original application to communicate Zambujal.

Finally, to create a framework to produce digital *storytelling* to communicate Archaeology, we develop a prototype for a virtual exhibition called "Histórias do Zambujal" [Stories of Zambujal]. With this experiment we "remix" Zambujal's archival material into an interactive documentary format.[11].

The hypothesis lays in terms of format, to aply the affordances of the digital *medium* (multimedia, convergence, interactivity and connectivity) to repurpose digitized *media* from an archaeological archive, in a novel way that is in line with the current *cultural conditions*. In terms of content, the hypothesis is to draw on the

[11] Available in appendixes C-3-3-WEBDOC.

guidelines of digital *storytelling* to communicate an archaeological site, by evidencing the life story of the excavation and the multiple voices around it, as the main narrative for public communication, instead of solely trying to explain the interpretation of the site.

Furthermore, digital technology alone is insufficient to create engaging communication strategies for museums or archaeological sites. Hence, it is necessary to deepen our understanding of what is *storytelling* and how it can be used to communicate Archaeology. It is up to science communicators to foster a close collaboration between designers, specialists and educators, in order to translate the scientific contents in a way that becomes intelligible and perceptible to a wider audience.

Considering that there are several forms of *storytelling*, our first goal is to understand how, in this case study (Zambujal), these stories were told during the last 70 years, and how digital *media* can contribute to improve the long tradition of communicating Archeology.

The main research question is how digital technology, as the main way of accessing information today, is impacting on the tradition of storytelling and pictorial representation of the past.

To assess changes and continuities in the practice of archaeological heritage communication we must look back and see how the field evolved. In the first part of our research (Chapter 4), we will analyze the Zambujal visual archive (maps, illustrations, infographics and models) and formulate the following questions:

RQ 1: ***What are the communications needs in Archaeology and how have different media supported them?***

- What narratives are used to communicate an archaeological site?
- What kinds of *media* are used to communicate archaeological sites?
- Is there a pattern in the narrative about the site, in different historical periods?
- Are visual *media* produced from scratch or are they appropriated from previous periods?
- What is the difference in communication in distinct historical periods?

- What is the impact of digital *media* on the communication of Archaeology?

We will approach this analysis using methodological tools from Visual Culture studies drawing on the *Visual Methodologies* of Gillian Rose (Rose, 2001), described in the methodology chapter of this thesis (Chapter 3).

The image of Archeology has its roots in the Renaissance pictorial tradition and has accompanied the evolution of Archeology as a science. For almost five centuries, the production of visual texts in the context of the visual record, study and communication of Heritage, oscillates between objective discourses of scientific study and narrative formulations with the aim of communicating the sites to the broader audience.

The interest in the image of Archeology as an object of study is part of a renewed interest in the image in general that emerged with Cultural Studies (and consequent Cultural Visual Studies) from the 60s / 70s where adressing the image is not restricted to the study of the image of artistic creation. Rethinking the scientific image (Barlex and Carré 1985; Latour, 1986; Baigrie, 1996; Powels 2006; Daston, 2007, 2011) is similar to questioning the image in publicity (Hall, 1997) or the photographic image as evidence in Law, Hospitals, Passports and Licences (Tagg 1993).

Studies from the History of Science inaugurate an interest in the image of Archeology as an autonomous subject. This line of research began with the writings of Stuart Piggott about the role of Antiquarians and their graphic methodology of visual recording to the development of Archaeology (Piggott 1976, 1978, 1985, 1989, 1999). While the antiquarian representation of megaliths received attention from visual culture studies (Michel, 1982, Mohen, 1989, 1998, 2000), other authors have focused on other issues, such as the representation repertoire of Prehistory as based in biblical images (Rudwick, 1992) or on the iconographic repertoire for depicting early man (Schnapp, 1993; Moser, 1998; Moser and Smiles, 2004).

Gradually, these studies found its place in the fringes of Archaeology, in special panels in conferences (TAG Conference, 1997, Historical Archaeology Conference, 1998) and in edited collective publications about visual representation in Archaeology addressing not only drawing, but also photography, TV, documentary, film, literature,

etc. (Molyneaux, 1997, Clack and Brittain, 2007).

From the 90's a new literature related to the possibilities of digital applications in the field called "Virtual Archeology" arises (Reilly, 1991, 1992; Barceló, Forte and Sanders, 2000) and finally, in the first decade of the twenty first century critical readings that relate the digital culture with great systemic changes in the society due to the new technological paradigm arise. (Bateman, 2000; Clarke, 2004; Kulik 2007)

Kulik (2007) analised archaeological communication through time but didn't focus on a specific archaeological site, instead, he focused on the means of communication and technology in different eras looking at the modus operating of the discipline in terms of professional organization and funding, actually relating the public communication to periods when lack of governamental funding led to a bigger concern in raising public awareness for archaeology research. Despite the studies on the image of Archaeology concentrating in specific Archaeological sites such as Stonehenge and Avebury (Piggott, 1985; Mortimer, 2003) we are not aware of other studies focusing solely on how a single archaeological site has been communicated, although we were inspired by the studies of how museums have changed communication strategies online and in the physical exhibits (Bouquet, 2012). Regarding the impact of digital *media* in archaeological visualization techniques both with aesthetics and cognitive implications for the practice of Archaeology, there is much literature (Reilly, 1991, 1992; Bateman, 2000; Clarke, 2004; Eiteljorg, 2004; Kalay, 2007) but none addresses the subject from an historical perspective, nor from a comparative perspective between analogical and digital *media*, like we propose in our research.

Our second empirical study, a cultural interface survey (Chapter 5) aims at deepening our understanding of virtual museography, mapping emerging modalities of digital communication of heritage sites. After studying "What to say" about an archaeological site in Chapter 4, we want to address "How to say it" with digital *media* applications. For this we formulated the following research questions:

RQ 2: *'What are the emerging modalities for presenting the past with interactive digital media?*

- What modalities of digital media applications exist in museums, and what

characterizes and differentiates them? What are their unique affordances (or specificities) and pitfalls?

- What modes of engagement can we identify in the different modalities?
- What narrative structures can we identify in virtual exhibitions?

To address these questions we recognized the literature on mapping digital technologies for cultural heritage, was mostly from the 1990s and 2000 when there was a need to understand the potential of digital media for the heritage field (Reilly, 1992; Plentickxs, 2004; Eiteljorg, 2004). However, we haven't found a recent comprehensive survey that would fit our need to map the available modalities of using interactive digital *media* in a manner that could be presented to the team of educators and archaeologists whith whom we would be working in the practical part of this research.

Our survey had the purpose of informing our choices in the development of a prototype of an interactive digital narrative for Zambujal as a complement to the study of its visual archive. So we will visit and experiment examples of interactive *media* use in museums, employing an ethnographic observation approach.

The criteria for selecting case studies was not meant to be a review of the state of the art, but what we call in design process "a lateral thinking", i.e. looking at inspirational examples that could guide our creative process.

The reporting of our observation provides a methodology that can be replicated by someone who wishes to develop a digital artefact to communicate an archaeological site, following this steps: study the archaeological site's archive identifying stories and developing a *media* database, conduct a survey to map possible applications and technologies and understanding the differences of the several tipologies (technical specifications, target audience, forms of interaction and user experience, balance between physical and virtual experience, i.e. is it a web site to visit from home, or is it an app to use in archaeological site in open air), and finnaly select one technology and understand its anatomy to replicate, applying the concept to communicate the archaeological site in case.

Finally, in Chapter 6, we will address the application of interaction design to archaeological communication. Our focus will be on the side of production of

interactive narratives including them in the tradition of visual *storytelling* in Archaeology, already explored in Chapter 4. Therefore, we opted to leave out of our study the visitor's studies and concise usability testing of the app, a topic well explored elsewhere in the literature (Nielsen, 2000; Woo, 2006; Buxton, 2007; Tullis and Albert, 2013). We assume our target audience is proficuous in exploring museums web sites and apps and focus on the design problems faced by content producers.

This part of our empirical study rely on creative design practical questions:

RQ 3: ***How can the principles of digital storytelling (and interaction design) be integrated into the traditional workflow of communication in Archaeology and contribute towards its improvement?***

- How to develop a virtual exhibition about an archaeological site using the 'interactive documentary' genre as a framework?
- How can interaction design improve archaeological communication?
- What steps are required to build a virtual exhibition?
- To what extent do we 'remediate' traditional practices, and in where do we really innovate?
- Are the new practices generating new problems or are these just new practices applied to old problems?

Our approach to develop this prototype aims at being in line with the premises of digital *storytelling* as promoted by the *Center for Digital Storytelling* in Berkeley, where the use of digital technology gives voice to personal stories building a sense of community in the producers and viewers (Lambert, 2006). Based on that idea we will use the site's life history as the main narrative. To conduct this practice-led research we will use interaction design methodologies (Buxton, 2007, 2008; Garrett, 2011; Hayes, 2011) in an experimental approach in a series of iterations using the Iteration Cicle Framework (Smith and Dean, 2009).

We will work closely with a team of educators and archaeologists specialized in Zambujal context, and adapting the form of our prototype to the collaborative emerging communication needs, using a practive-led research framework further specified in Chapter 3.

Thesis Structure

This research is divided into two volumes. Volume I contains the written component of the thesis, Volume II presents, in a series of appendixes, information relevant to research, but not presented in the main body of the thesis.

In Chapter 1 we present the literature review and state of the art in Digital Storytelling and Archaeological Museography.

In Chapter 2 we present our Methodology using in a Practice-led Research Approach with Qualitative Research Methods. We then describe the research instruments for the three empirical studies: study 1 – visual analysis of Zambujal using content analysis; study 2 - survey of the state of the art in digital *media* applications to museography using ethnography and interface critique; study 3 – development of a virtual exhibition using practice based research and interaction design methodologies.

In the following three chapters (Chapters 3, 4 and 5) we present the results of the empirical study. Chapter 3 presents a visual analysis of the archive of Zambujal archaeological site. We focus on identifying narratives produced about the site, and characterize the different *media* productions in the course of three periods (1946-1964; 1964-1994; 1994-2018).

In Chapter 4 we survey the use of digital *media* in museums by conducting observations of real case studies in Portugal and Spain, online observation of virtual exhibitions and a guided visit. From this analysis we describe the structure of different digital artefacts used in museums and compare them in order to choose one typology to use as framework to develop our prototype (we choose the web documentary format to create a virtual exhibition).

Chapter 5 describes the development of "Histórias do Zambujal" [Stories of Zambujal], a virtual exhibition for iPad, showing how digital *storytelling* can be applied to archaeological communication.

We then present the general Conclusion of this thesis, making a critical reflection about the research findings and recommend future work.

The document ends with the Bibliography divided in the following sections: Bilbiographic References cited in the text ; a List of Primary Sources consulted for the documentation analysis; and a Comprehensive Bibliography reflecting the Literature Review conducted in Heritage Studies, Museology, Museography, Visual Culture and Digital Media. To facilitate an understanding of the several types of themes, this section was organized according to distinct academic fields.

In a separate volume we present the Appendixes with information relative to fieldwork:

- Appendix A – Contains our database (Zambujal's *media* archive) and the instruments used for the content analysis.
- Appendix B – Contains our observation notes on the survey of digital storytelling applications to cultural heritage communication.
- Appendix C – Contains *media* files (videos and interactive media) related to the process, prototype and documentation of the development of "Histórias do Zambujal" [Stories of Zambujal] app.
- Appendix C – List of Publications derived from this research.

Chapter 1 - Literature Review

Digital *Storytelling* in the context of Archaeological Heritage Communication

Every museum today aims at making use of digital *media* to communicate, inform, and engage the public. But technology itself is not enough to engage the visitor, nor it should be the sole driver to produce virtual museography. It is important firstly to understand the underlying principles of Heritage Management and Heritage Interpretation that motivate the production of Museum Mediation and *Storytelling* before using the digital *medium* as a tool.

As we are entering a new communication paradigm it is important to review research done in digital *storytelling* and its impact in Heritage communication to inform future authoring of digital *media* artifacts in this field.

The kind of work that has been done on the topic of digital *storytelling* for heritage communication is of three types: there are reviews on digital technologies applied to archaeological heritage, usually literature from the 90s that aimed at recognizing the characteristics and affordance of a field named virtual archaeology. These studies didn't provide a critical approach; hence they were trying to clarify the available means and to promote guidelines for its use. (Reilly, 1991; Barceló, Forte and Sanders, 2000; Plentickx, Buhalis and Owen 2004; Styliaras, 2011).

Then, there is the field of museum studies that theorized the impact of digital technology in museums. Their approach is critical, identifying the impact of digital *media* in museum communication as a promoter of a visitor-centered strategy instead of the object centered approach of the previous Museography. (Cameron and Kenderdine, 2007; Tallon and Walker, 2008; Proctor, 2011) However none of these theorizations address Archaeology in particular.

The third type of literature concerns studies of Interactive Digital Narrative and study the impact of digital *media* affordances on narrative (Laurel, 1991; Murray, 1998, 2012). They are useful for our research in terms of being an Humanistic approach to understanding the digital *media.* For this line of thought, the digital

artifact is a cultural production such as many others (book, film), reflecting on the characteristics of digital *media* in comparison to non digital media (such as literature and performance) and providing theoretical frameworks to address the study of interactive narrative through Neo-Aristotelian and Neo-Proppian theory.

We organized our literature review around three main fields, Museum Studies to understand the context where Archaeology valorization takes place; Science Communication Studies to understand the use of narrative, voice, and *storytelling* in public communication of Archaeology, understanding the difference between scientific and popular communication; and finally, Digital *Media* Studies to understand how digital technology is impacting *storytelling* and review emerging trends and successful applications of interactive narrative to cultural projects (exploring the topics of linear digital *storytelling* and non-linear interactive digital narrative).

In the first part of the literature review, we start by addressing the concept of Heritage Management as the legal framework responsible for the protection and communication of archaeological sites and as the main context where virtual museography can be put in practice (through the principles of Heritage Interpretation). We then focus on archaeological communication discussing the differences between scientific and popular communication and review the authors who have studied the relation between Archaeology and *storytelling* and Archaeology and *media*.

In the second part we review the concept of *storytelling*, the importance of stories to learning and remembering, and the role of Museums as storytellers. We also provide a brief history of archaeological museum display from the Renaissance sculpture gardens and cabinets of curiosities to the emergence of the Virtual Museum, highlighting the changing nature of museum practices.

The third section addresses the digital turn in narrative. We start with the definition and a brief history of interactive digital narrative and a review of the theoretical approaches to its study. We then explore the triad computer / interface / interactor, characterizing the digital *medium* and its impact on narrative. And close this section by reviewing existing approaches in linear Digital *Storytelling* and non-linear Interactive Documentary.

Finally we review the state of the art in computer applications in Archaeology and place our thesis in the proposal of the interactive documentary format as an heritage interpretation strategy, and summarize this chapter.

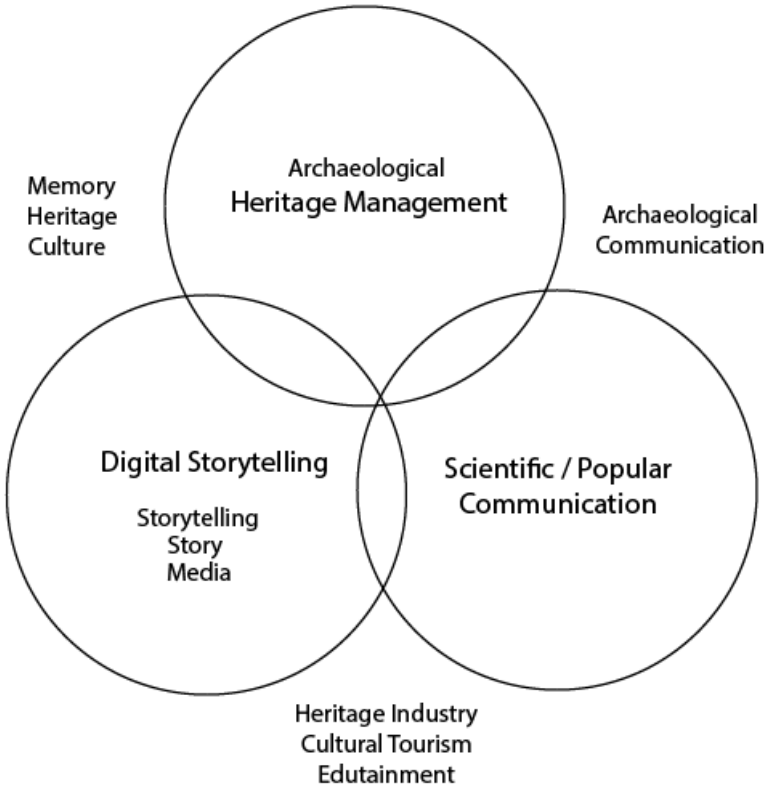


Table 1) Conceptual Framework

1.1. Heritage Management

1.1.1. Archaeological Heritage Management and Interpretation

We can point to a multitude of reasons why we should preserve archaeological sites. They embody information about our common past and they highlight how society changes. The aim of archaeological research is to analyze and study cultural material to improve our understanding of the past. In this context, musealization and museography play a major role in the preservation process allowing an effective knowledge sharing. If information is not shared, it is like it doesn't exist.

Archaeological Heritage Management is the activity of identifying, preserving and presenting to the public cultural heritage. But not all archaeological sites can be preserved, some criteria are used to decide which ones to preserve and musealize, such as their state of conservation, monumentality, quality of finds, and accessibility. (Martí, 2004).

Now, more than ever, there is a recommendation to share the results or archaeological research to the broader audience. With digital *media* we have means to do it in a faster and more efficient way than in the past (when sharing this kind of information was conceived as creating a museum or a publication). Today, to create a website or a digital publication can be a simpler and effective way. However, the digital production to create awareness about Archaeology is still clearly insufficient regarding what could effectively be done. This is why this research aims to contribute to understand the opportunities, as well as challenges, of making virtual museography for Archaeology.

During the past 50 years, since its foundation, ICOMOS[12] has produced several charters and recommendations maintaining that the dissemination of heritage sites is fundamental to positive conservation outcomes. Among these documents, two

[12] International Council on Monuments and Sites, founded in 1965.

stand out for their importance to the field of archaeological communication: The Ename Charter[13] and The London Charter[14].

The Ename Charter recognizes that interpretation and presentation of results are part of the overall process of cultural heritage conservation and management. It also reinforces the idea that the creation of an informational layer in Heritage sites,

> *"facilitate understanding and appreciation of cultural heritage sites and foster public awareness of the need for their protection and conservation".* (ICOMOS, 2009, The Ename Charter)

It also recommends that the Interpretation strategies (signage, activities, publications) should encourage the inclusiveness of local communities in the development and implementation of interpretative programs.

The London Charter recognizes the increasing use of computer technology in the reconstruction and visualization of archaeological heritage and promotes their conscious application:

> *"The spectacular growth of cultural tourism and the amazing technological advances in recent years have led to the development and implementation of a myriad of projects to investigate, preserve, interpret and present various elements of archaeological heritage using computer-based visualization. These projects have demonstrated not only the extraordinary potential of computer-based visualization but also its many weaknesses and inconsistencies. Therefore, there is a clear need for a theoretical debate with practical implications to enable heritage managers use the best that new technology can offer them in this area."* (ICOMOS, 2006, The London Charter)

[13] ICOMOS (2008). *Ename Charter for the Interpretation of Cultural Heritage Sites.* *http://www.enamecharter.org/*, https://www.icomos.org/charters/interpretation_e.pdf

[14] ICOMOS (2006) The London Charter http://www.londoncharter.org

The major contribute to the field of museum mediation was the seminal text by Freeman Tilden *Interpreting our Heritage,* written in 1957 (Tilden: 2007 [1957]). Working in the National Park Services in the United States, Tilden laid the guidelines for the way a guide should interact with visitors proposing the six principles of Heritage Interpretation, which are still relevant today:

> *"1) Any interpretation that does not somehow relate to what is being displayed or described to something within the personality or experience of the visitor will be sterile.*
> *2) Information, as such, is not Interpretation. Interpretation is revelation based upon information. But they are entirely different things. However all interpretation includes information.*
> *3) Interpretation is an art, which combines many arts, whether the materials presented are scientific, historical or architectural. Any art is in some degree teachable.*
> *4) The chief aim of Interpretation is not instruction, but provocation.*
> *5) Interpretation should aim to present a whole rather than a part, and must address itself to the whole man rather than any phase. 6) Interpretation addressed to children (say up to the age of twelve) should not be a dilution of the presentation to adults, but should follow a fundamentally different approach. To be at its best it will require a separate program."* (Tilden, 1977 [1957]: 9)

Other authors have followed Tilden and continued writing on Heritage Interpretation, contributing to making it a practical discipline among Heritage Management (Ham, 1992; Uzzel, 1998; Veverka, 1999; Carter, 2001; Beck & Cable, 2002; Gross & Buchholz, 2006).

What we retain from the Heritage Interpretation principles is that *information as such is not interpretation* and *interpretation is provocation*. The practitioner of some kind of mediation, following these principles, is encouraged to be creative. To be creative is to know how to engage the visitor in a pleasant way as long as scientific accuracy of facts is preserved.

Heritage communication should therefore be understood as part of this larger system. In a moment when there is a facility to communicate with digital *media*, and

all the creative possibilities that exist to produce communication about cultural heritage resources, it is important to recognize the specificities, needs and limitations of the heritage field. We should retain that there is a need to communicate to a broader audience more than ever, and that this communication should be adequate to the needs of both heritage management and audience expectations.

It is increasingly important to raise awareness among designers and practitioners of educative content about the ways Heritage Management operates and to understand the field of Heritage Interpretation as a subject in its own right. Understanding the policies that encourage public communication provides an opportunity for designers to increase their production. And by acknowledging the underlying mission of Heritage Interpretation to raise awareness in a *thought provoking way*, as suggested by Tilden, opens the way to designers to give response to the communication problem in more creative ways.

The question of "voice" in Heritage communication is extremely important. In Archaeology in specific, we should have in mind that although it is compelling to tell stories about archaeological sites trying to convey what they must have looked like in the past, Archaeology is a scientific discipline, and the style of writing (voice) among academics is not suitable to communicate with the broad audience. Similarly, the other way around, the type of language used in interpretation panels is not the kind of language that should be used in academic reports of excavations.

To better understand these differences, we should reflect on the topic of scientific *versus* popular communication.

1.1.2. Scientific Vs Popular Communication in Archaeology

Archaeological sites are a category of Heritage sites. Heritage is divided into cultural and natural Heritage. Cultural Heritage can be Artistic, Archaeological, Historical, Scientific or Ethnographic. Natural Heritage is related to National Parks, Zoos, Aquariums, Botanical Gardens, etc.

Archaeology interprets cultural artifacts and can communicate the human story that lies behind the scientific data they extract with their methods. We can say

that based on material evidence, archaeologists can reconstruct immaterial Heritage. Archaeologists' commitment to communicating their findings to society brings benefits to the discipline. Traditionally, archaeologists communicated mainly with their peers. The task of communicating to a broad audience has been delegated to science journalists or museum educators as communicating to the public demand a different approach than communicating within the academia. Literature in science communication clearly states the need for professional communicators:

> *"Archaeologists are not typically trained in public engagement techniques and they can find it difficult to transition between academic and public communication platforms* [...] *Engaging with public audiences is increasingly a core part of an archaeologist's role and involves engaging with challenges, tensions, and differing perspectives."* (Melville, 2014: 6511).

Current debates address the idea that Archaeology, since it has been explored by the *media* (Clack and Britain, 2007) is very attractive to the public:

> *"Archaeology has always generated fascination outside of academia. As a result, archaeologists encounter media communication issues more frequently than researchers in many other sciences*. [...] *Communicating Archaeology to non-specialists has become synonymous with wider debates about public engagement in science."* (Melville, 2014: 6511-12).

So, why produce archaeological public communication? Melville suggests a few guidelines: to attract future generations of archaeologists, as enthusiasm and fascination for Archaeology presented in the mass *media* inspires future researchers; to benefit the excavation process itself,

> "*engaging with communities can smooth excavation processes, build positive indigenous relationships, reduce illegal artefact trading and the looting of archaeological sites, and even lead to new research questions and directions*" (Melville, 2014: 6512);

and to promote social education, because a more informed public can help combat scientific misinformation on issues such as cultural diversity, memory, identity, biodiversity, etc. The benefits of communication are therefore widely recognized, but

knowing how to begin in non-academic communication is less widely understood.

Scholars in the field of science communication have pointed to the differences between peer and popular science communication. León (2001) points out the objectives and characteristics of different types of texts, distinguishing *scientific writing, popular writing* and *journalistic writing*.

The objective of *scientific writing* is to contribute to the knowledge of the field with the maximum accuracy and transparency. *Scientific writing* aims to demonstrate results, it is written with an impersonal voice, and it should explain the methods used so other scientists can replicate the same experience, expecting similar results.

In a different way, *literary writing* seeks an aesthetic experience where the reading pleasure itself is the main objective. The characteristics of this type of text are rhetorical figures. Narrative usually has a plot, characters, and the sequence of events showing tension and emotion. Léon argues that this type of text is not suitable for scientific research reporting.

There is a third type of writing, the *journalistic writing,* where the role of the author and his credibility are enough to create confidence on the reader that real events are being reported. Because of this authority assumption, journalism is a practice with extreme responsibility, demanding fact checking and accuracy, but at the same time it must appeal to the reader in a concise and engaging way. The language used in *journalistic writing* is classifiable according to the medium of communication (writing, radio, TV, etc.). The voice is informative, interpretative or commentary.

While science has a cognitive end and literature an aesthetic end, scientific journalism transforms objective knowledge into a meaningful experience. We believe science communication to the broad audience is closer to the journalistic rhetoric than the scientific or the literary writing.

According to the science communicator scholar Massimo Bucchi (2008) information in science communication is not transmitted directly from the scientist to the public in a linear model but through several steps.

The first step is the *Inter-specialist stage*, where communications by peer review, academic papers, and journals are produced and shared among professionals, contributing to the knowledge of a subject. Then, follows the *Pedagogic stage***,** where official educational texts are published for a more general public, or exhibitions are made. Finally, there would be the *Popular stage*, characterized by communication through television programs, newspapers and mass media (Bucchi, 2008:61).

Bucchi points out the danger of jumping these stages directly from the moment of research to the popular sphere (which is now possible through electronic publication and sharing on the Internet in a rush to communicate and use the affordances offered bu the digital medium). However, the danger of rapidly passing information from discovery to the public domain is the loss of scientific validation. Science communication for the broad audience should create an empathy with the public, appealing to emotion and engagement, without sacrificing scientific accuracy and verification.

In this line of thought, the work of Heritage Interpretation could only appear at the end of a long process and after a site has been studied and its reports published. Regarding the professional roles in Archaeology**,** communication is essential, but who has the responsibility of doing it, the archaeologist or the designer?

We suggest that in order to achieve a successfully communication in Archaeology is important to have a scientific communicator who is able to communicate with the archaeologists in order to fully understand the scientific facts that precede any valorization project and simultaneously understands the importance of narration and voice to address the visitor in an engaging way.

Although archaeologists can communicate their findings to the wider audience, their writing conventions are usually biased by their domain of technical terms, as their professional routine demands writing technical reports and scientific papers. To make a communication that is appealing to the public, it is necessary to translate this knowledge to another format. We believe that the concept of *storytelling* is useful tool, and if allied to digital technology in a digital *storytelling* framework represents a powerful and new way of promoting archaeological literacy in our present society.

1.1.3. Uses of *storytelling* in Archaeology

Archaeology seems to be the perfect subject to tell stories. However, the way stories are told about archaeological sites follow a long process before they can actually be presented to the public.

In their essence, archaeological sites are fragmentary; they are discovered, excavated, and studied in order to create knowledge about the past. The construction of narratives about archaeological sites begins with scientific studies, combining different methodological approaches (typological, chronological, stylistic, geological, archaeobotanical and archaeozoological, anthropological, etc.). These studies are circulated among academics through conferences and publications and undergo peer validation. It is only after scientific publications gain recognition that these stories can start to be presented to the general public.

There are a broad variety of forms of valorization of archaeological sites. They range from organized tours or guided visits with specialists to excavations, popular science publications, *media* documentaries, news reporting, complete museum exhibitions or *open-air* interpretation signage.

The scientific language used among peers in conferences and scientific monographs is different from the language and visual representations used in a museum or information panel. Science communication is a practice that helps to translate complex and technical jargon or conventions into meaningful and simplified forms of information that can reach a generalized audience. There are some things that Archaeology can affirm with security, for example, that a certain layer of stones is above or below another layer. Other things are more difficult, such as precise dating provided by radiocarbon dating (absolute chronology). In Archaeology, most of the data comes from observation. For example a group of stones in a circle, with burnt sediments on the inside, indicates the remains of a fireplace. Some archaeologists work on the maximum objectivity (Clarke, 1968; Sangmeister, 1981). Others are post-processualists and indicate that the past is a construction:

> *"I argue that archaeologists work on what is left of the past; we do not discover the past. We set up relationships with what remains"* (Shanks 2007: 273).

Storytelling in Archaeology is not a very debated topic, however, Praetzellis (1998) and Deetz (1998) questioned the role of *storytelling* in Archaeology addressing the theme of *scientific writing* vs. *literary writing* organizing a session of a conference in 1998 (Praetzellis, 1998) to debate this issue. And although many participants acknowledged the pleasures of engaging with a good story as a way to learn about archaeological sites, they also stressed the need to preserve and maintain *Science as Science*. They concluded that if an archaeologist *just tells a story* he *"will be no different than a common person from the street"* (Praetzellis, 1998:1). Scientists should continue doing *Archaeology as a Science*, producing results through academic writing and not mixing *scientific writing* (reporting facts) with *storytelling* (engaging the audience through emotion).

James Deetz (1998) states that archaeologists are natural storytellers because they "*are responsible for communicating the results and meanings of their research to as many people as possible*" (Deetz, 1998: 94). But he also points out to the opposition that is usually made between *scientific writing* and *creative writing* admitting that archaeologists do not dominate both.

Catherine Clarke (2004) summarized the same idea of the social responsibility of Archaeology as vital for the survival of the discipline (to attract funding and future students). And she highlighted that there has always been a tension within the discipline relative to the use of *storytelling* and suggested that Archaeology should make use of s*torytelling* through interpretations and reconstructions of the past, as long as they are accurate and scientifically validated.

There are many models for communicating archaeological knowledge. Holtorf (2007) pointed to three models that address different forms of communication: *Educational*, characterized by a unidirectional and hierarchical flow of information from knowledge-keeping experts to uninformed non- specialists; *Public relations,* in this model, Archaeology is a "brand" aimed at fostering a positive public image, to provide benefits in terms of funding and public support[15]; and *Democratic,* a model directed towards the needs of the non-academic community. From this perspective, communication is equal, participatory and conducted in partnership between

[15] In the early twentieth century. Mortimer Wheeler was adept at using the mass *media* to obtain financial support for his excavations (Clack & Brittain, 2007).

archaeologists and local communities. All three models are complementary in addressing different communication needs in Archaeology.

In all of these modes of communication, Archaeology uses *media* to inform, persuade or simply communicate. We should consider the different *media* used in this context, in order to further situate the digital *medium* in this practice of communication.

1.1.4. Uses of *media* in Archaeology

Not only written text has differences regarding the target audience in peer or popular communication in Archaeology. The images that accompany texts are also an important form of communication, supporting arguments, persuading hypothesis, and as an aid to visualize an interpretation of the often-fragmentary nature of archaeological finds.

Archaeological scientific publications use a specific type of images characterized by its objectivity, clarity and accuracy (ex. plans, maps and scientific illustrations). In contrast, popular or touristic publications about Archaeology prefer to use colorful and lively pictures, which can have a substantial amount of "guesswork" to fill the parts of the past that we don't now. The second example gains importance in the engagement with the general public because the audience does not always have sufficient visual literacy to understand stratigraphy, archaeological illustrations of pottery fragments or arrowheads, magnetograms, graphs or even historical periods so people need a visual contextualization that allows them to understand the archaeological findings and life in the past.

However, through *storytelling,* this type of educational visual communication must rely on scientific data and parallel examples (given for instance by Anthropology) to recreate aspects such as dress and hair styles, architectural typologies, landscape visualizations, etc.

Digital technology promoted the creation of many virtual reconstructions generally used in public education and entertainment. But because of the strong technological basis, these visualizations can be perceived as scientifically proven images, when in reality they comprise much guesswork and should be employed

carefully, just as an illustrator's reconstruction, or a constructive restoration. Bateman (2000) discussed the use of computer visualizations in Archaeology as an increasing part of the discipline's illustrative repertoire. One of the changes he notes with the adoption of computers in Archaeology is that it:

> "*widened the nature of illustration and reconstruction, opening it up to a much enlarged group of practitioners."* (Bateman, 2000: 1).

Although Archaeology has always collaborated with specialized photographers and draughtsmen, it is increasingly common nowadays to have a digital *media* specialist responsible for the database, or the GIS programming, or visualization in its varied forms. Parallel to the professionals who work with archaeologists in interdisciplinary teams, we have also witnessed a growing number of amateurs who like to experiment their gadgets and skills using Archaeology as a reference[16]. They publish in their blogs, and share content online in various ways (on Facebook groups for example). In this sense, technology can have an "empowering" effect in Archaeology inviting people from many fields to produce informative pieces about archaeological sites. This can be a threat to the authority of professional archaeologists who rely on scientific methods and studies to produce narratives about the past.

To preserve the integrity and objectivity in knowledge that has been acquired so far using scientific methods to do archaeological research, it is essential to educate society about the context of archaeological sites and the validity of the scientific methods. This is where our research fits when investigating the uses of interactive documentary to communicate Archaeology. We need to increase the visibility in the way the discipline operates, demystifying the fantastic approaches to Archaeology that have been promulgated in the mass *media* (e.g. Indiana Jones and similar movies).

Some TV Shows successfully play the role of communicating how Archaeology works (e.g. *Time Team,* 1994 -2014; *Meet the Ancestors*, 2004). And

[16] It is increasingly common to see how heritage sites are disputed by both archaeologists and historians but also by the general public. One example is a video footage in Zambujal archaeological site using a *GoPro* camera, or several amateurs experimenting with photogrammetry and 3D printing reproducing heritage sites. Other examples are open air activities mediated or not by technology (ex. Geocaching in Zambujal).

there is an increase in production of Films and Documentaries about Archaeology that deserve further attention[17].

Last but not the least, the best way to protect archaeological sites is to create awareness, as no one protects what they do not know. In the past, the ways of upgrading the value of archaeological sites included the restoration and conservation of ruins, the creation and maintenance of museums, information panels, etc., all requiring great investment. With the affordances of digital *media,* it is now possible to create virtual museums and applications that succeed in passing information and create engagement in a novel way at different costs. At an educational level, we believe digital *media* and the Internet play an important role in the way Archaeology can benefit society because this is a way of reaching thousands of people in a versatile way.

[17] See for example the *Festival International du Film de Archéologie* https://www.fifan.ch/

1.2. *Storytelling*, Memory and Museums

1.2.1. What is / is not a story?

The digital communication paradigm is changing the way we tell stories. But, what is a story? Alexander (2011) challenges us to question "what is not a story".

> *"Usually the negative answers that emerge identify an item typically associated with the digital world: data, especially data without meaningful patterns. Data are cold, while stories are warm. Data lack intrinsic meaning, while stories are all about meaning".* (Alexander 2011: 4)

Stories have structure. A story is usually associated with a sequence of events (beginning, middle and end), or sequential variations as proposed by diverse authors. Narrative structure has been analyzed by several authors, beginning with Aristotle in his work *Poetics* (c.335 BPE) where he analyzed Greek tragedy, dividing it in two parts (complicating and unraveling), in the first part the protagonist finds trouble, and in the second he resolves the problem (Sachs, 2006). Gustav Freytag (1816–1895) in *Die Technik des Dramas* (Freytag, 1863) analyzed ancient Greek and Shakespearean drama, proposing a pyramidal structure to narrative where the plot consists of five parts: exposition, rising action, climax, falling action and resolution. Vladimir Propp (1895-1970) in his *Morphology of the Folktale* (Propp, 1968 [1928]) analyzed the plot components of Russian folk tales identifying 31 narrative elements or functions. He also identified seven broad character types (the villain, the dispatcher, the helper, the princess, the donor, the hero and the false hero). More recent approach is from Robert McKee' in his book *Story* (McKee, 2002) where he extends the sequence of a story to five moments: inciting incident, progressive complications, crisis, climax, and then resolution. Manovich' text '*Database as Symbolic form'* (2010) compares the way we see and organize the world today to the database metaphor proposing that what make databases meaningful are the algorithms and semantics.

Stories have agency. They are fundamental to the human experience. *Storytelling* has been employed for centuries to transmit ideas and values. They structure learning through memory mechanisms and contribute to the creation of identity. Stories can assume different subjects, from personal narratives, to narratives of nationality and collective identity (Halbwachs, 1992; Edensor, 2002). John Niles (1999) proposes that the impulse to tell stories is what distinguishes the human being from other creatures. In his book "*Homo Narrans*" He speaks of stories as fundamental to the human condition. For Niles, the oral narrative:

> "*is the basis of one's culture*" proposing "*what we call reality is the effect of metaphors and stories that have become successful over others that have not avenged*" (Niles, 1999: 2).

This author refers to the "*cosmoplastic* function of narrative" as the ability of stories to shape the world in which we live. He acknowledges the contribution of Paul Ricoeur in his work "Time and Narrative" (Ricoeur, 1984) where Ricoeur concludes that personal or collective identity is acquired through narrative construction.

Stories use emotion and interactivity. The emotive dimension and the empathy between the storyteller and the listener facilitate the apprehension of the message. People learn better if they are surrounded by a positive emotion. The idea of interaction between the storyteller and the listener in *storytelling* in a two way communication suggests a performative or ritual dimension. The concept of ritual is present in communication studies. James Carey (2009) proposed a ritual theory of communication:

> "*A ritual vision of communication, for example, consists of the act of reading a newspaper, less how to send and receive information, and more like attending Mass, a situation in which nothing new is learned, but in which a vision of the world is represented and confirmed* "(Carey 2009: 6).

Participation, interaction and performance are linked to contemporary forms of citizenship where for example museum visitors are invited to participate in gallery content through adding digital content in social media platforms and engagement with

museum activities, digital or physical. Today's view of people interacting with their smartphones is reminiscent of a ritual that is perpetuated through the same gestures over and over.

Brenda Laurel (1993) In the book "Computers as Theatre" (1993) presents a performance-based theory for digital *media* comparing the interaction designer to a theatre director because the interactor must be guided through the interactive narrative following a certain path that must be previously projected by the designer. She introduces the idea of "*scripting the interactor*" (Laurel 1993: 9) meaning that authors must plan in advance the behaviors of the users.

Stories are transmitted through *media*. From oral stories or songs, fables, theatre plays, poems, images, movies, graphic novels, and more recently digital *media* artifacts. Simply put, digital *storytelling* is telling stories using digital *media.* Alexander (2011) gives a few examples of what can be considered digital *storytelling:*

> *"A very short story about growing food, made out of remixed archival photographs; a podcast about medieval history, where each installment takes listeners through the extraordinary lives of Norman rulers; a blog novel about America in 1968, following two teenagers as they travel through political and personal landscapes; an account of an alien invasion delivered through multiple Twitter accounts: an updated War of the Worlds hoax, tweet by tweet; a Holocaust victim's life retold by Facebook."* (Alexander, 2011)

Further in our study we will analyze examples of digital *storytelling* applied to cultural heritage communication. Although we are used to associate the idea of "story" to fiction, documentary for example is a story too. A non-fiction story, but as stated by John Grierson (1946), "Documentary is the creative treatment of actuality".

So, if a story is more than just the transmission of information, it involves a sequence of events, sometimes with causal relationships between them that reinforce or threaten values shared by a community. Story is what a hero recounts when returning from a long trip. Is something that has emotion.

In this sense we propose to relate the idea of *Storytelling* to that of Heritage Interpretation, where the aim of communication (according to Tilden, 1958) is to create emotional connection between a Heritage referent and the visitor, going beyond

the simple passing of information. If stories are a sequence of events, with characters and a plot (some action) we can imagine how a story about an archaeological site should be. We can imagine the story of the discovery of the site, or the chronological sequence of occupations. Our characters can be the archaeologists and other person that somehow interacts with the site, local people, visitors, teachers, etc.

Stories have structure, a database is not a story, an object is not a story, in making Heritage Interpretation we should create a narrative layer using characters, a plot, and some action in order to make it accessible to the public. Stories use media, if we use a combination of documentation derived from an archaeological site (documents, images, photographs, sounds, videos, illustrations, interactivity) we can tell a story. Stories have agency. They serve to perpetuate memory and change behaviors, as to create public awareness about Archaeology. Stories use emotion and interactivity, they aim at engaging people. Because we are doing heritage interpretation and not scientific writing, we can think of novel ways to transmit accurate and scientifically based information, but with the freedom of a creative approach.

In this research we will seek to identify narrative elements in archaeological sites by analyzing Zambujal archaeological site communication in different *media*, in chapter 3, and in chapter 5 we will develop an interactive narrative about this archaeological site exploring the affordances of the digital medium and digital *storytelling.*

1.2.2. Museums as storytellers

Museums are memory institutions, they operate at the level of *storytelling* to preserve and propagate the value of their collections. Barbara Kirschenblatt-Gimblett (1998) reflects on the 'muteness of objects' *versus* the 'active narratives' provided by mediation:

> *"While it looks old, heritage is actually something new. Heritage is a mode of cultural production in the present that has recourse to the past. Heritage thus defined depends on display to give dying economies and dead sites a second life as exhibitions of themselves"* (Kirshenblatt-Gimblett, 1998: 7)

She questions the intrinsic value of objects in museums putting primacy on the discourse constructed around them. Tackling the agency of display, she theorizes on the production of heritage in the era of cultural tourism, suggesting that museum mediation produces touristic destinations.

Bella Dicks (2004) makes a similar contribution, with which we agree. She suggests that people 'interact with the stories rather than with the authentic site' giving as example the *romantic* Paris, the *cosmopolitan* New York, etc. There is the marketing of a place, a construction of the place, which is then spread across different types of *media*:

> *"What this suggests: rather than traveling to places to interact with people who live there, visitors are travelling to places to interact with displays of those people (...) The more people travel the more they encounter the destination's culture in the form of visual representations"* (Dicks, 2004:4).

Bella Dicks also proposes the concept of "visitability". To be visitable, the sites must be friendly, accessible, interactive, safe and performative. This means that the site or the resource must be framed. To invest places with meaning and successfully present a *storytelling* to the audience is, in fact, the work of the discipline of Heritage Interpretation.

Heritage managers must produce "talking environments" there must be information otherwise there is no relation, no communication. This "packaging" of the past must be considered not only inside the walls of museums, but also in *open-air* heritage sites such as archaeological sites.

The approach to what we may call a "Usable Past" (Rozenweig and Thelen, 2000; Hamilakis, 2003) states that museum narratives can have agency to reproduce ideas investing places, past events, objects or historical figures with meaning. Museums have been regarded as places where the community is imagined (Anderson, 1983) and where national identity and colonialism is reproduced. (Coombes, 1988; MacDonald, 1996; Edensor, 2002). Pierre Nora (Nora, 1989) reflected on this fabricated history, defending the thesis that the past could never have been studied by itself, but rather by the construction of myths and in the materialization of memory such as with monuments, symbols, traditions, individuals, institutions and commemorative dates. Paul Connerton (Connerton, 1989) goes further in his

reflection of ritualization as a means of remembering through performance. Nevertheless he distinguishes between performed 'habit-memory', like riding a bicycle for example, from 'historical memory', in which remembrance is not an automatic reproduction, but an active reconstruction. He focuses on the importance of narrative sequences, stating that isolated facts by themselves don't have agency, and that only a sequential story can produce sense. He later returns to this subject writing "How modernity forgets" (Connerton, 2009), exploring the modernist desire to create the new, to be in the present, and deliberately forgetting the past. He recalls the Avant-garde movements and their insurgence against museums, libraries and academia and how in the post modernism that attitude is replaced by the pastiche, the appropriation and the remix.

Other authors have made critical approaches to the creation of the museum in the nineteenth century based on Foucault's ideas. Tony Bennett, in "The Birth of the Museum" (1995) draws on the idea of 'heterotopias' proposed by Michel Foucault to designate places that are somehow disturbing or are "worlds within worlds" like for example ships, fairs, cemeteries, brothels, prisons or fairs (Foucault, 1971). Bennett places museums at the level of fairgrounds *"filled with beard women, dwarfs and other strangeness"* (Bennett, 1995). He takes the comparison further, making a reading of the museum as a disciplinary place with the mission to lift the cultural level of the population. He compares museums to other nineteenth century institutions such as railways, department stores, schools, that had to deal with big masses of people facing behavior management.

John Urry (2002b [1990]) also draws on Foucault to develop a conceptualization of the way we relate and "*do things"* with the past. Starting from the concept of *Gaze,* which Foucault employs in "The birth of the Clinic" to describe how the medical eye is *"the eye that could grasp colors, variations, tiny anomalies..."* (Foucault, 1976:89) assuming that the tourist experience is *"to gaze upon or view a set of different scenes, of landscapes or townscapes which are out of the ordinary"* (Urry, 2002b [1990]).

Urry suggests that tourist destinations are places of contested meanings and shows how the deindustrialization of the Victorian past in England gave rise to industrial tourism. He highlights how tourism is one of the growing economic sectors of our time. Carol Duncan (1995) refers to museums as spaces where civilizing rituals are performed, based on ideas of Bennett and Foucault about institutional spaces. It

seems to be a consensus that places, objects or resources are invested with stories, branding and promotion.

As we will see, in order to look for ways to communicate archaeology we should look at archaeological museography as it is there where we can find a place where is possible to communicate in engaging ways that go beyond scientific communication. Museums use different means to address the visitor in an educational stance, where the visitor is also predisposed to learn. Falk and Dierking (1988) theorized the museum visitor as someone who is willing to learn in the museum environment, as someone who is open to be surprised. We are not talking about acquiring scientific facts (what should always be respected) but the willingness to have a pleasant experience. It is more about the experience than about the content. The content is what remains assimilated by the visitor in the end of the experience. But the experience of visiting a museum (or archaeological site) in itself is what the visitor expects.

Information professionals in museums work in creating layers of meanings based on collections. The scope of museums has evolved in the course of at least 500 years of History. Recently, museums in the twentieth century moved their focus from objects to stories. In a world obsessed by consumption of information, museum-going is seen as a consumption of stories and experiences. Although the contact with authentic objects is still a key asset to visiting a museum, the layer of surrounding information is increasingly more important.

Museums are hence the responsible institutions to transmit collective memory. They operate at the level of *storytelling* to propagate these shared heritage and narratives. With a tradition of 500 years, the museum is the place to look at *storytelling* and communication. As a cultural practice, museography evolved through time, and it is in this continuum that we must understand the current digital turn and the rise of digital museography.

We suggest *storytelling* in Museums is the same of Heritage Interpretation – to create an interpretational layer that goes beyond the simple description of an artefact. It is everything and every tool that allows to contextualize the object.

New Museology brought *storytelling* to the forefront in the museum visitor experience, promoting the creation of audio guides, video, play, organization of exhibits in thematic clusters often presenting multiple perspectives not always orthodox, challenging the visitor and producing edutainment enjoyable experiences.

With digital *media,* yet another layer could be added to models, videos, and other modalities of museum presentation. Digital media enables interactive narratives, in form of kiosks, mobile experiences, augmented reality, and other types of applications. But this change is better understood if seen from an historical perspective. How have museums presented their objects, and what changed in display and social interaction?

1.2.3. Brief History of Archaeological Museum Display

The role of the museum and modalities of display has been changing with society. Display modalities have evolved, from cabinets of curiosities where collections were arranged according to simplified systems like *naturalia* and *artificialia*, throughout the creation of National Museums where artifacts or natural specimens were organized chronologically and typologically. During the twentieth century, we saw the emergence of different types of museums: interpretative centers, thematic parks and virtual museums.

Hernandez (2010) wrote the history of archaeological museography, starting from private collections from the Church and Aristocracy. The first example of what could be the genesis of an archaeological museum are the Renaissance *sculpture gardens* and *loggias*, where fragments of classic sculptures were exhibited in private gardens, opening occasionally to visitors, with the communicative function of celebrating or enhancing the personality of the collector.

In the sixteenth and seventeenth centuries, innumerable inventions reinforce the idea that it is by direct observation of the world that we access knowledge. At this point the first excavations and confrontations with archaeological elements began. Thomas (2004) notes that these early approaches, although not considered Archaeology as such, were already addressing archaeological questions. In museographic terms, the taste for collecting antiquities is reflected in the cabinets of curiosities: an heterogeneous repository, made up of curiosities from the natural and artificial world (fossils, plants, shells, books and archaeological materials). *Naturalia* and *artificialia* will come at a later moment to be contextualized within the sciences as Natural Sciences, Art and Archaeology. This practice was the genesis of what

becomes the Museum institution, which we are interested in understanding in the light of contemporary society.

Thomas (2004) also points out a sudden interest in objects and the need to objectify, as something clearly modern. Archaeology of the eighteenth and nineteenth centuries is a passage from the Antiquarianism almost of curiosity, to a scientific Archaeology. The discoveries of Herculaneum (1738) and Pompeii (1748) created new enthusiasm towards the study of antiquity. The foundation of legal societies such as the Society of Antiquaries in London (1707) or Society of Dilettanti (1733) promoted and supported campaigns to systematize the study of archaeological sites as well as the first publications shared among peers.

After a first period of excavating and collecting, the need arose to organize museums, architectural spaces designed to receive the finds. In the beginning there was no method to order them, but gradually a scientific requirement, based on the theories of the three ages of Thomsen (1788–1865), led to the organization of artifacts by historical periods.

In the nineteenth century, Archaeology established itself as a science. Its communication was made through scientific meetings and in museums,which proliferated with an accumulative exhibition modality, where large amounts of showcases sought to gather all the objects of the collection for study by specialists.

The twentieth century sees the professionalization of Archaeology and Museology by its systematized teaching in Universities. At the level of Museography there was a concern to communicate with the public. In 1926 the International Museums Office was created. There was a general perception that museums were "dead" and inadequate for the new visitor's expectations. Subsequently, during the 1930s a movement began to reshape the museum space. Many visitor's studies were made in order to perceive the best routes for the visitor and visitor behavior. A selective criterion of exhibition of pieces was chosen, avoiding the accumulative museography. Gradually, the museum was no longer attractive only to scholars but also to a broader audience.

In 1946 the International Council for Museums (ICOM) was created, an organization for museum professionals to legislate the field and reinforce the role of museum communication and education through a series of recommendations and conventions. The New Delhi Recommendation of 1956, for example, defines the principles for excavations in Archaeology; the London Convention of 1969 lays down

rules for the protection of the archaeological heritage; the 1990 Lausanne Charter promotes Heritage Protection and Management, and the 1992 Malta Convention recommends the musealization of archaeological sites *in situ* whenever possible. At the European level, the Council of Europe requires in 1990 the protection of the archaeological heritage *in situ* and the adoption of new technologies, and stipulated the need for the active participation of the population. With these directives, museums are not only responsible for the preservation of the heritage, but also unequivocally have to assume the mission of content transmission. It is also observed that museums are dedicated to improving exhibitions, developing analogical resources (dioramas, mock-ups, interpretive panels, etc.).

In the second half of the twentieth century, digital technologies were introduced in the Museum, first with punch cards for collection management, later experimenting with hypertext in multimedia CD-ROMs, and from the mid 1990s with the generalization of the use of the Internet, cultural institutions invested in their online presence, creating websites, multimedia content for exhibition displays and mobile devices.

1.2.4. Theorizing the Virtual Museum

Alison Griffiths compares the current discussion about the popularization of museum display through digital *media* with *1900s discussions on the dismantling of storehouses of curiosities* (Griffiths, 2004) in order to modernize museums.

She places the digital revolution in museums as another step in the evolution in methods of museum display. The first occurred in 1900 with the birth of the National Museums, the second in the 1950s and 1960s with more educative exhibitions, and the third starting in the late 1980s to the present with the adoption of digital *media.* Key moments such as the explosion of the personal computer in the 1980s and the advent of the World Wide Web in the 1990s led to more design driven work in the humanities (Burdick et al., 2012):

> *"Digital Humanities mark a move beyond a privileging of the textual, emphasizing graphical methods of knowledge production and organization,*

design as an integral component of research, transmedia crisscrossing, and an expanded concept of the sensorium of humanistic knowledge" (Burdick et al., 2012: 122).

Huhtamo, in a Media Archaeology[18] approach suggests that other factors rather than digital technology contributed to the birth of the Virtual Museum. He makes a relation of the innovative Virtual Museum with a moment in Art History when exibit design was challenged by the avant-garde art movements.

The Avant-garde movements such as the Russian Formalism or the Italian Futurism sough to embrace the new technological advances and changes of the early twentieth century:

"the telegraph, the telephone, the phonograph, the train, the bicycle, the motorcycle, the automobile, the ocean liner, the dirigible, the airplane, the cinema, the great newspaper" (Huhtamo, 2002:4).

In Russian Avant-garde art movements of the 1920s, artists such as Laszlo Moholy-Nagy, El Lissitsky and Frederick Kiesler were reacting to new *media* technologies of their time such as sound recording, film, and photography, and experimenting in how these could be applied in Art. This rethinking reflected in the creation of disruptive exhibition spaces where the relation between visitors, art and space was much more dynamic and sensorial than the simple passive viewing of paintings hanging on the walls.

By doing so, they contested the tradition of nineteenth century art display visible at the *Amory Show* (1913 art exhibition in New York) or the Paris *Salon*-understood as reflection of the bourgeois ideology where the art object was a symbol of prestige and economic investment, thus fighting against secularism in museums:

"The key idea is integration. Here the exhibitions are no longer seen as separate entities put on display in any space. Instead, they are considered integral elements of a total environment that envelops the visitors and

[18] Media Archaeology is a relatively new area of enquiry that studies evolution of media artifacts tracing its origins in previous influences, or studies media that did not evolve to dominant practices and were forgotten. The theories of Media Archaeology are addressed by cultural critics such as Erkki Huhtamo, Siegfried Zielingsky, Jussi Parikka, Jonathan Crary and Fridrich Kittler.

encourages them into a dynamic [inclusive] relationship with the space and all its dimensions and elements. The environment comprises different media and channels of communication. Instead of a passive spectator in front of static exhibitions, the visitor is meant to turn into an active participant." (Huhtamo, 2002: 6)

This shift from spectator to interactor is what Huhtamo mentions as the "*activation of the viewer*" that in the new paradigm, must circulate and pass through intricate installations in the gallery, immersing himself in the exhibition design.

French *Dada* and *Surrealist* approaches also seemed to anticipate the Virtual Museum with inventions such as Duchamp´s piece "*boîte-en-valise*" – a set of miniatures of his work, reminding a portfolio website, or Andre Breton's "*poem object*" (an piece from 1941, consisting of a carved wood bust of man, oil lantern, framed photograph, toy boxing gloves, and paper mounted on drawing board). Another artifact, the "*Mutoscope*", an arcade peep show where people could insert a coin and watch a short movie, was a visual technology machine from popular culture, which became obsolete and was appropriated by artists.

All these exhibitions and installations or devices "*contest the taboo of touching the exhibitions*" (Huhtamo, 2002: 9). The avant-garde exhibitions were made precisely to provoke interaction, moving from viewing to touching. Using the hands previously associated with the act of creation now became a way to receive and consume art and communication. And this resonates with contemporary digital museography where we use *digit* (that can mean both 'numbers' digits and fingers, as in digit a unit of measure length).

1.2.5. Brief History of the Virtual Museum

The notion of the Virtual Museum received an impetus from the emergence of the World Wide Web (namely when it became a multimedia environment with the Mosaic Browser in 1993), but the invention of the hypertext in the 1960s was a stronger influence in the possibility of creating non linear narratives. In the origin of

the Hypertext is the Ted Nelson's *Xanadu* project (Nelson, 1965) and the Vanevar Bush's *Memex* project (Bush, 1945).

David Williams (Williams, 2010) reviewed the history of the adoption of digital *media* in museums. In the 1960s museums used programs and punch cards to create databases of the documentation. A museum concentrates first in acquiring objects and building a collection, then in the documentation task and record keeping. Computers were first used to in this often-overwhelming task.

The 1970s saw the invention of minicomputers, followed by microcomputers in the 1980s, which brought the power of big computers into desktop technology. With this shift it was possible to teach museum professionals to individually use computers. Publications and conference sections dedicated to museums and computers began to appear (e.g. the *Museums and Computers Group*[19] started in 1982 which has been organizing, since 1997, the annual conference *Museums and the Web*[20]). In these conferences, museum and heritage professionals shared their applications and methodologies.

During the 1990s there were innumerable projects experimenting with hypertext in museums, in what became known as CD-ROM based virtual museums. One of the first examples is the "*Micro Gallery of the National Gallery in London*" sponsored by American Express. Other early references were the Louvre's *"Palais et Peintures"* produced by the Réunion des Musées Nationaux in France. These types of *media* were sold in the museum shops allowing the museum to be taken home as souvenirs, providing a remote experience. According to Huhtamo (2002), one of the first experiments with interactive narrative in the museum is the 1991 project *"The Museum inside the Telephone Network",* consisting of an exhibition founded by the Japanese telecom company NTT, where users could telephone and fax to access the exhibition, only available there, and not physically.

With the generalization of the Internet, museums started developing their own websites and were among the first institutions to use it (*The Exploratorium* in San Francisco was the first museum to have a website). By the turn of the Millennium almost every museum had a website. These websites displayed information, such as

[19] Museums and Computers Group (MCN) http://www.museumscomputergroup.org.uk/

[20] Museums and the Web https://www.museumsandtheweb.com/

opening hours, ticket office, and information about the collection and catalogue databases.

From 2010 on, social *media* and mobile services started being adopted by museums, which become more open to the visitor's input through social *media*, or blog comments fostering a two way communication. Also, as mobile smartphones and tablets penetrated the market, museums began to create content for these devices. Location based applications such as *way finding* apps, and *augmented reality* apps to enhance physical exhibitions are examples of this adoption.

Archaeology has always been a rich field for experimenting with digital *media*. *Virtual reality* and 3D reconstructions tend to use archaeological sites as points of reference to develop and test graphic rendering and programming, often using Apple's Quick Time VR software to explore 3D simulations of archaeological sites, which is very useful when archaeological sites can no longer be visited (such as Lascaux and Chauvet caves).

The Virtual Archaeological Museum makes possible a remote visit to archaeological sites. Some virtual museums allow the exploration of 3D spaces simulating the real museum (for example the Virtual Museum of Iraq), or an excavation site (Diana Arcaizante Virtual Museum) others address a region or a city (Mattera Citá Narrata) or a country (Virtual Museum of Canada). Elements provided by virtual museums can include on-line catalogues, layout of the museum, visualization of 3D models, interactive graphics, videos etc. They are usually sponsored by grants, licensed products, or advertising. But their costs are minor when compared to the creation and maintenance of physical museums. They need to be found online, so they should create Internet marketing strategies, referencing, connection to other Internet services such as institutional sites (Djindjian, 2007).

Between 2011 and 2015 the V-MUST project, a network funded by the European Union focused on Virtual Museums joined more than 100 associated members in defining and developing Virtual Museums.
Their definition of a Virtual Museum is:

> *"A virtual museum is a digital entity that draws on the characteristics of a museum, in order to complement, enhance, or augment the museum experience through personalization, interactivity and richness of content. Virtual museums can perform as the digital footprint of a physical museum, or*

can act independently, while maintaining the authoritative status. (...) As with a traditional museum, a virtual museum can be designed around specific objects (akin to an art museum, natural history museum), or can consist of new exhibitions created from scratch (akin to the exhibitions at science museums). Virtual museums are usually, but not exclusively delivered electronically when they are denoted as online museums, hypermuseum, digital museum, cybermuseums or web museums". (http://www.v-must.net/virtual- museums/what-virtual-museum)

They present in their study 42 examples of Archaeological virtual museums (http://www.v-must.net/virtual-museums/categories/archaeological-vm) but in our opinion none of them present an immersive and pleasant experience as they resemble online databases.

This problem has been addressed by Perry et al. (2017) that despite the potential, virtual museums are still "rather immature cultural constructs" that tend to deliver sole informational content, use limited interaction, normally navigational and hotspot based interactivity and use traditional curating approaches. They are not explored to the full potential for storytelling:

"Storytelling as applied by museums, including VMs, has for the most part been limited to descriptive, scholarly prose. Despite the continuous improvement of their technological features, the underlying interpretative approach of most VMs has followed the traditional example of many cultural heritage collections and sites whose meaning is typically communicated in situ in didactic fashion, disconnected from the emotions, evocations and morals which inspire and motivate the larger world. (...) *By our reckoning, then, no coherent framework of practice (neither a conceptual model, nor practical guidelines) yet exists for designing and evaluating emotive experiences for the cultural heritage sector at large".* (Perry et al 2017: 2-4)

Erkki Huhtamo (2002) also points out how the "virtual museum" stands as a category for many digital *media* objects that *"might more conveniently be classified as libraries or archives*" (Huhtamo, 2002: 1).

The impact of digital technology in museums has been seen has bringing changes such as a change in *authority*. The traditional museum was authoritative, often a building, producing knowledge in a one way communication model. The museum of the 21st century is more focused on the visitor's experiences, trying to involve the local communities it serves. Museums today acknowledge that many of its visitors have background (and often extensive) knowledge of the collections hence their visits are invested with great requirement for good quality content.

This change in *authority* is also manifested in the inclusiveness of multivocality, asking the visitor to contribute with content. An example is the Stevemuseum folksonomy project (Chun, 2006). The project consisted in a prototype for social tagging, where people could assign the words they wanted when facing a museum object. This way, the museum collected information about the terms used by the audience while connecting and involving the community with the collection. *Tagging appeals because it represents a dialogue between the viewer and the work.* (Chun, 2006)

Another characteristic is that information about collections is now provided beyond the museum walls, in mobile apps, websites and podcasts, for example. Oral History and Anthropology are hugely valorised today, as examples in virtual museums such as the "911 archive",

> *"an archive that uses electronic media to collect, preserve, and present the history of the September 11, 2001 attacks by collecting and archiving first-hand accounts, emails and other electronic communications, digital photographs and artworks, and a range of other digital materials related to the attacks".* (www.911digitalarchive.org)

Control over intellectual property of museums is another disputed area. Many museums recognized that opening up their collections bring more benefits (and revenue) than the traditional control over copyright. An outstanding example is the Rijksmuseum in Amsterdam, that opened the collections to creative uses through its Rijksstudio[21], an online presentation of more than 125,000 artworks of its collection

[21] Rijksstudio https://www.rijksmuseum.nl/en/rijksstudio

(Gorgels, 2013). Members of the public are invited to download the images and use them in creative ways, and created the Rijksstudio Awards, to give visibility to this creations.

> *"This digital strategy has greatly contributed to the rejuvenation of the Rijksmuseum as a whole. The museum and its image used to be a little boring, a little detached, and overly traditional. (...) And now that the collection has been made available online, you can see "old art" everywhere. Old masters have become fashionable again, and the Rijksmuseum is now a "love brand." Reuse makes the artworks, the creations based on the works, and the new artists themselves ambassadors for the Rijksmuseum. While the value of the images online is almost zero, the marketing value increases, which also boosts the Rijksmuseum's brand. This marketing value is therefore higher than the small profit the museum used to make by selling images".* (Gorgels, 2018)

In sum, the Virtual Museum aroused from experimentation with technological developments (punch cards, hypertext, CD-ROMs and the Internet) but also implemented concepts of interactivity, immersion and total atmosphere that were experimented in avant-garde exhibit design where emerging museographies pointed to the need to provide the visitor with synesthetic experiences, i.e., involving several senses.

The virtualization of the experience of interacting with a multimedia CD-ROM or a Virtual Museum online, enables remote visits to museums or regions that the audience might have never visit physically, a similar situation that allowed the "domestic pinacoteca" (Huhtamo, 2002) in the 1950s when photographic reproductions allowed a circulation of artworks – a new possibility of access to art allowed by reproduction technology and distribution, that was addressed by Benjamin and Malraux in the ideas of *loss of aura* (Benjamin, 1936), and the *imaginary museum without walls* (Malraux, 1947).

If early debates on the Virtual Museum feared that the visit to websites would compete with real visits to museums, now it is not the case, as visitors tend to consult the museum web site prior to a real visit, maybe during the visit they interact with services provided if they exist (such as audio tours), and they can also have a post-visit experience by accessing deeper content.

In line with this idea of integrating the visitor in a more participatory way, the sharing authority paradigm in virtual museums is allowing successful initiatives such as the Stevemuseum folksonomy project, or the Rijksstudio opening of the collection for the public to co-create meaning. This opening takes full advantage of the two-way communication allowed by digital *media*.

However, many self-described virtual museums lack *storytelling* and immersive approaches, being more like online databases. In this sense our research aims to focus on the *storytelling* dimension, the total atmosphere and immersion, using interactivity to produce an online exhibit.

If the story of museums is one from the private sphere to the collective enjoyment, today with digital technologies suggest an inverse movement, from collective to private, where the visitor expects to be addressed and involved personally to make sense of the value of heritage.

1.3. The Digital Turn in Narrative

1.3.1. Definition of Interactive Digital Narrative

As digital technology evolved, contributes from several fields explored the new *medium* as a form of creating narratives. These narratives included explorations with hypertext novels, multimedia CD-ROMs, Internet based narratives, videogames, and more recently location based narratives, and applications with Virtual Reality and Augmented Reality.

Comparing with traditional forms of *storytelling* in media such as the book or a film, digital media *storytelling* is a much younger cultural production, and there are arguments in understanding its constant changes because it is a *medium* that hasn't stabilized yet. "*A sign that this is not a well-established and fixed field is that those of us in this area have not yet agreed on its name".* (Montfort, 2015: xi)

Several names are used to address the use of the digital medium for narrative production: digital storytelling, interactive storytelling, transmedia storytelling, interactive digital narrative, and interactive documentary.

Interactive digital narrative seems to us the best term for a narrative format that consists in a "*software-based system that produce different outputs each time a user interacts with them".* (Ferry, 2015: 77).

Besides the narrative impetus and the digital materiality of interactive digital narratives, another particularity of this genre must be addressed: the need of a user to interact with the system in order to reveal it. These narratives need to be "navigated" by a user who controls the curse of the narrative[22].

However, the exploration of *non-linearity* (and *agency* of the reader) in narrative is not exclusive of the digital *media* environment. For example, the "choose your own adventure" books, where the reader has the freedom to choose the pages to read next, according to a pre determined organization; theatre performances where the audience is invited to influence the course of a story; cinema effect of "breaking of the fourth wall" (when the actor directly addresses the audience ignoring the imaginary wall that separates actors from the audience) in films like *The Purple Rose*

[22] The etymology of *cybyernetics* is as *κυβερνητικός* (kubernētikós), the Greek sailor exerting control over his environment.

of Cairo (Woody Allen, 1985) or museum exhibits where the visitor can explore the space in its own pace, not following the pre-established linear order of visit.

In the same manner, the concept of *linearity* is not exclusive of surrogate *media*. The digital *medium* can also present *linear narratives*, such as a digital catalogues for example.

The idea of the *agency* of the reader has been addressed before the computer. The idea of interaction of a reader with a text (or other artistic form, painting, music, film) has been questioned by several authors. Bakhtin in his *Discourse of the Novel* (Bakhtin, 1935) argues that both the writer and the reader have impact on the meaning coining the concept of *heteroglossia* – meaning that a language that must belong to both different persons, in this case, the writer and the reader.

Thirty years later, Umberto Eco writes in *The Open Work* (Eco, 1965) that all artistic experiences are open to the reader to complete. Without the reader there is no communication, no "work", the reader's comprehension of the original artefact is always modified by his particular and individual perspective.

In the *Death of the Author* (Barthes, 1977) Roland Barthes presents the idea that the sole responsibility for meaning creation lies in the hands of the reader. His approach is very useful to interactive storytelling creation, especially with the question of multiple choice script paths allowed by interactive media.

Janet Murray in *Hamlet on the Holodeck* (Murray, 1997) presents the idea of immersion as one of the main principles od digital media. Immersion is a concept based on Coleridge's "suspension of disbelief" that happens when a reader believes what he is reading creating meaning from narrative.

All these authors address the role of interactivity and *agency* of the reader or interactor, in completing the narrative designed or scripted by the author. But the main characteristic of this new form of narrative is the Hypertext.

The Hypertext, or the capacity given by computers to create links among several chunks of information (*lexias*) was first conceptualized by Theodore Holm Nelson (1965) in his paper "*Complex information processing: A File Structure for the Complex, the Changing, and the Indeterminate*" when he introduced the term hypertext:

"Let me introduce the word "hypertext" to mean a body of written or pictorial material interconnected in such a complex way that it could not conveniently be presented or represented on paper." (Nelson, 1965: 42)

Since the beginning, Ted Nelson acknowledged the potential of uses of hypermedia in new systems that could revolutionize education. Hypertext is then a decisive characteristic of digital media interactive narrative.

1.3.2. The triad (computer / interface / interactor)

Interactive narrative need three main elements to exist: the technological basis (digital *medium*) the interactor (or user) and the interface (the contact zone between both the human and the computer system).

a) Defining the Digital Medium

Medium, or *media* in the plural, is all the material into which *textualities* can be inscribed. According to Murray (2012), everything from charcoal pencils to multinational communication companies is considered *media*. *Media* is all the technologies that human beings can transform into the creation of meanings, from the most tangible,

"*such as marble as a medium to a sculpture, to the most imperceptible as the radio waves to the radio broadcast*." (Murray, 2012: 25).

According to Marshal McLuhan (1964), *media* theorist, *medium* is an extension of man, the means of transportation become extensions of the legs; the telephone, extensions of the ear and voice; the voice, an extension of thought and the hammer an extension of the arm.

"The medium is the message. This is merely to say that the personal and social consequences of any medium - that is, of any extension of ourselves - result from the new scale that is introduced into our affairs by each extension of ourselves, or by any new technology." (McLuhan, 1967: 1).

The term *media* also gained acceptance throughout the twentieth century related to the *mass media.* Something to be said "in the *media*" means something that circulates in newspapers, radio and television, something that has a big impact and some degree of belief.

For Janet Murray (2012) digital *media* is both a system and a cultural artefact. For this author, what defines the *digital medium* is its computational nature. The materials themselves and the cultural practices that make any *medium* are based on three distinct processes: *inscription* (in the case of paper and pencil); *transmission* (in the case of radio broadcast, the radio waves, in the case of digital *media*, the protocols or compression formats) and finally, *representation* as a set of signs commonly accepted by a community.

The characteristics of the digital *medium*, according to Murray, are four: first, the computer is a *processual medium,* i.e. the computer as *medium* distinguishes itself from the previous ones because it has the capacity to represent and execute pre-programmed behaviors[23] (Murray, 2012: 51); second, the computer is a *participatory medium*, i.e.,

"the relationship between the interactor and the digital artifact and reciprocal, active, even given to communication errors" (Murray, 2012: 55).

The interaction between a human and a computer can produce frustrating or satisfactory experiments (*Flow theory*[24]); third, the computer is an *encyclopedic medium*. The first punch-card computers that occupied a whole room had less

[23] Murray suggests that when designing for this type of support we not only have to script the system, but also to predict the behavior of the user (interactor). More on this subject: computer Eliza, and the theory of Brenda Laurel in "Computers as Theater".

[24] Flow also called "Optimal experience" is a concept developed by Mihaly Csikszentmihalyi (1990). Flow is a state in which people are so involved in an activity that nothing else seems to matter; the experience itself is enjoyable.

capacity than the small chips we use today[25]; and fourth, the computer is a *spatial medium*, based on the idea of the Graphic User Interface and how we relate to the spatial abstractions of the screen.

In *The Language of New Media,* Lev Manovich (2001) focuses on the characteristics of the digital *medium* and in the affordances of *interactivity*, where hyperlinks allow the manipulation of screen *media* implying movement and time, comparing this *medium* to the Avant-garde cinema. Manovich reflected on the characteristics of the digital medium as a cultural form, analysing it among other cultural creations. If the novel was the medium of the nineteenth century, database seems to be the election medium of the twenty-first:

> *"After the novel, and subsequently cinema privileged narrative as the key form of cultural expression of the modern age, the computer age introduces its correlate — database".* (Manovich, 2001: 194)

Grounded on Panofsky's study '*Perspective as a symbolic form'* (1997 [1950]) Manovich's text '*Database as Symbolic form'* (2010) compares the way we see and organize the world today to the database metaphor. If Panofsky considers the invention of linear perspective something that creates a humanist central point of view, that would shape the ideology of the Renaissance, Manovich considers the power of computer databases as a mirror of our society. Jorge Luis Borges' tale about a map that is so big and accurate it would occupy a whole territory, in the digital culture, Manovich argues the map overrides the territory.

This change in tools and technologies is making a huge paradigm shift in society, culture and mentality. Technology might be powerful, but what make databases meaningful are the algorithms and semantics.

Bolter and Grusin (2000) coined the term "*remediation*" to explain how the emergence of a new medium always repurposes a previous *media*. When a new medium appears, early practitioners often start by extending existing practices, for

example, early film was used to film theatrical performances before it became "cinema". With digital interactive narrative we are still experimenting with the

[25] Moore's law (Gordon Moore, 1965) says that technology doubles capacity every year. Murray refers to the encyclopedic impulse that this medium allows.

affordances of the new medium, although we strongly believe that the genre of interactive documentary is becoming stabilized as a genre.

Another idea is the concept of "*media convergence*" coined by Henry Jenkins (2008) to highlight how digital communications assimilate the affordances of different types of *media* (like text, image, film and sound) on a single *media* environment.

Finally the concept of *Transmedia* storytelling refers to *media* productions, in particular the digital interactive narratives are often part of a wider communication strategy, where their role is not to replace, but to complement other narrative forms. The term *Transmedia* was coined also by Henry Jenkins when referring to the strategies of the Film "Matrix" that developed a transmedia marketing strategy including the film, a videogame, and an animation series. This concept is particularly useful in the field that we are working – archaeological public communication – as a digital media artifact must be conceived in relation the whole other strategies of communication – often the archaeological site and open air information panels, the museum exhibit with its layer of interpretation, and its online presence – that can range from an institutional website, to social media, to applications such as an online exhibit.

b) The User interface

According to Carlos Scolari in *Las reglas dela Interfaz* (Scolari, 2017) the term *Interface* first appears in 1882 by an English physicist, who uses it to name the membrane that joins or separates two liquids. Finally, this term is adopted as a umbrella concept to indicate a type of language that occurs at the screen level in a human-computer interaction system.

Later on with the development of "multi-touch" screens we have new metaphors based on gestures (Pinch, Swipe, Zoom, etc.). It is said that the best interface is the one that does not need metaphors, the ideal is to move to a transparent interface, or imperceptible, that does not stand between the user and the system so that communication is as natural as possible.

Donald Norman in his *The Design of Everyday Things* (Norman, 1988) states that the interface is a tool that allows the user to manipulate a technical device and

perform a task. It does not need to be digital. It can be the door handle, or the index of a book. In fact, thinking about interfaces is thinking about tools. Man from the dawn of humanity that relates to tools, first the instruments of stone carved, then the metals, the ceramics, etc.

Another definition of interface is "where action takes place". So there is no single definition, it is a place of interaction, it is a contact, it is a communication device. The interface is also what allows us to relate to systems that are often seen as Black Box (Pasquale, 2016) a black box that only allow us to see inputs and outputs.

Behind the Interface (not necessarily, but most commonly a screen) there is a stack of protocols and orders that take command to trigger actions – prepared by the programming field. In general, and in the purpose of our research we are interested in what happens in the interface (Interface design) and in the interactor side (User Experience). We will leave out of our study what happens in terms of programming. There are several techniques that can help us design an interactive experience (one of the aims of this research) that don't require coding skills. Many platforms exist nowadays to produce interactive narratives from the perspective of the user experience and interface design[26].

c) The Interactor

In "The Medium is the Message" McLuhan (1967) defies our tendency to think that the *medium* is a container for a message. On the contrary, McLuhan suggests that a new *medium* (a new technological invention) will have an impact on the environment that surrounds us, like in the sentence "*We first shape our tools and then our tools shape us*"[27] this notion of exchange between the human being, technology and the natural and cultural environment in which he is inserted, gives origin to the Theory of *Media* Ecology proposed by this author. It is a theory that reinforces the characteristic of unity between these three elements (*media,* Man and environment).

[26] To name a few platforms Tumult Hype (https://tumult.com/hype/), Korsakov (http://korsakow.com/), Klymt (https://klymt.bandcamp.com/).

[27] John Culkin (Culkin 1967:70) helped to popularize this expression attributed to McLuhan.

Carlos Scolari (2008) focuses on the difference between analogical *media* (communication from one to many) and digital *media* (communication from many to many): the classic communication model of the *mass media* (with the "one-to-many" model of communication) was replaced by a reticular and interactive model of communication (from many to many).

From a communication studies point of view, Carlos Scolari (2008) proposes that the study of digital *media* can adopt several perspectives: as a focus on the productive process of communication (technological transformation / digitalization); as a focus on the technological support (reticular configuration / many to many); a focus on the message (non-sequential textual structures / hypertext); a focus on the content - *media* convergence and languages (multimedia); a focus on the intervenient of communication (active participation of the users / *interactivity*) (Scolari, 2008).

For this author, the *media* convergence has produced several changes in the production and consumption of communication. We can analyze these changes on the site of production, i.e. from the point of view of who produces the communication, on the site of the object, i.e. the digital artifact itself, and on the site of reception, i.e. from the point of view of the users/interactors[28].

On the *site of production* he notes the emergence of new economic sectors, and the birth of new professional roles (interaction designer, programmer, multimedia editor, multimedia journalist and multiplatform, etc.) and the disappearance of others (photo mechanics, proof-reader, etc.).

On the *site of the object* itself, he notes the birth of a new multimedia rhetoric, the expansion of languages and *media* (infographics, information visualization, *interactivity*), and a convergence of services (the same message must be distributed by different *media* - mobile, web, publishing, etc.).

And on the *site of reception*, he notes a proliferation of new consumer objects (iPads, mobile phones, virtual reality viewers, such as *Oculus Rift, Google Cardboard Viewer*, etc.). A change in the sense of emancipation is also visible, as digital *media* allow everyone the right to produce content (Scolari, 2008: 158).

Some changes in consumer behavior were shaped by the possibilities of the digital medium. As technology gets easier to use, people not only use digital *media* to

[28] The concept of site of production, site of the object, site of the reception is adapted from Gillian Rose's methods for visual research (2012).

access content but increasingly to share content that entertains, informs or inspires them. This inversion of use of *media* from consumers to producers has coined the term *produser* (Bruns, 2008; Jenkins, 2008).

1.3.3. Brief History of Interactive Narrative

Koenitz et al (2015) identifies three evolutionary trajectories of interactive digital narratives: text-based, cinematic/performative and ludic/experimental (Koenitz et al. 2015: 11).

Regarding the first **text based** experiments with interactive narrative, *Eliza* (Joseph Weizenbaum, 1966) was a computer program that responded through artificial intelligence simulating a therapist, answering to the input of the user (Ex. to sentences like *"I'm depressed much of the time" responded with "I am sorry to hear you are depressed"* (Weizenbaum, 1966). Other experiments with text-based interactive narratives, termed *Interactive Fiction* or *Hyperfiction*, where short segments of text (*lexias*) connected through hyperlinks where the interactor had an active role in constructing meaning by selecting arbitrary paths. Some examples of early Hyperfiction are *Adventure* (Crowther, 1976), *Zork I* (Blank and Lebling, 1980), *Afternoon, A Story (*Michael Joyce*,* 1987), *Storyspace* (Michael Joyce and Jay Bolter, 1995), *Versu* (Linden Labs, 2013).

Another trajectory is the one known as **Interactive Cinema,** and has its first experiment in the project *Kinoautomat* (Radúz Çinçera, 1967). This pioneer form combined the linearity of projected film that stopped at several points where the audience was asked to make a decision. The film *One Man and His House* was screened in Monttreal'67 expo, in a custom-built seat cinema with a red and green push button box attached to every seat allowing to implement a story branched with parallel narrative structures.

It was only in 70s after the invention of the **laser disc** that interaction could be made without a human intermediary (it was a direct interaction between the viewer and the system). A landmark of this early experiments is the *Aspen Moviemap* (1978*),* an interface that allowed the user to explore the city of Colorado by interacting with a running video with hotspots in the building façades that lead to interviews of the

inhabitants. Gloriana Davenport explored this concept in the project *A City in Transition: New Orleans 1983–86* (Davenport, 1987) an interactive documentary about New Orleans Mississippi river embankment. In the exhibition mode, interactive video installations were combined with algorithmic rules that allowed interaction with the audience.

With the invention of the **Internet** (Tim Berners-Lee's *development of the World Wide Web in 1989–91, the release of the Mosaic Web browser in 1992 and its commercial cousin Netscape in 1994*) more participation and personalization was explored. With the Internet, the role of computers in society changed, allowing people to communicate in s global network. The Internet also allowed a longer life to projects made with older software that are no longer readable by recent computers.

On the **ludic form**, videogame type narratives were explored after the pioneer *King's Quest* series (1984), *Myst* (1993), The *Monkey Island* (1990–2010) series of games combining puzzle solving in virtual world environments from a first person perspective. The game industry developed in graphics and narrative design, being a subject on its own right today.

1.3.4. Theorizing Digital Narrative

> *"Digital media artefacts seem to follow a variety of structures in their narrative development. Some are designed on Aristotelian models, others are based on folk tales, and yet others are much more experimental"*. (Ferri, 2015: 78).

The field of Interactive Digital Narrative as academic subject had several theoretical perspectives. We briefly address two principal approaches: neo Proppian and neo Aristotelian.

a) Neo Proppian Approach

One theoretical perspective to understand new media representations is the neo Proppian model. It originates in the formalist study of Russian Folktales by Vladimir Propp (*The Morphology of Folktales* (Propp, 1928) where he analysed several folk tales and identified a similar canonical structure to all of them. This discovery had the implication that it would be possible to produce an infinite number of stories.

This formalist narratology, inspired the creation of storytelling machines through the development of algorithms that could recombine elements of narrative using Artificial Intelligence techniques.

Alan Dundes (1965) who was also the first American translator of Propp reports the work of Joseph Grimes implementing an algorithm that recombined sets characters and narrative functions based on Propp categories. This recombination was made solely by the computer not including an interactor, but we believe it gives an important contribute for Narrative design. In our research we will draw in this idea of having a certain number of narrative types (when analyzing the archaeological site of Zambujal, we will search for narrative units that we can combine in an interactive narrative).

b) Neo Aristotelian Approach

One of the first proposals to recognize Interactive Digital Narrative as a subject for academic research was Brenda Laurel's metaphor of "Computers as Theatre" (Laurel, 1986, 1991). She made a PhD in theatre and performance studies, while working with Atari Research Centre and Apple Computer, Inc. Because of this multidisciplinary she was able to compare human computer interaction and performance studies elaborating a theoretical framework based on Aristotle's *Poetics.* She identified affinities between scripting a theatre play and authoring an interactive narrative. For Laurel, to produce an interactive narrative, the author must "script the interactor" thinking in how will perform and interact with the system. In this metaphor, the screen is the theatre stage, and the script is the interaction of the user with the computer software and hardware.

Janet Murray is another scholar who combined a Humanist background and worked with IBM as a programmer. For Murray the interactive digital narrative is similar to any other artistic production, like a book or a film. She used the Holodeck metaphor to characterize the potential of interactive narratives. The "Holodeck" is an imaginary device depicted in *Star Treck: The Next Generation* TV series, where the audience is immersed in a reactive narrative. Murray identifies four properties of computers as a narrative medium: procedural, participatory, spatial and encyclopedic which are common to the "Holodeck" and actual Interactive Digital Narratives.

This approach is important to our research in the sense that to communicate Archaeology we will have to think in terms of *Rethoric* (what to communicate about archaeological sites) and *Poetic* (how to communicate it).

1.3.5. Telling stories with digital media

Telling stories with digital media can adopt a linear or a non-linear format. Two examples are of use for our research in interactive digital storytelling to communicate Archaeology. In the linear format we will address the experiments made in the Digital Storytelling Center in Berkeley, a movement that helped develop digital storytelling empowering people in the early 90s to create short stories with digital video and share them on the internet. We address this topic in our research because we think it is fundamental not to forget the roots of a word that is becoming so widespread. Digital Storytelling and the inclusiveness premises and focus on the emotional side of the story. The other is the Interactive Documentary format as a growing genre with multiple applications, that explores non fiction themes using the digital media format.

But as the digital *medium* allows other possibilities for "writing" or creating an interactive narrative, content producers and creative have been exploring it this way to a point where the users today are mostly adapted to navigate interactive sites. The question is, in front of this new model of "writing" with interactivity, new models of production aroused, new conventions, new trends. And a creative should ask himself if the interactivity really adds something new, is there something you can express with interactive narrative that you cannot with any other media. Interactive

narratives are surely rewarding to interact, as they offer possibilities that a printed book does not, such as adding film, sound and hyperlinks, to text and image. They can combine different *media*, due to the convergence affordance of the digital medium.

We can have a layout on the screen, similar to a newspaper for example, and instead of an image illustrating the text, we can have a video. Infographics illustrations can have interactive captions and can be manipulated in a way that the message is conveyed in a more efficient way. Interactive comics, audio slideshows, news games, are examples of how the digital medium is impacting narrative. Somehow there is a trend in producing interactive narratives, as people spend more time on the screen than reading a printed text.

a) Linear Digital Storytelling

What is *Digital Storytelling*? The more immediate meaning of the term *Digital Storytelling* refers to the combination of the old *storytelling* tradition with the latest trends in digital technologies.

Alexander (2011) recalls that digital *storytelling* is both the technique of *storytelling* with digital *media* and also a methodology developed by Joe Lambert, first with the *San Francisco Digital Media Center* (1994-1998) and later with the *Center for Digital Storytelling based in Berkeley* (1998-present).

The specificity of the digital *medium*, as we saw in the previous section, allows the combination of video, photography, text, audio, interactivity and sharing in the internet. As digital *media* became more accessible, affordable, and requiring less skills many people started using it in personal and creative ways. Joe Lambert and Dana Atchley and the *Center for Digital Storytelling in Berkeley*[29] project are an example.

In 1994, Joe Lambert and Dana Atchley, along with Nina Mullen, founded the *San Francisco Digital Media Center,* a Community Arts Center[30] where artists, educators and social activists provided a space for experimentation and digital *media*

[29] Center for Digital Storytelling https://www.storycenter.org/

[30] The Community Arts movement is born in the United States as a response to a crisis in the Arts. It arises from the need to create employability of artists at a time when the art market no longer allows so many new artists, and a series of local projects arise to bring creativity to the public, empowering local communities around ideas of citizenship (Tagg, 1992).

learning. It involved young people from local communities in creative projects based on the sharing of life histories. Joe Lambert had directed a theatre in the 80's, where the interest for *storytelling* was expressed through solo performances, giving priority to voice and personal stories. It is in this context that Joe Lambert meets Dana Atchley, an artist and videographer, whit an obsession with personal *storytelling*. He had a well-organized family archive, ranging from daguerreotypes to amateur photographs and films that he started editing with digital media[31].

The advent of digital video enabled to work on archival materials at much lower prices than was initially possible. In this way both Joe and Dana began to develop community projects combining archival images with personal voice over.

The first piece developed in a community workshop was the *Tanya* film[32], combining very short text (about 50 words) with about 60 pictures into a short film telling a very emotional story addressing friendship and the loss related to AIDS.

After this, they continued to improve the methods of the Digital Storytelling workshops. In 1998 they were invited by the University of Berkeley to establish a University Center, the Center for Digital Storytelling where they give workshops to University staff contributing to use digital storytelling applications in primary education.

From Berkeley, the model of workshops spread across the United States and Europe. In the workshops, Joe Lambert (2010) proposes the creation of a *Story Circle*, or a circle of stories, where through a series of techniques and guidelines, shared via a document (*The Digital Storytelling Cookbook*[33]) anyone could implement such activities. In the story circle, each participant at a time tells a personal story to the group during the short time that a match remains alight. After telling the story, and starting from short and emotive recording, a text is written to later be read aloud and edited in a video composed of archival images that are scanned in the workshop and used as visual support to the story.

[31] Dana Atchley film based on family films https://www.youtube.com/watch?v=bKuGpBaWqQk

[32] *Tanya,* by Monte Hallis, a digital story from the first digital *storytelling* workshop that CDS ever facilitated in 1993 at the American Film Institute in LA. https://www.youtube.com/watch?v=D0zA9q7qJZc

[33] The Digital Storytelling Cookbook https://wrd.as.uky.edu/sites/default/files/cookbook.pdf

This movement, which initially went through local shares between the communities, acquires a professional scale from 2000. The CDS begins to collaborate with *media* production companies in Europe (PBS and BBC). Essentially, mini-documentaries (of about 2 to 3 minutes, corresponding to a text of 250 words) were broadcasted by the BBC on television and on their website.

At these workshops, they used open source software (Audacity, Windows Media Player) to practice multimedia editing, and then share the results online. The work subsequently began to be used by institutions such as Museums and Local Heritage interest group (*Capturing Wales, Telling Lives*)[34]. This practice extended as a way to give voice to the most silenced parts of the population, as the project *Silence Speaks,* coordinated by Amy Hill around social groups less favored or with physical impediments or reduced cognitive development. They also applied these methods in developing countries addressing human rights issues (*Man as Partners Project,* 2006, South Africa)[35]. At the heart of this movement stands the recognition of the transformative value of sharing stories both for participants and for the community.

If the model proposed by the *Centre for Digital Storytelling* rests primarily on personal narratives, other authors have recognized the value of *storytelling* for creating networks of meaning around collective memory.

The pioneering work of Ken Burns with his *Civil War*[36] project is an example of this. This documentary, created for PBS in 1990, explores personal stories surrounding the American Civil War, rediscovering narratives from an extensive documentary archive of more than 16,000 photographs, paintings, and newspaper articles. In practice, Burns performed a series of five documentaries that were issued by PBS with great audience success. Cinematographic effects such as the use of zoom and pan on photographs led to the coining of the term "Ken Burns effect" - today a reference for digital video editing. In 2002 the series was re-mastered and produced on DVD. Another Ken Burns project is *The National Parks*[37], which won the

[34] *Capturing Wales* consisted of creating about 800 stories over 7 years. The project is currently archived, but there is some documentation on this URL http://www.bbc.co.uk/wales/arts/yourvideo/queries/capturewales.shtml Another BBC project of Digital Storytelling, also archived now, is *Telling Lives* http://www.bbc.co.uk/cumbria/tellinglives/take_part.shtml

[35] *MAP-Man as Partners*, 2006, South Africa, CDS https://www.engenderhealth.org/our-work/gender/digital-stories-south-africa.php

[36] *Civil War* project by Ken Burns, http://www.pbs.org/civilwar/

[37] *The National Parks* http://www.pbs.org/nationalparks/

America's Best Idea Award in 2009. In this series, Ken Burns addresses the theme of the United States Natural Parks system through a documentary, an archive, and a website that compiles all the episodes, including an educational section with various activity plans[38].

Still in the scope of *Digital Storytelling* for the communication of Historical themes we highlight the recent work of Adam Westbrook and the project *Delve* (2014) [39]. Adam Westbrook[40] is a journalist, multimedia editor with several projects developed in the area of *Digital Storytelling* author of various blogs and e-books about this new form of digital writing[41]. In this project, he makes use of video editing techniques with narration to tell stories about human nature and universal History.

Between 2010 and 2014 *Digital Storytelling* became a buzzword, and saw the proliferation of editing platforms that do not require programming skills, where pre-defined templates can be adapted. As the teaser of one of these platforms states, "*it's not worth wasting time programming, we can focus on what really matters, which is to build beautiful stories."* (storyforms.com)[42].

In the area of Cultural Heritage, some recent studies begin to include the term *Digital Storytelling*, but not always in the sense proposed by Joe Lambert. It is no longer a question of making personal and emotional films in a workshop environment with the community, but rather communicating stories around Museum collections using digital media (Roussou, Gonzales-Tenant).

Since the 1990s, the idea of *storytelling* in Museums began to be used in the sense of personal stories related to historical events. Julie Springer (2004) used *Digital Storytelling* as a technique for engaging the school audience with a Museum collection (*Digital Storytelling* experience at the National Gallery of Art.) This activity consisted of applying the model proposed by the *Center for Digital Storytelling* of Berkeley, but instead of telling a story of a personal life, they

[38] Of particular relevance is the tutorial section on Location Based Storytelling http://www.pbs.org/nationalparks/for-educators/digital-storytelling/ where methodologies for creating location based narratives (with Geo-localization) are available.

[39] *Delve* (2014) http://delve.tv/

[40] Adam Westbrook (http://www.adamwestbrook.co.uk/)

[41] Westbrook, Adam. 2012. *Ideas on Digital Storytelling and Publishing*. e-book. https://adamwestbrook.files.wordpress.com/2012/10/adamwestbrook_collection.pdf http://www.insidethestory.org/about/

[42] Other platforms of this type (*storyform, odyssey, storyline, adobe voice, raccontr*, to mention a few)

developed a story about objects in the Museum. Participants were invited to create small digital videos using free tools like *iMovie*, thus promoting a motivated learning, and resulting in the development of communication skills and digital literacy.

The CHESS project (Cultural Heritage Experiences through Socio-personal Interactions and Storytelling), coordinated by Maria Roussou since 2012, has developed the concept of *Digital Storytelling* for use within the galleries of different museums. The development process resembles the production of a film where: themes are defined, a script is created, staged, filmed and distributed (in this case on mobile devices). The experiences reported by Roussou (2006) indicate that the experience of the visitors to the proposals of *digital storytelling* is indeed positive. Visitors enjoyed these experiences stating that they add value to the visit as usual when digital technology is employed in the gallery.

b) Non-linear Interactive Documentary

Many projects can fall in the category of Interactive Documentary, sometimes they are described as *Webdocs* (based on their transmission on the internet); *iDocs* (as for interactive docs – based on the idea of interactivity); *serious games* (as for the non-fiction subject and the ludic narrative structure); *docu-games* (documentaries that adopt a gaming strategy); *data-base narratives* (based on the structure) *virtual reality non-fiction*, to name a few. (Aston, Gaudenzi and Rose, 2017)

Like Manovich points out, when film was invented, people didn't produce movies, they filmed theatre for example, experimented with montage, repetition, cut and paste, etc. Similarly, with interactive digital narrative there must be a long evolution towards perfection, testing, changing, and exploring the new medium (all media is new media before they stabilize and eventually become old).

The term 'interactive documentary' appears for its first time in 2002 in a text from Mitchell Whitelaw (Whitelaw 2002) for an exhibition catalogue of the artist Brogan Bunt for the Adelaide Fringe film festival in Australia. In this text, Whitelaw links the connection between documentary and 'new media' to the independent production: with the simplification of software suddenly anyone could be a producer and filmmaker in a "do it yourself" way. He also points out to new narrative formats and modes of perception *"the viewer can wander around interactive narratives just*

like in other new media activities such as web surfing, database browsing and game playing" (Whitelaw, 2002:2).

Definitions of interactive documentary point to the use of digital tools to tell stories (Lambert 2006) or to tell factual stories (Aston & Gaudenzi, 2012) that are changing the ways we conceive narrative.

Aston & Gaudenzi (2012) argue that interactive documentaries are not the result of a linear evolution of the documentary genre, but a distinct and separate mode of practice that goes beyond simple representation of the real, moving towards one that constructs the real through an immersive and enacted user experience. They define interactive documentary as the use of Digital Media to convey factual stories: "*any project that starts with the intention to engage with the real and does so by using digital technology*." For these editors, the notion of the real is a shifting concept, in line with Grierson's definition of documentary as "a creative treatment of actuality" (Sussex,1972).

Drawing on Bill Nichols (2001) styles of documentary (poetic, expositive, observational, participative, thoughtful and performative) they further offer four modes for understanding the nature of interactive documentary; the conversational mode as a conversation with a computer that is typified through forms of game-play, the hypertext mode as means of structuring user experience through a series of branching choices; the participative mode as two-way conversation between author and users that actively involves the user in production of material; the experiential mode as a way of utilizing space and embodiment to structure the user experience particularly where the experience of the real and the virtual become blurred.

Arnau Gifreu Castells (Gifreu-Castells 2013) further elaborates and explores the characteristics of digital interactive documentaries as being

> "*interactive, enabled by digital tools*"; having "*hyperlinks* [that] *allow the viewer to jump across different points of the narrative";* being Multimedia or "*incorporating different types of media (image, text, video, audio, text, illustration, animation, infographics.)*"; and presenting the "*integration of graphic design: text, letters, interface, buttons".* (Gifreu-Castells 2013)

> Katherine Cizek (in an interview by Wiehl, 2017) defines interactive documentary putting a focus on the collaboration with the subjects:

"a collaboration with the intent to make quality media with partners instead of just about hem, to make media (...) with people that aren't media-makers: citizens, academics, professionals, technologists, organizations" (Wiehl, 2017: 39).

Several PhD thesis have addressed interactive documentary (Dena, 2009; Gifreu-Castells, 2013; Gaudenzi, 2013). Also several events emerged to share and promote this genre: *i-Docs Symposium* in Bristol was the first dedicated to interactive documentary – convened by Judith Aston, Jon Dovey and Sandra Gaudenzi in March 2011. In Barcelona, the *Popathon*[43] promoted the creation of interactive stories using Popcorn Maker software. Also, in Barcelona, *Interdocs Barcelona*[44] (since 2013).

The interactive documentary format is becoming more popular in recent years as new productions appear. The production of interactive documentaries is expanding and diversifying formats and this field is becoming a"*space where we can look across disciplines at what interactivity brings to these engagements*" (Aston, Gaudenzi and Rose, 2017: 2). Several repositories curate collection of emerging authoring in interactive documentary: MIT Doclab[45], Docubase[46], SXSW[47] and in blogs such as Ben Hoghuet interactive narrative 'Hall of Fame' 48[48] , Sandra Gaudenzi's blog Interactive Factual[49], or Arnau Giffreu Castells *comeindoc*[50] project.

Literature addressing interactive documentary, is made by writers and thinkers about this practice, which are also i-doc practitioners themselves[51], and after a first moment of debate about the definition of interactive documentary and how to produce them, became concerned with questions of *agency,* questioning not what documentary means, but what documentary does. This form of creation increasingly is seen as a

[43] Popathon Event http://popathon.org/

[44] InterDocs Barcelona http://www.docsbarcelona.com/en/ed-2016/interdocsbarcelona-2016/

[45] OpenDoc Lab http://opendoclab.mit.edu/

[46] Docubase https://docubase.mit.edu/

[47] South by Southwest Conference https://www.sxsw.com/

[48] Benjamin Hoguet Website http://www.benhoguet.com/hall-of-fame/

[49] Interactive Factual blog http://www.interactivefactual.net/sandra-gaudenzi/

[50] ComeInDoc http://comeindoc.com/

[51] See for example Judith Aston, Sandra Gaudenzi, Mandy Rose, Arnau Gifreu Castels, Jon Dovey, Nonny de la Pena, William Uricchio, Paolo Favero.

process rather than a product and the focus is on the strategy of involving the audience as co-creators.

Co-creation between media makers and documentary subjects in an interdisciplinary way, and by people and computers; the development of citizenship role (Kate Nash address civic value of projects like *Fort McMoney* and *Hollow*); cross class collaboration, make work with partners, not just about them (Whiel, 2017 interview with Katherina Cizek, author of *Highrise* 2009-15); co-creation as a strategy for activism. Citing two examples: Catherina Cizek, worked in 2004 as Filmmaker in Residence in a national Filmboard of Canada project called *Challenge for Change* where she worked with architects, city planners, academics, in what she saw them "the people formerly known as subjects" (Wiehl, 2017: 39). Mandy Rose did a project for BBC2 (Video Nation project) in which they gave fifty people across the UK a camcorder and asked them to use it to reflect on the diversity of life in the UK in a self *anthropology approach*.

William Uricchio (2017) addressed the affordances of digital *media* to remix, and how that is a contribution to make interactive documentary:

"*the term "remix" (...) enabled by an abundance of source material and user-friendly tools for the cutting-and-pasting of digitalized text, image and sound, remixing seems to be a condition born of the digital era*" (Uricchio, 2017: 194).

In our research we will "remix" the archive of the archaeological site, Zambujal, into an interactive narrative prototype.

1.4. Digital Storytelling for Archaeology

1.4.1. Archaeology and Computers (state of the art)

The area of application of digital technologies to Archaeology is vast[52]. Through its 150 years of existence, Archaeology has developed new methods for survey, register, study and publishing, according to the technology of each era, naturally seeking more efficient methods of survey and communication.

The availability of computers since the mid 20th century was immediately employed in benefit of archaeological practices, on each improvement in the technology, Archaeology also found new uses and applications.

The first use of the computer in Archaeology was marked by the storage capabilities of computers and its suitability to store and retrieve data, reflecting on the development of databases useful to archaeological collections management.

Then, due to the development of the Graphic User Interface and Computer Graphics in general, Archaeology used computers to develop what is today a field in its own right - Virtual Archaeology- which consist in the creation of accurate 3D models of ancient sites, obtaining visualizations useful both to archaeologists, who need to study and test hypothesis of interpretation, and to public or museum presentation (on Virtual Archaeology see Maurizio Forte and Franco Nicolluci and the *Learning Sites* project[53]).

The development of Digital Cameras and Scanners led to an improvement in data capture techniques, very useful in fieldwork to create precise survey and cartography, but also in the digitization of artifacts and monuments. A recent endeavor in this field is the Google Arts and Culture Institute initiative[54] of digitizing the world's main works of art and making them available to the broad audience through the Internet in High resolution.

The phenomenon of the Internet led to the development of Virtual Museums, and Museums Websites, and more recently, the burst of Social Media impacted on the

[52] The main conferences in this field are CAA and VAST.

[53] Learning Sites http://www.learningsites.com/index.php

[54] Google Cultural Institute https://www.google.com/culturalinstitute/about/partners/

communication function of Museums and Archaeological sites and projects. The development of Mobile Computing also led to new applications such as Mobile Museography and the development of creative applications that are shaping the way people interact with Heritage.

In the book *Archaeology and the information age*, Paul Reilly (Reilly, 1992) brings together several contributions from all over the world around the question of how Archaeology is using digital technology. The focus of this book is in *'technology as a tool to perform common archaeological research'* from data capture in fieldwork, through the use of databases to organize documentations and quantitative information management.

Issues like image digitization and storage, or standards regarding files formats were the main problems addressed. It also addresses issues of computer visualization, like spatial analysis through geographical information studies and 3D modelling for archaeological sites reconstruction focusing in the development and use of tools for computer graphics and surface modelling. In the 1990s many efforts were made in 3d modelling and visualization. Paul Reilly coined the term Virtual Archaeology (Reilly, 1991).

Following Reilly, several authors wrote on Virtual Archaeology, like Barceló, Sanders and Forte who created Learning Spaces. Their main concern was in produce effective and realistic visualizations of monuments both for scientific research and public display. Their main research was on the accuracy of the models and don´t say much about the message or form of engagement with audiences.

Another book on the topic is *Archaeological Computing* (Eiteljorg 2008). This book presents a classification of the uses of computing in archaeology, referring the process: entering data, storing data, retrieving and presenting data, sharing data.

The sharing data section sees a site excavation web site as a version of data management. (Eiteljorg 2008: 251). And doesn't mention visitor's reception or public communication. However this framework is helpful to understand the scope of archaeological activity from excavation to laboratory and then publishing, letting public communication of archaeology or the making of archaeological exhibits out of the scope.

A related approach is Daniel Plentickx' article "Identifying technologies used in Cultural Heritage" (Plentickx 2004). By adopting an information systems theory approach Plentickx classifies archaeological research procedures into three activities:

input, process or output presenting a framework to look and map the plethora of possible applications of Digital Heritage. Current state of the art of Archaeology's uses of digital technology should be understood in a threefold spectrum that ranges from data acquisition, scientific analysis and interpretation, to professional and popular dissemination. This field is constantly evolving and more recent reviews are available elsewhere (Forte and Campana, 2016; Vincent et al 2017; Galeazzi et al 2018).

a) Data Capture Technologies

The survey phase in Archaeology concerns data capture and several digital technologies are being adopted. *Laser scanning and Photogrammetry* improve data capture in excavation and revolutionize the traditional pencil drawing survey. A state of the art example is the point cloud scanning of the Chauvet Caves in France, famous for its subsequent application in the documentary by Dziga Herzog "The cave of the forgotten dreams"[55], Lascaux Caves[56] or the The Mount Rushmore digitization by the company Cyark is another example of the accuracy of this technology[57].

In Portugal, at least in Zambujal, a drone equipped with a photographic camera allowed the creation of a 3D Model using Photogrammetry made by Christian Hartl-Reiter (see Appendixes p.53). Of reference also is the work of Portuguese Morbase[58] company in Montemor-o-Novo who are using photogrammetry and 3D modelling to present Montemor' heritage to the public with several videos presented at their website, in the social media and in the local museum, where they provide a highlight of the object of the month in 3D.

A number of applications for smartphones with compass and camera can similarly *capture data and generate 3D models*. For example, Autodesk 123D[59]. This

[55] Cave of Forgotten Dreams (2010) Full Documentary by Werner Herzog https://www.youtube.com/watch?v=ieftFgu1wes

[56] Lascaux Caves video based on 3D scanning http://archeologie.culture.fr/lascaux/fr/visiter-grotte-lascaux

[57] Mount Rushmoore digitization https://www.cyark.org/projects/mount-rushmore-national-memorial

[58] Montemorbase https://montemorbase.com/

[59] Autodesk 123D http://www.123dapp.com/

kind of packages can be combined with online 3D viewers (like *Sketchfab*[60]) to share information on the web.

Digitization with *Reflectance transformation imaging (RTI)* is now accessible to obtain extremely accurate visual descriptions, being particularly suitable for the analysis of small objects. See for example how manuscripts can reveal information invisible to the naked eye. A good example of the use of this technology in Portugal is the example of a goat petroglyph in the UNESCO World Heritage Prehistoric Rock-Art Site, Côa Valley in collaboration with Parque Arqueológico do Vale do Côa (PAVC) Centro Nacional de Arte Rupestre (CNART) and the Universidade do Minho. Portugal[61].

b) Data Analysis Technologies

In the second research phase, concerning data analysis, structured databases in connection to *Geographic Information Systems* allow the development of historical and thematic cartography. Open Source packages like *Quantum Gis*[62] allow for the geo referencing of images, while also working with available data from cartographic institutions. Models and maps produced with this software can be integrated in Google Earth. This type of work with geographic information makes it possible to deliver *Location Based Content.* In the case of historians, researchers are increasingly using digital tools to do their work, see for example the Atlas of Historical Cartography developed by the Universidade Nova de Lisboa[63].

Virtual Reality was one of the first technologies to be explored in archaeology context to recreate 3D buildings and navigation spaces. This technology can be used in the data analysis phase in archaeology to test hypothesis of interpretation of the sites. Projects like the Virtual World Project[64] present interactive virtual tours and are designed to study and teaching antiquity.

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[60] Sketchfab https://sketchfab.com/

[61] RTI of Penascosa Rock Art https://vimeo.com/23055544

[62] QGis https://www.qgis.org/en/site/

[63] Atlas of Historical Cartography http://www.fcsh.unl.pt/atlas/

[64] Virtual World Project http://moses.creighton.edu/vr/

c) Dissemination Technologies

In the dissemination phase, several digital technologies are being adopted in archaeology. *Virtual worlds* are a way of exploring past landscapes in both an informative and entertaining way. Several state of the art projects are exploring this field. See for instance the Virtual Prehistoric World built by Past Horizons[65]. In Portugal, the Centro de História da Arte e Investigação Artística (CHAIA) da Universidade de Évora in collaboration with King's College Visualization Lab has generated a Virtual World of Lisbon before the 1755 earthquake that destroyed part of the city and this world can be navigated in the platform *Kitely*[66].

Games are also a powerful tool to explore and teach about the past. It's a very sophisticated field, being one of the main industries of digital entertainment. Blockbusters like *Civilization* or *Age of Empires,* address knowledge about the past. Smaller scale games like "1066"[67] produced by Channel 4 game or small applications can be used as educational resources associated to heritage resources. Another good example is *Mysteries of Çathalyouk*[68]. This game has an interesting introduction with a comic book stytle multimedia – with links to videos and very accessible text. It has video interviews with Ian Hodder the Project Directors, a glossary, a link to a sound of how to say Çatalhoyuk, and an interactive timeline situating the archaeological city. Many other games are collected in educational sections of websites such as BBC[69] or British Museum[70].

Augmented Reality and *Location-based* storytelling apps are a growing application in Archaeology. AR is a technology allows the superimposition of virtual labels in the reality view, captured by mobile cameras. This technology is more commonly used in popular contextual information. The first application was

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[65] Past Horizons http://www.pasthorizonspr.com/index.php/archives/09/2013/a-virtual-prehistoric-world-you-can-explore

[66] Lisbon pre 1755 earthquake https://lisbon-pre-1755-earthquake.org/

[67] 1066 game https://www.1066online.co.uk/game/

[68] Mysteries of Çathalyouk Game http://www.smm.org/catal/top.php?visited=TRUE).

[69] BBC suggsted games *https://www.bbc.co.uk/history/interactive/games/*

[70] British Museum games resources https://www.britishmuseum.org/learning/schools_and_teachers/web_resources.aspx

Archeoguide (Vlahakis et al. 2001)[71] a Virtual Reality system to explore the site of Olympia, in Greece. More recently *The Londinium Streetmuseum App* (Museum of London , 2010) provides location-based information about Roman London[72].

In gallery interactives present an important modality for presenting archaeological information in exhibits, see for instance *Second Story* studio productions in cultural heritage digital *storytelling*[73].

Crowd funded projects are being used to foster participation in the cultural and natural heritage fields. People from different geographic locations can co-work for a common project. An example is *Transcribe Bentham*[74] where the public is engaged in the online transcription (typing) of original unstudied manuscripts of philosopher Jeremy Bentham, (1748-1832). Other example of citizen science is the *Zooniverse* platform[75] that enables the collaboration of public volunteers with scientists, in research that would be impossible otherwise. The projects cover different areas, in the Humanities two projects stand out: *Ancient Lives* (a crowdsourced transcription of Ancient Greek papyrus fragments) and *Operation War Diary* (crowdsourcing transcription of British Army's day-to-day life at the trenches of WWI)

Interactive interfaces are also used to communicate Archaeology in online publications such as "*Reading an ancient comic strip"* by National Geographic (2015)[76], which allows the reading of the carved marble pillar in Rome known as Trajan's Column. Viewers can follow the story carved in stone from bottom to top, that reading it like a comic strip.

Museum Web sites such as Virtual Museum of Iraq[77] (Centro Nazionale di Ricerca, 2009) allows a virtual visit to the museum, through 360o Quick Time VR representations of the space, combined with interactive graphics and videos with the scientific curators. The Virtual Museum of Canada[78] (2006) is composed of a

[71] Archeoguide http://www.archeoguide.it/old/

[72] Londinium App https://www.youtube.com/watch?v=yfbWgIpkHrU

[73] Second Story studio projects http://www.secondstory.com/projects/browse/subject/storytelling

[74] Transcribe Bentham http://blogs.ucl.ac.uk/transcribe-bentham/

[75] Zooniverse https://www.zooniverse.org/

[76] Reading an Ancient Comic Strip https://www.nationalgeographic.com/trajan-column/

[77] Virtual Museum of Iraq http://www.virtualmuseumiraq.cnr.it/noflash.htm

[78] The Virtual Museum of Canada http://www.virtualmuseum.ca/home/

branched narrative with several chapters in the manner of Choose your own adventure books. The interface resembles a simple website, is not immersive, and presents 5 storylines, a contextual section, a timeline, an educational game "A Virtual Archaeological Dig" a section with collections of artifacts, and teaching resources.

Interactive documentaries, such as *Becoming Human*[79] and *Matera Cittá Narrata* provide examples of how content can be presented in a more immersive way. In order to keep a record of good examples of interactive narratives for Archaeology (but also Heritage and Memory in general) we've created an online repository called iStories Site (https://istoriessite.wordpress.com/).

[79] Becoming Human http://www.becominghuman.org/node/interactive-documentary

1.5. The Interactive Documentary as a Framework for Archaeological Communication

In a reference to Manovich's work on database narratives (Manovich, 2010), we conceive 'heritage interpretation' as a curatorial practice upon an archive or collection, similarly to an algorithm imposed on a database. Information is objective, storytelling claims emotion, voice and subjectivity, all in all creativity.

What I would like to stress is that the majority of self-called Virtual Exhibits, Multimedia Presentations, Virtual Visits, Interactive Experiences, Multimedia Apps or state of the art systems for archaeological heritage dissemination, are often no more than database repositories based in geographic information system (GIS) to inventory and manage archaeology sites or are simple visualizations with no narrative so ever.

To look for good digital *storytelling* examples we had to widen the field and look to authoring productions in the fields of fine art installation, interactive journalism, videogame, and media industry in general.

So what if we could see cultural heritage collections (like an archaeological archive) as a database of objects (texts, photos, videos, sound recordings) what kind of algorithms can we impose on these data in order to make them meaningful? Perhaps *storytelling* is the key. What we propose as a framework to guide our research work is to draw on the principles of digital *storytelling* (in the sense that they address the "creative look at reality" approach attributed to Grierson) to communicate Archaeology to the broad audience. At the Center for Digital Storytelling of Berkeley, the 7 principles of Digital Storytelling are:

> *"1.Point of View (What is the main point of the story and what is the perspective of the author?)*
> *2. A Dramatic Question (A key question that keeps the viewer's attention and will be answered by the end of the story).*
> *3. Emotional Content (Serious issues that come alive in a personal and powerful way and connects the audience to the story).*
> *4. The Gift of Your Voice (A way to personalize the story to help the audience understand the context).*

5. The Power of the Soundtrack (Music or other sounds that support and embellish the story).

6. Economy (Using just enough content to tell the story without overloading the viewer).

7. Pacing (The rhythm of the story and how slowly or quickly it progresses).”

(The 7 principles of Digital Storytelling of the Center for Digital Storytelling of Berkeley, last retrieved 2-9-2018)

http://digitalstorytelling.coe.uh.edu/page.cfm?id=27&cid=27&sublinkid=31

The production of an interactive documentary in Archaeology is to fill a gap. A non-fiction approach is the best way to be in line with science communication of Archaeology. On the other hand, there is a pressure in the field of archaeological public communication to use new available tools that are in line with contemporary visual culture. Interactive documentary combines both requisites: a non-fiction approach to storytelling (creative treatment of reality) and uses multimedia, interactivity and connectivity.

Almost twenty years after the first experiments with the genre of interactive documentary, the production on this field never ceased to exist. In terms of application, there is considerably bigger production of interactive documentary in the field of journalism, addressing social and political issues and human rights. The application of the Interactive Documentary model to heritage and science communication exists, but in a lesser extent. We believe there is still an opportunity to experiment with this rich *medium* in our field of expertise (archaeological communication).

1.6. Summary

Archaeology needs to communicate their finds to the public in order to gain support and maintain itself relevant to Society. There are many ways this communication can be made. Digital technology is just the latest modality of performing it. This chapter addressed archaeological communication in print and digital *media*.

Heritage Management increasingly recommends public communication laying guidelines through charters and recognizing the discipline of Heritage Interpretation as a professional activity. The principles that guide this practice are those of engaging, more than simply passing information. However, using *storytelling* in Archaeology should always respect scientific accuracy and recognize that solid archaeological studies are necessary before an archaeological site can be communicated to the public.

More recently, the adoption of digital applications in Archaeology not only allowed new forms of representation, but also opened the discipline to a wider group of practitioners. Artists, educators, designers, IT specialists, and also *produsers* (increasingly, groups of amateurs create and share online, digital content about archaeological sites) are now part of the producers of narratives about the past.

Museums are potential *storytellers,* they fabricate "talking environments" and are responsible to transmit collective memory. No study about virtual museography can exist without acknowledging what has changed since the first private collections (sculpture gardens and cabinets of curiosities) through the creation of national museums, followed by the avant-garde movements and its influence in the museum narrative space. More recently, virtual museums are forms of interactive digital narratives that need to be understood in the light of contemporary research.

We then addressed the digital turn in narrative, presenting the definition of interactive digital narrative and reviewing its evolutionary trajectories (text-based experiments, interactive cinema, and videogames).

We presented the two main theoretical approaches to study interactive narrative, the Neo-Proppian approach that uses Vladimir Propp's *Morphology of Folktales* (Propp, 1928) to construct narratives using the elements of narrative identified by Propp. And the Neo-Aristotelian approach that is based in the *Poetics* of Aristotle to address rhetoric and poetic in interactive narratives.

We also presented the concepts of digital *medium*, interface and interactor, and reviewed applications of linear digital *storytelling* and non-linear interactive documentary as the main genres of interest to our study.

We further reviewed the state of the art in computer applications in Archaeology and presented our hypothesis of using interactive documentary as a framework to communicate archaeological sites.

The field of *Digital Storytelling* for Cultural Heritage Communication is an evolving field grounded in traditions of both museography and digital interactive narrative. We recognize the challenges of working in a cross-disciplinary field (science communication, visual studies, museography and digital *media*) which has contributions being added every day, nevertheless we have presented the authors we consider the main references for our thesis.

Chapter 2 - Methodology

2.1. A Practice-led research approach

In this chapter we present our choices in conducting a Practice-led Research where the combination of different instruments supported a methodology that can be replicated to produce digital *storytelling* for other archaeological sites. Our main methodological stance is grounded in qualitative research methods. We characterize it as distinct from quantitative research methods, claiming its appropriateness for our research problem, discussing the forms of validity and limitations of our methods. We then present our research design divided into three empirical studies. The first study is an analysis of the visual content communication the archaeological site of Zambujal to identify narratives and media, the second study is a survey of state of the art applications of digital *media* in heritage communication with the aim of informing the prototype development of a virtual exhibition for Zambujal. For each of the three studies we describe in detail the specific research setting, research methods of data collection, analytical instruments and forms of interpretation. We also describe the practical strategies that will be applied to each project: case study, ethnography, content analysis and practice-led research in interaction design.

Although in the Humanities, theory, criticism and historical investigation have been prioritized over arts practice, recent changes in academia led to an increasing significance of practice-based research raising an awareness that creative practices can convey knowledge. Academic research can impact and inform creative practice in a bi-directional way.

> "*Creative work within the university environment is now often referred to as practice-led research, practice-based research, creative research or practice as research. The terminologies are a means to characterize the way in which practice can result in research insights, such as those that arise out of making*

creative work and/or in the documentation and theorization of that work." (Smith and Dean 2009: 2).

Practice-based research presumes that creative work is made in order to generate detectable research output while practice-led research suggests that the practice leads to a specialization, which can be generalized and written up as research. There is also another category: research-led practice. This is a terminology that suggests that academic research can lead to the creation of new work (be it a new pharmaceutical, a physical machine or even a digital media artifact). The first two types (practice based and practice led research) are often carried out collaboratively between creative practitioners that join forces with basic research work while research-led practice is more applied in certain areas, such as music, creative writing and new media for example (Smith and Dean 2009: 8)

Smith and Dean propose a model called The Iterative Cyclic Web – which is a model of creative and research processes including practice-led research; research-led practice; creative work and basic scholarly research. A very important aspect to the model is the concept of iteration:

"To iterate a process is to repeat it several times (though probably with some variation) before proceeding, setting up a cycle: start-end-start. The creator must choose between the alternative results created by the iteration, focusing on some and leaving others behind (temporarily or permanently). In a research phase, this can be viewed as a selection based on empirical data or an analytical/theoretical fit; in a practice phase the choice might be aesthetic, technical or ideological, or somewhat random. Iteration is particularly relevant to the sub-cycles but also to the larger cycle." (Smith and Dean 2009: 19)

Simply put, to iterate is to remake the same think over and over again always perfecting it until reaching the desired result. It is to start with a "rough-cut" and later perfect it, working out the details. This process is very common to creative arts production and is being applied to digital media artefacts creation. In this sense we believe Fine Arts or Creative approaches to research, add value to Digital *Media* research and production.

Our research focuses on the study of changes and continuities in science communication through the case study of the archaeological site Zambujal. It is motivated by our need to deepen our understanding of the challenges and opportunities given by digital technology, making a contribution to informed adoption of digital strategies in archaeological sites' communication.

We shall study Archaeology as the institution that creates knowledge about archaeological sites, and look at how the sub-products of the discipline (text, image, publication, exhibition) can be studied from a communication standpoint. The process of knowledge creation and communication in Archaeology starts with scientific studies (archaeological excavation, laboratory practices and scientific publications) and is followed by communication with the public (general publications or magazine articles, exhibitions, heritage interpretation panels and digital applications). These practices are performed by different social actors (scientists, educators, designers) and produce several artefacts (texts, maps, drawings, photographs, videos, exhibitions, websites or other digital *media* applications). We believe the work made in Archaeology is a cultural construct, hence changes with society in a Constructive theoretical approach.

To pursue this research we will adopt qualitative research methods. This approach has its origins in the 20th century as a rejection of positivism. The first attempts at doing qualitative research focused on ensuring methods of validity. But it is only in the 70s and 80s that it became well accepted in the academy. It is a broad research approach that contrasts with quantitative research. While quantitative research focuses on the analysis of quantifiable data (e.g. analysis of the number of times an image of the reconstruction of Zambujal appears in the press), qualitative research focuses on the semantic analysis of the images, questioning for example when do archaeologists use "artistic impressions" of Zambujal instead of using the general excavation plans (the answer has to do with the context of communication, usually excavation plans are used in scientific reports, and artistic impressions are used when communicating with the public such as exhibitions or general press articles). Our purpose is to better understand the subject of communication in Archaeology, learn about it in depth rather than testing a theory. In our study we will use qualitative research methods to examine semantic questions that deal with value-

laden problems that cannot be answered using quantitative research methods.

The qualitative research approach is often used in the humanities to apply research techniques such as observations, case-study and interviewing, as opposed to statistics and surveys characteristic of quantitative research. Creswell (2013) contends that qualitative research has three distinctive characteristics: it takes place in a natural setting; the researcher is the main instrument for data collection; and it uses multiple modes of data collection. It has an emergent design, meaning that the initial plan for research may well change according to the flow of fieldwork. Its applications range from historical analysis (archival research, primary and secondary sources, artefacts, oral history), to ethnography (observation, participant observant) and to life history and case study (findings are instructive and cannot always be generalized).

Its advantages are that it can examine complex and semantic questions that cannot be answered using quantitative methods, dealing with value-laden questions. Accurate reflection and detailed descriptions constitute the main forms of validity. The credibility of a study is related to the right setting and participants / informants. Our research takes place in a natural setting, the archaeological site of Zambujal. The disadvantages are that the replicability of the study cannot be made exactly in the same manner although it can be adapted, and the subjective nature of this type of research as well as the natural bias of the researcher can lead to critiques. For instance, because we have worked at this site in the past years, our familiarity with the site and our knowledge about existent *media*, may impede a fresh gaze on the subject.

The phases of qualitative research include: data collection (documentation, observation, interviews); interpretation of data (a process of coding by categories) and then reading the material according to coding categories, using data to support arguments. Questions and forms of data collection might change; they use subjective data, like observation and note taking, extracting meaning from a subjective interpretation in a holistic approach. It is common for the inquirer to reflect about his or her role in the study, as personal background can influence the interpretation. In the case of our research, I knew the research setting for many years as I worked as scientific illustrator and surveyor of the site since 2002 to present.

2.2. Research Design

In this section we present the design of three empirical studies specifying the methodologies and instruments, respectively: study 1 - content analysis using visual research methodologies; study 2 - survey of digital technologies applied to cultural heritage sites using interface critique methodology, and study 3 - prototype development using interaction design cycle and workflow. For each study we specify the research setting, fonts and sampling, data collection and methods of data analysis (along with the coding categories), as well as the form of reporting the results.

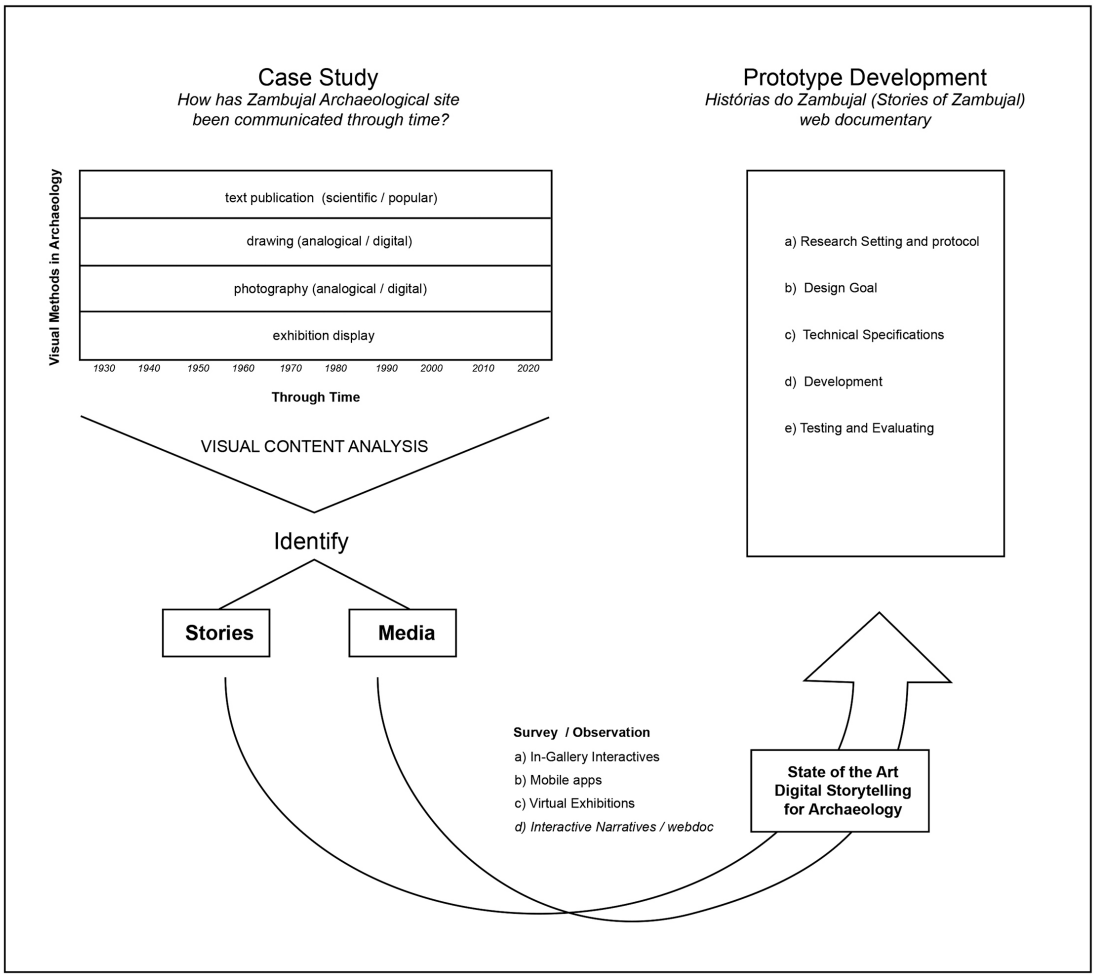


Table 2) Research Design diagram: we start by analysing the corpus of visual representation in Zambujal in order to identify *media* and stories, we then make a survey of the state of the art in digital applications to cultural heritage dissemination, and then we develop a prototype of a virtual exhibition for Zambujal.

2.2.1. Study 1: Visual Content Analysis

In this section we describe the research setting for the analysis of the visual content of Zambujal. We start with the creation of a research protocol, the criteria for data sampling, the methods for data collection and analysis including coding categories, and how we shall report the results.

The main research strategy adopted in our fieldwork is case study, a design inquiry where the researcher conducts an in-depth analysis of a case, often an activity, a process, or an event, collecting data over a long period of time. Jenifer Platt (cited in Yin, 2003: 13) places the origin of case studies in the work undertaken by the Chicago School of Sociology with participant-observant practices in conducting life histories. Case study is applied to describe behaviors of a group as a whole. It has been applied to research areas such as psychology, anthropology, sociology, political science, education, clinical science and social work.

Yin (2003) recommends using case study when a researcher wants to cover the contextual conditions of a specific situation, believing that the conditions are highly pertinent to the phenomenon being studied. According to this author, case studies can be illustrative (descriptive of a situation giving the reader a common language about a topic); exploratory (with the function of identifying types of measurement in a certain topic); cumulative (serving to extract a common understanding from several sites allowing generalizations) and critical (usually to identify cause and effect questions).

Phases of field procedure include: gaining access to key organization; having sufficient resources; developing a procedure; making a clear schedule; providing for unanticipated events including changes in the availability. The advantage of a case study is to study in depth a phenomenon. The disadvantage is the difficulty in creating generalizations.

To analiyze the media produced by the archaeological site case study we adopted ethnographic research methods. Ethnography is the systematic study of people and cultures. It relies on a method of observation in which the researcher integrates a community over a certain period of time (the longer the better) and

collects information about the habits, practices and artefacts of a certain community (Clifford, 1988). Ethnographic field notes are treated in ways that some concepts can be identified and grouped according to categories. When writing up the ethnography, field notes are used to illustrate concepts (Emerson, 1995; Clifford and Marcus, 1986). Phases of ethnography start with identifying a culture or a group. Then, cultural themes or issues about the group are selected. These themes, issues and theories provide an orienting framework for the study of the culture-sharing group. Data collection ranges from observation of a culture or a group, in the form of artefacts, interviews, symbols and secondary data. Data analysis involves interpretation of meanings and functions, and the product is a narrative with explanations. The advantages of ethnographic observations are first-hand experiences, where the researcher can record information as it occurs, instead of using secondary sources. The limitations of this procedure are that the researcher can be seen as intrusive. Also some information that the researcher collects might be impossible to report, because of privacy issues, i.e. the researcher can notice unusual aspects and explore aspects by himself that can be uncomfortable for participants to discuss. The validity of ethnographic research relies on the substantive contribution to the understanding of a phenomenon.

a) Research Setting

The primary fonts for our study are the images produced to represent and communicate the archaeological site of Zambujal. They are housed in the archive of the German Archaeological Institute in Madrid and in the Museu Municipal Leonel Trindade in Torres Vedras (photographs, drawings, tridimensional models and video footage) and publications (including scientific and popular publications, exhibitions, TV documentaries and websites).

Looking at the *media* produced to communicate the archaeological site also led us to observe other settings where the action of producing *media* and narratives about archaeology takes place. The research settings include the excavations, the laboratory, the publication, the exhibitions and the web presence. The excavations will be analyzed through photographs, field notebooks and video footage; the

laboratory practices will be analyzed through the interaction of archaeologists with other professionals (illustrators, conservators, photographers); we shall pay special attention to the circumstances under which the five public exhibitions of the site occurred, looking at the collaboration among teams of educators, artists, and curators that made them possible. Finally we will analyze how the archaeological site is represented online.

Chronologically we frame the observation across a seven decades time span (1946-2018). 1946 is the date of the first publication of the site (discovered in 1932) and 2018 the time of writing this thesis.

b) Research Protocol

In order to gain access to the site of Zambujal we presented a research proposal to the University of Texas, Austin, Doctoral Program board at the Faculty of Social Sciences in Universidade Nova de Lisboa; to Michael Kunst at the German Archaeological Institute of Madrid, who is the actual director of the excavation, and also our co-supervisor, and to Rui Bras of the Department of Culture and Tourism in the Torres Vedras Municipality.

In this proposal we explained our motivation for conducting a content analysis of the representations of Zambujal in analogical *media*, and the intention of experimenting with the creation of audio-visual and interactive content using this site as a case study. At a meeting in Torres Vedras we were given with the opportunity of creating an interactive narrative for iPad to enrich a physical exhibition being prepared to celebrate 50 years of research of the German Archaeological Institute in Zambujal. The project had two moments. The exhibition was initially planned to be a small temporary exhibition in the atrium of Torres Vedras City Hall, but subsequently changed to a two year exhibition in Museu Municipal Leonel Trindade which was launched in May 2016.

c) Selecting the Sample

To collect data for our first study, we visited the Museu Municipal Leonel Trindade in Torres Vedras. This is where most of the artifacts from the excavation are kept, and whose library holds most publications that concern this site.

The current policy of the museum is to organize temporary exhibitions rather than have a permanent collection on display. Nevertheless there is a room near the educational services area where exhibition panels and other display material concerning Zambujal are kept (tridimensional models and artistic impressions paintings) used to create family and school activities.

We also visited the archive of the German Archaeological Institute in Madrid to collect drawings, consult field notebooks, and gain access to unedited video and sound footage about Zambujal. In the pre-analysis stage we began by gathering the maximum amount of information and created a digital database with digitized material, in order to organize it in categories in the best possible way. We collected examples of different types of *media,* ensuring the criteria for validity in content analysis: exhaustiveness, representativeness, homogeneity and pertinence.

d) Data Collection

Information is gathered through the examination of documents, observation of behaviors or interviewing participants. In our case, we collected several kinds of *media* from the Zambujal archives, digitized it and organized it in a digital database. Drawing on multiple sources of data (documents such as drawings, photographs, maps, paintings, tridimensional models, but also published articles, exhibitions, TV documentaries produced about Zambujal, and last but not least, personal communications based on interviews) we started organizing the material in order to answer our research questions.

During the data collection phase we proceeded to the pre-analysis of the material. We did an overall reading started by dividing the documents into folders according to the kind of *media* and then we divided these elements into three periods.

So, the folder from period 1 (1946-1964) would contain folders with drawings, photos, and publications from this period. The same for the other two: period 2 (1964-1994) and period 3 (1994-2014).

e) Data Analysis

The following phase was the exploration and analysis of the material. In this phase we began by observing and making descriptions of the material, which induced us to create coding categories. We created a "catalogue" for each category of *media* and described it. Catalogues can be consulted in Appendixes A-1-Media Catalogue - Media Description. We made a separate document for each one of the 7 categories: 1- oral history; 2- photographs; 3- drawings; 4- publications; 5- exhibitions; 6- video and sound; 7- Internet. Analysis was based on the inferences that were drawn in the exploration phase and is presented in the tables below. Interpretation is based on the application of the coding model developed for this study, which we suggest can also be applied to other archaeological sites. We divided the *media* elements according to the time they were produced, according to the kind of technology and *media*, to the kind of communication (scientific or popular) and to the kind of narrative (we suggest there are 6 kinds of narrative in Archaeology: spatial, chronological, interpretational, factual, folklore and grand narratives).

ANALYTICAL FRAMEWORK PROPOSAL:

Chronological Division	
Phase 1	Starts with the first publication about the site in 1946 and is covered until the excavations held by the German Archaeologists in 1964.
Phase 2	Corresponds to the period of archaeological interventions taken by the German Archaeologists Sangmeister and Schubart and ends with the change of direction to archaeologist Michael Kunst. (1964-1994)
Phase 3	Corresponds to the period from 1994 to present.

Table 3) Table of chronological division of the documentation.

Categorization according the Type of *Media*	
Graphic Image	Includes field drawing, and field notebooks, published drawings of maps, plans, sections, artefacts and reconstructions or artistic impressions, and born digital image.
Photographic Image	Is dictated by the technique but is divided in different practices. Scientific image as record, and ethnographic photography of the teams at work, or social events.
Mechanical Image	Image taken by machines like magnetograms, C14 graphics, point clouds with GPS systems, etc.
Models	In this category we included 3d handmade models and dioramas made for exhibitions and museum display, but also 3D models made later in the 20th century as an emergent technology.
Video	Since the 90s there are a few records of excavation footage, interviews, and TV shows, or sketches in documentaries addressing Zambujal
Sound	During our visit to the archives we found out that Michael Kunst had made some audio interviews.
Text	Although we don't focus on textual content analysis, we consulted the archive, and occasionally we will use text to exemplify "voice" in science communication.
Digital	In this category we included the presence on the Internet, such as institutional websites, but also social *media* and amateur production.

Table 4) Table of division of the documentation by type of *media.*

USE OF *MEDIA* Categorization according to the Context of Communication **(scientific or popular) following the scientific research and dissemination sequence:**	
Sequence	**Type of *Media***
Discovery of the Site	Folklore, cartography, oral history
Excavation	Scientific and ethnographic image
Laboratory	Drawings of materials, infography, schematic, hypothetic models
Scientific Publication	Text, cartography, photography, illustration, presentations in conferences
Popular / Educational Communication	3D models, artistic impressions, exhibitions, documentaries

Table 5) Table relating *media* to the context of communication.

USE OF NARRATIVE Categorization according to Narratives	
Spatial Narratives	Cartography with several different expressions
Chronological Narratives	Stratigraphy, storytelling
Interpretation Narratives	Use of space, typology, culture, typically the archaeological knowledge produced about the place
Factual Narratives	History of the finding of the site, episodes and anecdotes of the scientific research and historical evolution of the institution
Popular Narratives	Folklore around the site
Grand Narratives	Themes that drive research or are used to convey ideas about the site in exhibitions, ex. War, Commerce, Environment Changes, etc.

Table 6) Table of identification of 6 types of narratives in Archaeology.

f) Reporting Results

By the end of the systematic reading and coding of the material we will have enough information to discuss our interpretation of the results. The treatment of results is presented in Chapter 4 in the form of a narrative where we answer the research question of how Zambujal was represented in the *media*. In discussion we will reflect on how *storytelling* and *media* in Zambujal changed through time, in particular with the adoption of digital technology.

2.2.2. Study 2: Survey of Digital Technologies applied to Heritage

In this section we describe the methodology applied in research that allowed us to understand and characterize several modalities of communicating Heritage using digital *media.* We present the research setting, the criteria for data sampling, the methods used for data collection and analysis, and how we will report results.

Our survey of digital technologies applied to Heritage communication is divided in two moments. The first moment has the aim to map the diversity of genres (mobile apps, kiosks, interactive installations, virtual exhibits, etc.) of digital *storytelling* applications in Archaeology and Heritage. The second study has the aim of understand one genre in detail (interactive documentary) identifying a framework that could be applied to a virtual exhibit development. The results of this two moments are described in Chapter 5.

The objective of this study is to inform and sustain the design choices that will be applied in the creation if a prototype of a virtual exhibition for Zambujal (our last project described in Chapter 6). But also contributes as a methodology for whoever wants to address interactive narrative from a practice based research standpoint.

a) Research Setting

The research setting for our fieldwork is the online and offline interactive narrative forms to communicate cultural heritage resources. We started with a number of certainties about what we were looking for (digital applications to heritage *storytelling*) but we aimed at recognizing and classifying the plethora of typologies available in order to choose one that could be applied to a practical application for Zambujal.

After choosing one convenient genre to our project (the typology of interactive documentary as a desktop virtual exhibit) we analysed several examples of this genre to understand its "anatomy" in order to replicate the process creating a new

application.

The research setting initially was restricted to applications that addressed the communication of archaeological heritage. But soon we extended the criteria to include examples from other domains. We hence looked at digital initiatives carried out in the wider context of Art Museums, Libraries, Institutions, NGOs, Film and Documentary, Media productions in Digital Journalism, etc. This widening of the field permitted us to reach more creative approaches essential to inspire our prototype.

The limitation of this study was the difficulty in not making subjective judgements and not to be impressed with extremely creative approaches leading to an extensive collection of examples. To overcome this difficulty we focused on describing objective observations with the maximum objectivity (data analysis) and selecting only five case studies for each survey.

To select the case studies we started by creating an online database with an exhaustive amount of examples of what we considered good practices of cultural interfaces archiving them in a personal blog named *iStories* (https://istoriessite.wordpress.com/).

To identify successful examples we searched in repositories related to conferences and festivals, such as the Museums and the Web[80] *Best of the Web Awards*[81], Museum Next, MIT Doclab[82], Docubase[83], SXSW[84]. We searched websites of the main international museums to see if they had interactive online experiences (*Rijksmuseum, Tate Gallery, Cooper Hewitt, Guggenheim*). We also collected representative examples as they appeared randomly in the *media* looking interactive content area of the main international newspapers and *media* institutions (*The Guardian, The New York Times, Al Jazeera, Arte TV, Público, Expresso*), and in blogs such as Ben Hoghuet interactive narrative 'Hall of Fame'[85], Sandra Gaudenzi's

[80] Best of the Web Awards https://www.museumsandtheweb.com/best.html

[81] Museums and the Web Conference https://www.museumsandtheweb.com/

[82] OpenDoc Lab http://opendoclab.mit.edu/

[83] Docubase https://docubase.mit.edu/

[84] South by Southwest Conference https://www.sxsw.com/

[85] Benjamin Hoguet Website http://www.benhoguet.com/hall-of-fame/

blog Interactive Factual[86], or Arnau Giffreu Castells *comeindoc*[87] project.

In all we collected a vast amount of resources archiving them for further access in our *iStories* site, posting an entry for each case study and tagging it with three categories that allowed a thematic retrieval (type of production: mobile app, interactive documentary, collaborative project; subject: archaeology, memory, nostalgia, social issues, etc,; and another tag for the production studio: second story, the Guardian, arteTV, etc.).

b) Selecting the Sample

After the wide and continuous collection of examples in our database *iStories* site, we were able to identify a few case studies that were representative and manageable for a concise description and analysis.

To meet the research aim of mapping the plethora of genres, our first survey consisted in an *extensive* approach, selecting the maximum number possible of variation in typologies (in gallery apps, mobile apps, physical interaction and interactive kiosks in exhibits). We then selected five case studies that were representative of different modes of interaction but had in common the topic of Archaeology and Heritage.

The five case studies have in common the subject of communication (Archaeology and Heritage) and represent distinct modalities: in gallery installation, mobile app for iPhone, mobile app for iPad, and a guided visit. This diversity allowed us to discuss different forms of interaction and engagement.

[86] Interactive Factual blog http://www.interactivefactual.net/sandra-gaudenzi/

[87] ComeInDoc http://comeindoc.com/

The following cases were analysed:

Date	Offline Observation Case studies	Typology
25 March 2014	Museu Nacional dos Coches Game and Guide[88]	Mobile app – Game for smartphone
1 May 2014	La Biblioteca Nacional de Israel iPad virtual exhibition[89]	Mobile app – virtual exhibition for tablet
1 May 2014	La Villa de los Papiros exhibition[90]	In Gallery installation
1 May 2014	MAN Museo Arqueologico Nacional way finding App[91]	Mobile App
24 May 2014	Guided Visit and Workshop to Zambujal exhibition room[92]	Guided Visit

Table 7) List and time of observation of uses of digital *media* in museums

Our second survey adopted an *incisive* approach focusing in one typology of *media* artefacts to communicate Archaeology and Heritage – the desktop interactive documentary. They have in common the genre and the topic related to heritage, and differ in the time of production (from 2006 to 2016) and design choices.

The selected case studies are the following: *Atacama Stories*, an interactive documentary from 2006 made by the students of Alberto Cairo in the University of North Carolina in Chapel Hill. We included this example because it has the characteristics of an interactive narrative and it was the first example we saw of this genre. Although being made a few years ago it is still actual in the innovative approach. It combines video, personal interviews, interactive infographics in a very immersive and engaging way.

The second case study is the *Becoming Human* interactive documentary (2009) and we included it as it is the first example of interactive documentary we identified specifically applied to Palaeontology.

[88] Museu Nacional dos Coches - Game and Guide (https://itunes.apple.com/pt/app/guia-jogo-do-museu-nacional-dos-coches/id579922139?mt=8)

[89] Constekam, T. (2014) La memoria judía se expone en iPad, El Pais, 05/03/2014 https://elpais.com/cultura/2014/03/05/actualidad/1394047004_090821.html

[90] La Villa de Los Papiros http://www.mataderomadrid.org/ficha/2824/la-villa-de-los-papiros.html

[91] MAN Museo Arqueologico Nacional App https://play.google.com/store/apps/details?id=man.gvam&hl=es

https://itunes.apple.com/es/app/man-museo-arqueol%C3%B3gico-nacional/id845542885?mt=8

[92] This observation was made as term of comparation to virtual experiences.

The third is *Mattera Citá Narrata* (2009-15) an interactive documentary addressing the city's Archaeology. Again it was relevant this connection with the subject of our study, an archaelogical site.

The fourth, *A Global Guide to WWII* (2014) is included as an example of addressing a theme from History and shows an example of more recent approaches to interactive documentary, serving as a comparison to the earlier examples.

The fifth is *Magellan* (2015) an interactive documentary from arteTV and addresses the story of Ferdinand Magellan using a desktop metaphor of a journal of the discoverer showing an innovative approach to *digital storytelling*. It is included as an example of a very engaging and immersive experience.

Date	Online Observation Case studies	Typology
2006	Atacama Stories[93]	Virtual exhibition
2009	Becoming Human[94]	Virtual exhibition
2012	Matera Città Narrata[95]	Virtual exhibition
2014	A Global Guide to WWI [96]	Virtual exhibition
2015	Magellan[97]	Virtual exhibition

Table 8) List of observations of online virtual exhibitions.

c) Data Collection

Methods of data collection included taking notes of the observations and experiencing the websites applications reporting the overall user experience. The

[93] Atacama Stories (2006) http://atacamastories.jomc.unc.edu/

[94] Becoming Human (2009) http://www.becominghuman.org/

[95] Matera Città Narrata (2012) http://www.itabc.cnr.it/progetti/matera-citta-narrata

[96] A Global Guide to the WWI **(**2014**)** https://www.theguardian.com/world/ng-interactive/2014/jul/23/a-global-guide-to-the-first-world-war-interactive-documentary

[97] Magellan **(**2015**)** http://magellan.arte.tv/en

description consists in the reporting of each case study according to a questionnaire with fields such as: author, date, funding, context of development and technical specifications. We also made visual documentations taking screenshots of the main pages to illustrate the design and the narrative architecture and made a storyboard of the general narrative architecture to improve our understanding of its construction.

d) Data Analysis

In the first survey, by reading the descriptions and observations of the case studies we will be able to produce a generalization of our understanding answering the research questions. We discuss several forms of interaction and engagement identifying five typologies: the human tour guide (as a form of comparison to digital storytelling), the in-gallery installation, the mobile app, the iPad app and the desktop virtual exhibition.

To study the desktop virtual exhibition as the genre we would develop in our prototype, we analyse the five case studies using the Interface Critique approach as proposed by Mattern (2014) and discuss topics that arise from the analysis and we consider pertinent to produce a new prototype.

The topics that seemed relevant were questions of durability and digital preservation of these artefacts. We noticed that some of them disappear from the original website. The promotion is another aspect that became relevant. After producing an interactive documentary is necessary to create awareness in the users to find it, and there are marketing strategies to be developed. The narrative structure is another topic. How many chapters should it have, how does the user navigate in the narrative. The question of content and type of media is also discussed.

e) Reporting Results

Results are reported through the description of the observations and discussion of the analysis. We compare the case studies to produce generalizations that answer our research questions and will inform the development of a virtual exhibition for Zambujal.

2.2.3. Study 3: Prototype Development

In this section we describe the research settings and protocol for developing a virtual exhibition about Zambujal. We then present the design goal for developing a web app that addresses the archaeological site. We describe the technical specifications and the workflow and methods for the development of the web app. Practice-based research is a relatively new approach that originated with the rise of PhD research in creative and design areas. The idea evolved as research students took the subject of research as part of their practice. Research results from a continual reflection on practice and on methods that inform those practices. For example, when creating a new artefact or designing a new object, the researcher would be concerned with reflections upon the processes undertaken.

> *"Claims of originality and contribution to knowledge may be demonstrated through creative outcomes which may include artifacts such as images, music, designs, models, digital media or other outcomes such as performances and exhibitions. Whilst the significance and context of the claims are described in words, a full understanding can only be obtained with direct reference to those outcomes."* (Candy, 2006: 3)

This practice-oriented research focuses on resolving practical problems or improving a problematic state of affairs (Verschuren, 2009). Objects of practice-based research vary, and Verschuren points to one of many as a:

> "*new phenomenon: the object of a practice based research often consists of new phenomena that recently came into being. (...) In case a new artefact needs to be evaluated*" (Verschuren, 2009: 19).

According to this author the intervention cycle follows these stages: problem analysis; diagnosis; conditions for a solution; plan for an intervention and execution of a plan. In our case we will use an interaction design cycle to develop a virtual exhibition about Zambujal archaeological site. We will start with the design goal and design demands. Then we will define the structural and technical specifications of the prototype. Then we will collect and prepare content and construct the prototype. The last phase will deal with testing and improving the prototype.

a) Research Setting and Protocol

At the beginning of this research, a protocol was discussed with the archaeologist in charge of the excavation, Michael Kunst, and Torres Vedras city council, providing an opportunity to develop a digital artefact based in Zambujal archaeological site. The first aim was to explore the technology in itself to understand how *interactivity* and *multimedia* could be integrated as a visual method in Archaeology. We then had to choose a concrete application to develop (among many possibilities such as physical interaction installation, website, mobile app, database, serious game and 3D visualization).

The creation of an exhibition in the Municipal Museum that was being planned to commemorate 50 years of research of the German Archaeological Institute in Torres Vedras provided an ideal research setting to develop what came to be the "Histórias do Zambujal" [Stories of Zambujal] digital *storytelling* project. Its communication aim was to fulfil the institutional need to provide online information about Zambujal, in an engaging way, and mixing different *media*: text, image, sound, video, interactivity.

b) Design Goal

We began by creating a list with the objectives of the app: create a non-fiction interactive experience about the archaeological site of Zambujal; integrate different sources of *media* from the Zambujal archive (drawings, photographs, video, maps); make a piece of interactive narrative capable of being engaging to the broad audience, while maintaining accurate scientific information; allow several levels of content, from a simpler to a deeper level of complexity, providing access to both general and specialized audiences; use simple and affordable editing tools allowing reproduction of the framework from museums with fewer resources; design an interactive experience focused on user experience, but requiring little or no coding skills; set a communication goal that inform and foster interest in the value of the collection of Zambujal; explore teamwork collaboration among professionals (specialists, educators, designers); test the digital *storytelling* framework in the context of archaeological communication.

The aim of this project was to build a creative experience that would reflect the importance of telling stories about an archaeological site. More than remediating older *media* and narratives about the archaeological site, we wanted to create an autonomous piece that would stand by itself as an 'art form' or as a publication. The *side effect* was expected to foster interest in the viewer to know more about archaeology in Torres Vedras.

The goal was to make an *edutainment* piece, creative enough to be an experience in itself and rich enough to add a layer of meaning, that would complement, enrich, but not substitute, the physical exhibition or a visit to the open air archaeological site. The style and language should be accessible both to experts in Archaeology as well as a lay audience, but perhaps not for school children or families. It should resemble more a piece of long journalism.

The key challenge was to make stories from the cultural heritage world more available to the local community using the Internet as away to take the museum outside the walls and hopefully bring back visitors attention to the museum heritage and exhibitions.

c) Technical Specifications

The technical requisites were to use technology that allowed little or no programing skills. We used Tumult Hype software (https://tumult.com/hype/), use BYOD (bring your own device model) so the museum did not have the need to invest in hardware (Proctor, 2011). We opted for a web app that could live in a URL online and be accessed through any browser (available in Appendixes C-3-3-WEBDOC.html)

d) Development

The process of the prototype development evolved as a sandbox project, in a very experimental mode, first by doing testing, and then iterating. We divided the workflow in three phases:

Phase 1 – Exploring the Material

The first phase involved the preliminary study of the archive, conducted as a first case study of this thesis (Chapter 4). During that phase we made an inventory of documents and stories about the site. We digitized documents and organized them chronologically, according to the type of *media*, and identified narrative units.

Phase 2 – Narrative Design (2 versions)

Narrative design was explored in two iterations. The first one was an in-gallery interactive table. The second was an iPad interactive narrative. We first created a low-fi sketching representing the overall experience in a storyboard-like manner in order to plan the material development.

Phase 3 – Prototype Development

In the third phase we prepared the material, optimizing it for the web. We defined the canvas size as 1080x980 px. We had folders in the computer, with all the prepared material for each chapter. Then we created the interface design and graphics and started designing the several pages of the artefact. Finally we added the pages to a Tumult Hype project, where we added action buttons that allowed one to perform the interaction. The prototype development was concluded shortly before the exhibition launching in 2016.

e) Testing and Evaluating

After completing the prototype, the aim is to test the artefact only with Interaction Designers to assess usability design issues and gain insight into improvements at the design level. We opted not to do usability testing with end users, as it will be resource and time consuming in the context of our research objectives from the standpoint of production of interactive design content.

Chapter 3 – Results

3.1. Visual Content Analysis of Zambujal

In this chapter we present the results of a visual content analysis of the communication of Zambujal archaeological site addressing the first research question:

RQ 1: *What narratives are produced about archaeological sites, and what media are used to support and disseminate them? How does this communication change (or not) through time?*

We start with the *corpus* description following a chronological order. Based on the observations and inferences that emerged during the reading of the different *media,* we discuss the visual content analysis, identifying six types of narratives used to tell the story of a site. We also discuss changes and continuities in the communication of Zambujal between 1946 and 2018, focusing on the impact of digital *media* in archaeological research, documentation and communication.

3.2. Archaeological Communication through time

To analyse how the archaeological site of Zambujal was communicated historically, we will use as reference the period framework proposed by Karol Kulik (2007). Kulik suggests a five-phase periodization for archaeological communication: the age of antiquarian communication (1700-1830); the age of print communication (1840-1910); the age of mass communication (1920-1950); the age of specialist communication (1960-1980); and the age of global communication (1990-2007). Each period has specific characteristics that connect the discipline to the different socio-systems.

In the *age of antiquarian communication* (1700-1830) educated men belonging to important families (or to the clergy) would address the study of antiquities more like an hobby than a profession. This activity included the discovery,

identification and description of sites, constituting personal collections with the excavated artifacts. Their approach was more aesthetic than scientific. Renowned figures from this period are for example William Stukeley (1687-1765) from England, Comte de Caylus (1692-1765) from France, or Frei Manuel do Cenáculo (1724-1814) from Portugal. The funding of such works was supported at personal expense or by literate societies (e.g. Society of Antiquaries in 1718 or Society of Dilettanti in 1733) that would finance expeditions and publications. Communication was made essentially among peers through letters, newspaper articles or self-published volumes, printed in typography and profusely illustrated with etchings.

In the second period, the *age of print communication* (1850-1910), Archaeology became an academic discipline. The figure of the archaeologist substitutes the one of the antiquarian. The approach was scientific rather than contemplative; research was driven by the concern to find the correct chronology of the archaeological finds. An example of a work of this period is the theory of the three ages (stone age, bronze age, iron age) by Christian Jürgensen Thomsen (1788-1865). Although academic training in Archaeology did not exist, some engineers with financial autonomy started some studies, such as Pitt Rivers (1827-1900) or Heywood Summer (1853–1940). In this period the formation of National Museums and the legislation such as the *Monuments Act* (1882) imposed rules to avoid excavations without control led by treasure hunters. Communication was undertaken to educate the masses and feed the press industry that was created in the late nineteenth century.

The *age of mass communication* (1920-1950) was probably the golden period of representation of Archaeology in the *media*. Excavations in cities, such as the *Mithreum* in London attracted hundreds of curious viewers. The discovery of the tomb of Tutankhamun in Egypt in 1922 provoked a dispute for the exclusives in covering news by the main Newspapers. In, literature Agatha Christie (1890-1976) addressed Archaeology in her policial romances, and in television, TV shows such as *Animal, Vegetable, Mineral* (1952-59)[98] helped to popularize Archaeology - in this show, a panel of art historians, archaeologists and natural history experts were asked to identify objects from Museum collections.

[98] Animal, Vegetable, Mineral (1956) https://www.youtube.com/watch?v=RdI6T-74E_o

In the *age of specialist communication* (1960-1980) the professionalization of Archaeology that began to be taught at the University, lead to changes in communication. Academic vocabulary became prevalent as the pressure to publish academic articles leaves less space to communicate with a broad audience. Simultaneously, public investment alleviates archaeologists from the need to communicate with the public, concentrating solely in research. In the mid 80's the Hollywood movie *Indiana Jones* (George Lucas, 1984) creates a strong myth in the collective imaginary about relating Archaeology to adventure and mystery.

The *age of global communication* (1990-2007) is characterized by Archaeology as a profession, oriented towards the client, with increasingly stronger legislations that demand supervision of all public works to guarantee that archaeological finds are registered and preserved, if they are found during construction works. Although not all excavations justify preservation and musealization, documentation is made in order to preserve the knowledge about the finds. The emphasis of communication of this period is hence in the collection of information with the development of ever more sophisticated and accurate techniques, but there is also an increasing tendency to communicate with the public. TV shows such as *Time Team* (BBC Channel 4, 1994-2014), or *Meet the Ancestors* (BBC, 1998-2004) help to raise awareness of the archaeological professions in an entertaining way. By the turn of the millennium, the rise of digital technologies allowed new forms of publication and communication with the public, such as virtual visits, mobile tours, or citizen science projects, not yet addressed by Kulik.

3.3. *Corpus* Description

After establishing a protocol with the *German Archaeological Institute* of Madrid and *Museu Municipal Leonel Trindade* in Torres Vedras we collected several types of documents produced to communicate the archaeological site of Zambujal. These materials include drawings, photographs, publications, records of public exhibitions about the site (photographs and catalogues), video and sound recordings of the excavations, and a few representations of Zambujal on the Internet. We constructed a digital database organizing the documents in a three period division, based on the determination of three distinct phases of the excavation:

First Phase (1946-1964)

The site was discovered in 1932 and a first survey was made in 1944. Between 1959 and 1961, Leonel Trindade and Aurelio Ricardo Belo conducted the first excavation, and from 1964 on, a team of German Archaeologists directed the research. We set the first phase between 1946 (the date of the first publication[99] in a general science magazine) and 1964 (the date of the first excavation made by the team of German archaeologists Sangmeister and Schubart in 1964). The documentation corresponding to the first phase comprise elements of oral history (the story of the discovery of the site and folklore associated with local Archaeology), two publications about the site, illustrated with drawings and photographs, and documentation regarding the creation of the first Museum in Torres Vedras as an example of the museography of that time (catalogues, photographs and a manuscript).

[99] Jalhay, E. (1946). O monumento pré-histórico do Casal do Zambujal (Torres Vedras). *Brotéria*, *XLII* (Fasc.IV), 387–398.

Second Phase (1964-1994)

In the second phase, set between 1964 and 1994, Hermanfried Schubart and Edward Sangmeister directed the excavations, publishing the first scientific reports about the site. Towards the end of this period, the first two exhibitions (one in 1987 and the other in 1991) lay the guidelines for future communication narratives about the archaeological site of Zambujal. Documentation from this phase comprises oral history sources in the form of two unpublished texts from Sangmeister and Schubart giving their personal views on how they started working in Zambujal; photographs and drawings; print publications (scientific and popular texts) and information regarding the two exhibitions.

Third Phase (1994-2018)

The third phase (1994-2018) was defined by the start of the contribution of the archaeologist Michael Kunst as director of excavation and the time of writing this thesis: after participating in the 1968 campaigns, Kunst led an excavation in partnership with Hans-Peter and Margarethe Uerpmann (in 1994 and 1995); with Rui Parreira and Elena Morán (in 2001 and 2002); and from 2004 to the present day he was the sole director of the excavations. The third phase is the period that concerns the adoption of digital *media* in all phases of research and dissemination, characterizing contemporary practice. Documentation from this period comprises elements of oral history (recordings made in video and sound); drawings and photographs both analogical and digital; printed scientific and popular communication articles; online representations of the site (institutional web sites and *amateur* user generated content); appearance of Zambujal on TV documentaries and three exhibitions (2006, 2008, 2016) produced during this period. At the end of 2018, already beyond the scope of this thesis, Zambujal was the subject of a valorization project, with the creation of an *open-air* museum, with tours, information panels and an audio guide.

PERIOD	ORAL HISTORY	PUBLICATIONS	EXIBITS	DIGITAL *MEDIA*
First Phase (1946-1964)	**FOLKLORE** "Pedras de Raio"[Thunderstones]" (Video Recording) "Legend of *Cova da Moura*" (text)	**GENERAL SCIENCE MAGAZINES** Jalhay, Eugénio. 1946. "O Monumento Pré-Histórico Do Casal Do Zambujal (Torres Vedras)." *Brotéria*, *XLII* (Fasc.IV), pp.387–398. Belo, Aurélio Ricardo – *Nótulas sobre arqueologia de Torres Vedras e seu termo*, n.^{os}XXXV e XXXVIII a XLI. *Badaladas*. Torres Vedras: Fábrica da Igreja Paroquial de S. Pedro e S. Tiago, 1954-1955.	**Museu Municipal de Torres Vedras.** Founded in 21st June 1929 (Irmandade dos Clérigos Pobres, near S.Pedro Church in Torres Vedras). 16th March 1946 (Irmandade da Santa Casa da Misericórdia, Rua Serpa Pinto). From 19th March 1956 occupies 2 floors in the same building. Since 1992 the museum changed to Convento Nossa Senhora da Graça in the city center where it is today. (Photos, Catalogue)	–
Second Phase (1964-1994)	**TWO INTERVIEWS** "As relações entre pré-historiadores portugueses e alemães desde 1954, ano da reabertura do Instituto Arqueológico Alemão de Madrid, até 1971, ano da fundação do Instituto Arqueológico Alemão de Lisboa " (Hermanfrid Schubart) "O meu Percurso até ao Zambujal" (Edward Sangmeister).	**SCIENTIFIC PUBLICATION** Sangmeister, Edward; Schubart, Hermanfrid; Trindade, Leonel (1971), *Escavações na Fortificação da Idade do Cobre do Zambujal/Portugal 1970* (in Portuguese), Série III, vol. 5, Lisbon, Portugal **MONOGRAPH** Sangmeister, E., & Schubart, H. (1981). *Zambujal* (Madrider Beiträge, Vols. 1–2). Madrid, Mainz, Zabern. **POPULAR PUBLICATION** Schubart, H., & Sangmeister, E. (1984). Zambujal, un asentamiento fortificado de la edad del Cobre en Portugal. *Revista de Arqueologia, Ano V*, (37).	**1st EXHIBITION** "Zambujal, Fortified Settlement of the Copper Age, Torres Vedras, Portugal" 3rd of April of 1987 Commerce Association of Torres Vedras (Photos, Catalogue) **2nd EXHIBITION** "20 years of Presence of the German Archaeological Institute in Portugal", Museu Nacional de Arqueologia, Lisbon, December 1991, Museu Municipal Leonel Trindade, Torres Vedras, 7-15 March1992, Museu de Peniche, 9 Oct.- 6 Nov. 1992 (Photos, Catalogue)	–

Third Phase (1994-2018)	**TWO INTERVIEWS** "Interview with Sr. Jose" (audio recording) "Interview with Sr. Hermínio about the discovery of *Tholos da Borracheira*" (video recording)	**SCIENTIFIC PUBLICATION** Kunst, M., & Arnold, F. (2011). Sobre a reconstrução de estruturas defensivas do Calcolítico na Península Ibérica com base na Torre B de Zambujal (Torres Vedras, Lisboa). O Arqueólogo Português Série V, 1, 429–488. **POPULAR PUBLICATION** Karen A.(1998), *'Arqueologia: os segredos de Zambujal" Deutschland magazine* Revista de Política, Cultura, Economia e Ciência Nº3, Junho de1998	**3rd EXHIBITION** "Zambujal, Life War and Commerce in 3rd Millennium BC" MMLT 26 Sep. 2006- Sep. 2007. (Photos, Flyer and Poster) **4th EXHIBITION** "Bell Beaker Pottery - Europe in 3rd millennium BC". 30th April-31st August 2008 Museu Municipal Leonel Trindade 15th May 2009 National Museum of Archaeology, Lisbon (Photos, Small Catalogue, and Poster) **5th EXHIBITION** "Stories of Zambujal: 50 years of the German Archaeological Institute in Torres Vedras" 27th May 2016 30 June 2018 Museu Municipal Leonel Trindade (Photos, Flyer and Poster)	**WEB PRESENCE** **Institutional** Endovélico Portal do Arqueólogo DAI Arachne CMTV **Commercial Services** Tourism **User Generated Content** Blogs *Youtube* *Geocaching* *Google Maps* **Social *Media*** *Facebook*

Table 9) Table with the source documents analysed.

3.3.1. First Phase (1946-1964): The Pioneers

Leonel de Freitas Sampaio Trindade (1903-1992) who discovered Zambujal, was born in Torres Vedras in 1903. After finishing high school studies he started working in his family business, a commercial textiles company called *Trindade &C^{a}*. His taste for nature observation and love of the *open-air* led him to found a local Scouts group which allowed him to explore the territory around Torres Vedras contributing towards his future career as an archaeologist. Reading a book from José Leite de Vasconcelos[100] at the age of 25, fostered his interest in Archaeology, a field he would pursue a few years later, when Aurélio Ricardo Belo (director of the local museum of Torres Vedras) invited him to be sub-director and create an archaeological collection with artefacts of the region. During the subsequent 50 years, individually and in collaboration with other archaeologists, Trindade undertook several excavations and identified innumerous sites in the Torres Vedras district, from dinosaur fossils, to prehistoric and medieval sites (*Cova da Moura, Tholos of Paimogo, Zambujal*, among others). During his life, Leonel Trindade became a member of prestigious archaeological associations, both national and international, and was nominated director of the museum of Torres Vedras in 1969 where he remained until he died in 1992, aged 89.

In 1932 he discovered Zambujal, which he surveyed in 1944 (leading to the classification of the site as a national monument in 1946). In 1959/60 he excavated the site with Afonso do Paço and Aurélio Ricardo Belo, and in 1964-73 with Hermanfried Schubart and Edward Sangmeister. To investigate the context of discovery of Zambujal, we consulted different sources (publications, letters, photographs and drawings) but this story was unveiled to us during an informal conversation in the field campaign in 2014, by his son, Leonel Trindade Junior, with great emotion. This led us to register it in a video interview in 2014 and include in our archive as a new category of *media* representations of the site: oral history and folklore[101].

[100] José Leite de Vasconcelos was a renowned archaeologist of that time, director of the *National Archaeological and Ethnographical Museum* in Lisbon.

[101] See video interview in appendix C (C-1-3-Pedras de Raio.mov)



Fig.2) Photo of the moment where the story of the discovery of Zambujal was related to us for the first time. © G.Casella

a) Oral History and Folklore

In a personal communication, Leonel Trindade Junior recalls accompanying his father on long walks in the valley surrounding the Sizandro River, and along the cliffs over the Atlantic coast, prospecting, picking up surface artefacts, asking local people about curious things in the landscape and in the soil. It is not unusual for archaeologists to consult local shepherds and farmers who know the territory and can identify potential archaeological sites. Leonel Trindade, who collected folklore tales as well, identified a local legend (the legend of *Cova da Moura*) mentioning an enchanted Moorish lady which inhabited a cave, attracting and killing men after seducing them. In Portugal, very old places are associated with the Moors, and this clue led him to identify *Cova da Moura [the Moor's Cave]*, a natural cave, with a very important necropolis with late Neolithic, Chalcolithic and Bronze Age cultures, discovered in 1932 and later studied by Konrad Spindler in 1981. Leonel Trindade obtained permission to excavate the cave, collecting extraordinary artefacts, testimony of a 5000 years old local society.



Fig. 3) Artefacts from *Cova da Moura*. © G.A.I.

During an archaeological excavation in the *Cova da Moura* site in 1932, a local worker said he found a *thunderstone* as he was picking up a polished stone axe. According to popular culture, *thunderstones* were supposedly stones that:

"After the earth is hit by a thunder, a stone is buried in the soil and after 7 years it emerges to the surface. At this point, local people can pick them up and use them as amulets to protect their houses from future thunder attacks. Usually they are incorporated in the architecture placed under the entrance door or inside the wall." (Trindade, 2015) [102].

The worker, perceiving Leonel Trindade's excitement with the finding of copper age polished stone axes, told him about a place near his house where he found many *thunderstones*- this site was Zambujal. Following this clue, Leonel Trindade visited the site finding archaeological remains on the surface and noticing an earth mound that he assumed to be a funerary monument of the *tholos* type[103].

After a survey conducted in 1944 where they found part of a stone wall which seemed to be a chamber of a *tholos* (prehistoric funerary structure), Leonel Trindade contacted Eugenio Jalhay who wrote a letter to the Minister of Culture of Portugal demanding the classification of Zambujal as a National Monument, which was granted in 1946 (Jalhay, 1946).

[102] Excerpt from interview with Leonel Trindade Junior, filmed in video in 2015. See appendix C (C-1-3-Pedras de Raio.mov).

[103] *Tholos* are prehistoric collective tombs built with a stone dome, covered by earth.

b) Publications

The first publication concerning the archaeological site of Zambujal was made in 1946 in *Brotéria* magazine (Jalhay, 1946). The text entitled "*The Prehistoric Monument of Castro do Zambujal (Torres Vedras)"* was written by Eugenio Jalhay, a Jesuit priest and important archaeologist in Portugal in the first half of the 20th century. Archaeological studies in those times were often self-funded and undertaken by figures from an educated class or from a religious background. Indeed, Eugenio Jalhay (1881-1950), born in Portugal, son of a Belgian entrepreneur, studied in several Jesuit colleges, among which the novitiate of *Barro* in Torres Vedras and in *Colégio Português de La Guardia* in Galicia. There he met the Priest Bovier-Lapièrre (1837-1899) also interested in Archaeology, who had discovered in 1909 in that village, an Iron Age funerary monument known as *Tholos do Barro*[104].

Jalhay pursued archaeological studies and became a recognized figure in this field[105] becoming the vice-president of the Prehistory section of the *Association of Portuguese Archaeologists in* 1928 and vice-president of the same Association in 1944. To his studies about important Bronze Age sites in Portugal (like *Vila Nova de São Pedro, Alapraia* in S. João do Estoril and the Celtic–Roman site *Citânia de Sanfins*), adds the connection to Zambujal.

The *Brotéria* magazine was a Natural Sciences magazine founded in 1902 in Louriçal do Campo (Castelo Branco) by three Jesuit priests from the College of São Fiel- It was a Popular Science magazine addressing areas such as Botany, Zoology, Genetics, Chemistry, Physics, Agriculture, Biology, Medicine and Archaeology.

In the nine page article about Zambujal, Jalhay begins by describing the existence of Bronze Age archaeological evidence (c.3500-1800 BC) in the area of Torres Vedras enumerating several known treasures in the region. Then he describes the circumstances of the discovery of Zambujal:

[104] See Fig. 7) Picturesque drawing of Tholos de Barro, made by Father Bovier Lapièrre.

[105] Moita, Irisalva, "O Padre Eugénio Jalhay", O Arqueólogo Português, 2ª série, Vol. 1, 1951, pp.213-219, http://www.patrimoniocultural.gov.pt/static/data/publicacoes/o_arqueologo_portugues/serie_2/volume_1/eugenio_jalhay.pdf

"On a certain Easter Sunday afternoon, in 1944, on 9th April, I was surprised in my home by the delegate of the national educational committee in Torres Vedras, Dr. Aurelio Ricardo Belo. He came on purpose to Lisbon to communicate me a finding of the maximum importance that he made a few days earlier in Torres Vedras." (Jalhay, 1946: 389).

He continues with the description of the geographical localization of the site and how "he went there on the 15th of May" to confirm the importance of the site. The text ends with four photographic images of the site before it was excavated and a note regarding the need for protection and valorization of the site, which earned the title of National Monument later that year (1946).

The first interpretation of this site is of a funerary monument such as a *tholos or a cairn.* That is why in another article from this period in *Badaladas*[106] local newspaper (Belo, 1954-55) Aurélio Ricardo Belo describing monuments of the region publishes a drawing of Zambujal represented as a *tholos*.

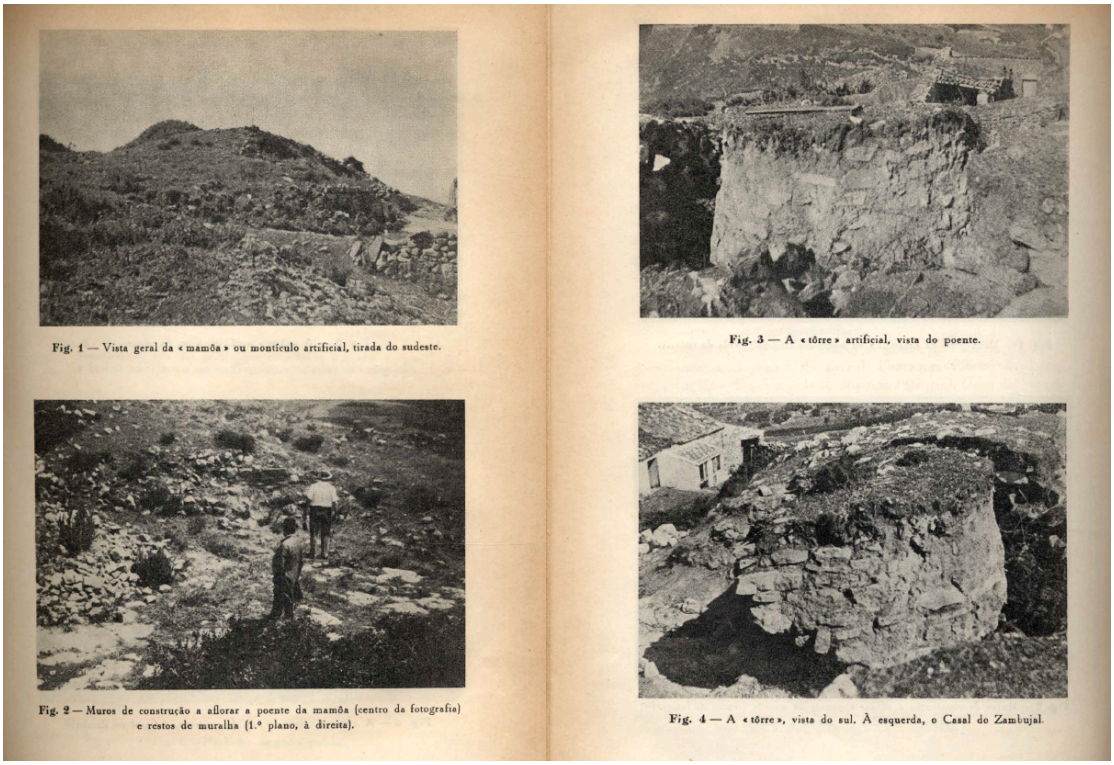

Fig. 1 — Vista geral da «mamôa» ou montículo artificial, tirada do sudeste.

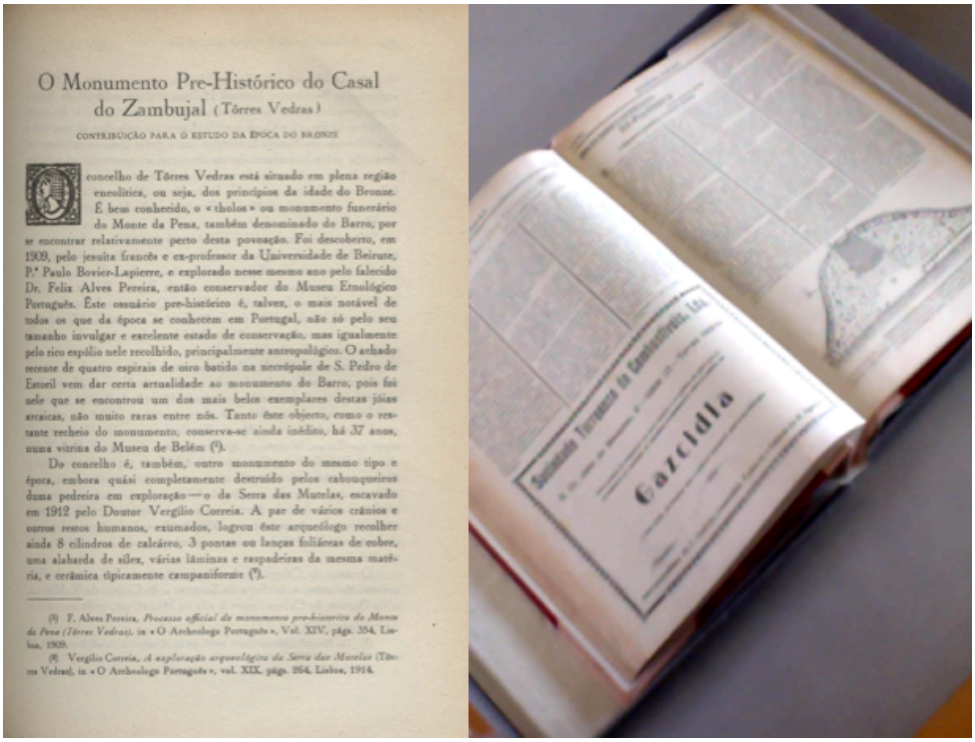
Fig. 2 — Muros de construção a aflorar a poente da mamôa (centro da fotografia) e restos de muralha (1.º plano, à direita).

Fig. 3 — A «tôrre» artificial, vista do poente.

Fig. 4 — A «tôrre», vista do sul. À esquerda, o Casal do Zambujal.

Fig. 4) Photograph of Zambujal mound before excavation, published in *Brotéria* (1946).

[106] Belo, A. R. (1954-55). Nótulas sobre Arqueologia de Torres Vedras e seu termo. XVIII Pré História. O Monumento Pré-Histórico do Casal do Zambujal., (63).



O Monumento Pre-Histórico do Casal do Zambujal (Tôrres Vedras)

CONTRIBUIÇÃO PARA O ESTUDO DA ÉPOCA DO BRONZE

O concelho de Tôrres Vedras está situado em plena região eneolítica, ou seja, dos princípios da idade do Bronze. É bem conhecido, o «tholos» ou monumento funerário do Monte da Pena, também denominado do Barro, por se encontrar relativamente perto desta povoação. Foi descoberto, em 1909, pelo jesuíta francês e ex-professor da Universidade de Beirute, P.e Paulo Bovier-Lapierre, e explorado nesse mesmo ano pelo falecido Dr. Felix Alves Pereira, então conservador do Museu Etnológico Português. Êste ossuário pre-histórico é, talvez, o mais notável de todos os que da época se conhecem em Portugal, não só pelo seu tamanho invulgar e excelente estado de conservação, mas igualmente pelo rico espólio nele recolhido, principalmente antropológico. O achado recente de quatro espirais de oiro batido na necrópole de S. Pedro de Estoril vem dar certa actualidade ao monumento do Barro, pois foi nele que se encontrou um dos mais belos exemplares destas jóias arcaicas, não muito raras entre nós. Tanto êste objecto, como o restante recheio do monumento, conserva-se ainda inédito, há 37 anos, numa vitrina do Museu de Belém (6).

Do concelho é, também, outro monumento do mesmo tipo e época, embora quási completamente destruído pelos cabouqueiros duma pedreira em exploração — o da Serra das Mutelas, escavado em 1912 pelo Doutor Vergílio Correia. A par de vários crânios e outros restos humanos, exumados, logrou êste arqueólogo recolher ainda 8 cilindros de calcáreo, 3 pontas ou lanças folháceas de cobre, uma alabarda de sílex, várias lâminas e raspadeiras da mesma matéria, e cerâmica tipicamente campaniforme (7).

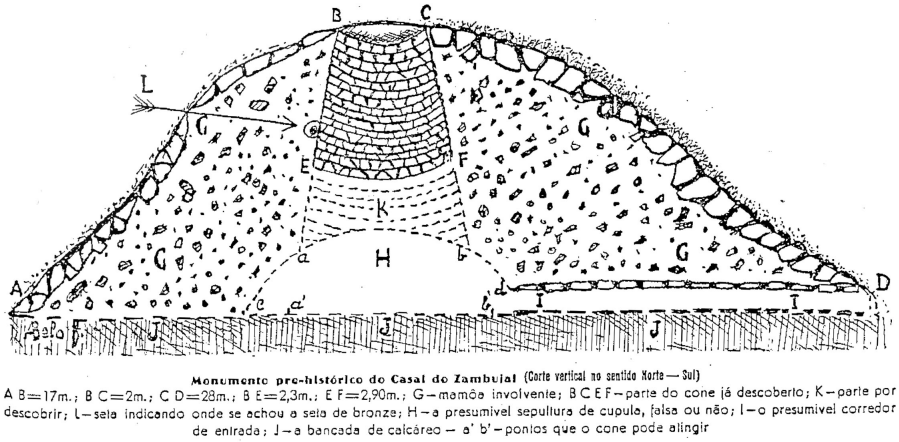
(6) F. Alves Pereira, *Processo official do monumento pre-histórico do Monte da Pena (Tôrres Vedras)*, in «O Archeologo Português», Vol. XIV, págs. 354, Lisboa, 1909.

(7) Vergílio Correia, *A exploração arqueológica da Serra das Mutelas* (Tôrres Vedras), in «O Archeologo Português», vol. XIX, págs. 264, Lisboa, 1914.

Fig. 5) Photo of *Brotéria* (1946) Magazine, the first publications about Castro do Zambujal and *Badaladas* (1954-55) small notice with the published drawing of a *Tholos*.

c) Drawing

The first drawing of Zambujal is an illustration published in 1954-55 by Aurelio Ricardo Belo in the local newspaper *Badaladas* where the site is represented as *tholos* (see Fig. 6). This image is not well known or mentioned, becoming relegated to the history of the excavation as a curiosity. Scientists do not cite it because it doesn't reflect a scientific truth, as in further excavations at Zambujal reveal it to have been a fortified settlement and not a *tholos*. By using a scientific visual language (line drawing of a section of the mound) it depicts an architectural structure like a tower, covered with earth. It is noticeable how the textual description of nine rows of stones is precisely represented in the schema. Compare this representation with the scientific excavation plan produced in 1964 (Fig. 14).



Monumento pre-histórico do Casal do Zambujal (Corte vertical no sentido Norte — Sul)
A B=17m.; B C=2m.; C D=28m.; B E=2,3m.; E F=2,90m.; G—mamôa involvente; B C E F—parte do cone já descoberto; K—parte por descobrir; L—seta indicando onde se achou a seta de bronze; H—a presumivel sepultura de cupula, falsa ou não; I—o presumivel corredor de entrada; J—a bancada de calcáreo — a' b'—pontos que o cone pode atingir

Fig. 6) Drawing published in *Badaladas* in 1954-55 showing an interpretation of Zambujal as a *tholos*. © Badaladas



Fig.7) Picturesque drawing of *Tholos de Barro*, made by Father Bovier Lapièrre. © MMLT

d) Photography

The discovery of Zambujal and its identification by Leonel Trindade as an archaeological site was accompanied since the very beginning by a photographic record. Many unpublished photographs are archived in folders in the Museu Municipal Leonel Trindade in Torres Vedras. Four photographs of this period are published in *Brotéria* magazine with aspects of the 1944 survey. The first photographs of Zambujal show the site before it was excavated. It was an earth mound with several archaeological artefacts appearing on the surface.



Fig. 8) Photo of Zambujal before excavation. © MMLT



Fig.9) Photo of the people related to Archaeology in Torres Vedras in the first half of the 20th century. From left to right, Bovier Lapièrre, Aurélio Ricardo Belo, Eugénio Jalhay, Leonel Trindade, Vera Leisner. Photomontage: © G.Casella

f) Museography

To address Museography during the first phase, we shall mention the creation of the archaeological museum of Torres Vedras. This museum presented collections from several archaeological sites from the county, one of which was Zambujal. Is not until 1987 that a special exhibition was dedicated solely to Zambujal. The creation of national museums was a difficult task for a small country like Portugal, so legislation

opened the way to the creation of new museums most of them regional[107]. A picture of Portugal in the 1930s is a poor country, without roads, basic access to water, and with many illiterate people. Some figures of the priest, the doctor, or the "good man" [*homens bons*] occupy the role of political figures to promote education and culture. (Pimentel, 2005: 128[108]). In a handwtitten document consulted in MMLT, we see how Leonel Trindade set the aims for the creation of the new museum:

"*Art.1. The Municipal Museum of Torres Vedras has the aim of contributing to the study of the origins and historical evolution of the Torres Vedras region, through the collecting, study and permanent exhibition of archaeological artefacts originating from this region." [109]*

The Municipal Museum Leonel Trindade opened on the 28th July 1929 in a small room of *Irmandade dos Clérigos Pobres*, near St. Peter's Church in the center of Torres Vedras village. It opened with a heterogeneous group of artefacts of artistic and historic importance to Torres Vedras, drawing on temporary loans from local parishes and individual people. The exhibition display had a cumulative approach using wood and glass museum cases specially designed for the museum, one of them preserved and still in use today (see Fig. 10). Catalogues present important records to document museography. There is a catalogue from the second museum (the building of the *Santa Casa da Misericórdia*). It is an undated booklet probably from the 70s or 80s as it is written with a typewriter.

In terms of content, it presents a bibliography of Torres Vedras Archaeology and History and a map of the first museum with a first floor with seven rooms dedicated to, respectively: Archaeology, the Peninsular Wars, the Sta Casa da Misericórdia, Portuguese Painting (XIV-XVII centuries), tiles, contemporary Painting, and the Municipality; on the ground floor it presents in the manner of renaissance museums, a garden with sculptures (epigraphy garden). The catalogue

[107] Between 1912 and 1914 Portugal had 13 regional Museum, and all of these museums belonged to the category of "Museums of Art and Archaeology" (Pimentel 2005). In 1934 there is the Colonial Exhibit in Palacio de Cristal in Porto and in 1940s the Exhibit of "Mundo Português" [Portuguese World] in Lisbon. (Pimentel, 2005: 116).

[108] Pimentel, C. (2005). *O sistema museológico Português (1833-1991): em direcção a um novo modelo teórico para o seu estudo*. Lisbon: Fundação Calouste Gulbenkian : Fundação para a Ciência e a Tecnologia : Ministério da Ciência e do Ensino Superior.

[109] Appendix A (A-1-5-Catalogue Exhibitions- Manuscript with guidelines for the creation of a new Museum in Torres Vedras).

describes each one of the sections and collections, mentioning Zambujal in the Archaeology room and closing with a History of the Museum[110].



Fig. 10) Leonel Trindade in the garden of Sculptures of the first museum and a view of the first museum with the wood and glass cases. © M. Kunst

In 1944 the Museum was transferred to the building of *Santa Casa da Misericórdia* where it had larger exhibition areas and a diversified collection, namely integrating the archaeological artefacts resulting from the local research made by Leonel Trindade. The museum structure and display modalities were typical of those times, with a cumulative display of collections (one museum that can still be seen in this style is the *Museu do Instituto Geológico e Mineiro* in Lisbon). The aim of the first museum was to house and preserve specimens from that region. Visitors to this type of museum are mostly other archaeologists who would need to compare specimens or artifacts to their own findings. Since 1992 the museum moved to the *Convento Nossa Senhora da Graça* in the city center, where it remains to our days. After a period of permanent exhibitions, the museum now houses temporary exhibitions attracting numerous visitors. The exhibitions now aim to provide more context for the artefacts through text, illustration and models.

[110] See Appendix A (A-1-4 Catalogue Publications)



Fig.11) Photo of a glass case (kunstkamer style) from the original archaeological museum housed at the actual museum. © G.Casella

3.3.2. Second Phase (1964-1994): The Professional Archaeologists

In 1961 Vera Leisner, a German archaeologist who was making a survey of the Megalithic tombs in Portugal and Spain, enables a contact between Leonel Trindade and Hermanfried Schubart, a young archaeologist from the German Archaeological Institute. After this contact, Leonel Trindade, who was then director of the Torres Vedras' Museum, invited Hermanfried Schubart[111] and Edward Sangmeister[112] to excavate in Zambujal, initiating what we have called the second phase of archaeological research in our case study.

Excavations took place between 1964 and 1973 and were followed by a pause for publication of the site's monograph in 1981. These series of excavation were funded by a private sponsor from Torres Vedras, D. Fernando de Almeida, by the *German Archaeological Institute* and by the *Institute of Pre and Protohistory of the University of Freiburg*. The scientific work produced in this phase constitutes a valuable example of the professional Archaeology of the 1960s. During this period of excavation, Zambujal served as a passage point for many national and future Portuguese archaeologists such as Vítor Oliveira Jorge, José Arnaud, Rui Parreira, João Ludgero, as well as renowned international archaeologists , such as Oswaldo Arteaga, Konrad Spindler, George Harrison, Hans-Peter and Margarethe Uerpmann and Michael Kunst.

The first motivation to excavate Zambujal was to understand the morphology and extension of the site, which soon after 1964 was identified not as a *tholos* but as a fortified settlement with four concentric lines of stone walls (see Fig. 14). Excavations were fully documented in field notebooks, field drawings and photographs - published after the excavations through regular scientific monographs. During this phase, besides the scientific publishing, popular magazine articles were also written to present to a broad audience the importance of the findings.

[111] Hermanfried Schubart was an archaeologist from the German Archaeological Institut.

[112] Edward Sangmeister was a German archaeologist from the University of Freiburg, who had experience in excavating sites similiar to Zambujal (*Vila Nova de S. Pedro, Azambuja*, in Portugal and *Los Millares*, in Spain), and could help better understand Zambujal.

In 1987, a conference[113] was organized and the first exhibition dedicated solely to Zambujal was made in the *Associação dos Comerciantes de Torres Vedras*. In 1991 the second exhibition about Zambujal was organized at the *National Archaeological Museum* in Lisbon for the commemorations of the twentieth anniversary of the *German Archaeological Institute* in Lisbon. The creation of the Lisbon branch of the *German Archaeological Institute* (G.A.I.) on 26th October of 1971 reflects a strengthening of a long-standing relation between German and Portuguese archaeologists. Theodor Hauschild, Director of G.A.I., highlights in a text for the 1991 exhibition catalogue that this long-term collaboration dates back to the times of King D. Fernando II (the *king-artist*) who had German ascendency and funded the first Portuguese Archaeology Association, the *Sociedade Archeologica Lusitana*. This institution served as a model for the foundation in 1864 of the *Real Associação de Arquitectos e Arqueólogos*. Hauschild also mentions German travel writing, citing for example Bellarmann who wrote in 1860 a text about roman antiquities in Portugal (Hauschild, 1991:8). Emil Hubner in 1870 published through the *Academia Real das Sciencias* a book entitled "*Noticias Archeologicas*", whose main object of study was the *Citânia de Briteiros* near Guimarães, subsequently excavated by Martins Sarmento and Eugenio Jalhay.

The Lisbon's branch of the *German Archaeological Institute* opened in order to provide support to German scientists studying in Portugal - Hermanfried Schubart with studies of Zambujal and Atalaia; Theodor Hauschild with investigations in Milreu and Évora, Helmut Schlunk with the study of São Gião, Philine Kalb and Martin Hock in Baiões. Philine Kalb was also responsible for preparing material of Vera Leisner for publication. During the 20 years of existence of the G.A.I. (1971-1991) a very important library was created, based on the acquisition of several private libraries and contributions from excavation projects. Today, this library is housed in the *Palácio da Ajuda* in Lisbon, and includes the Leisner's Archive with around 49.500 documents (19.000 written and 30.500 graphic and photographic). This archive was donated by Vera Leisner to the *German Archaeological Institute* with a special requirement that it should stay in Portugal as a form of gratitude to the country that received her so well and her husband when they had to flee Germany at the outbreak of the World War II.

[113] *Primeiras Jornadas Arqueológicas de Torres Vedras,* 3-5 april, 1987.

a) Oral History / Documents

Two unpublished texts describe the circumstances under which the German Archaeologists came to work in Zambujal. In 2012, Michael Kunst asked Sangmeister and Schubart to write a personal *memoire* about how they started working in this excavation. The results are two interviews, profusely illustrated with photographs from that era, that tell us the story of this collaboration: the text of Hermanfried Schubart is *"The relations between Portuguese and German pre-historians since 1954, the year of the reopening of the German Archaeological Institute of Madrid, until 1971, the year of the founding of the German Archaeological Institute of Lisbon"* , and Edward Sangmeister's is "*My Way to Zambujal"* [114].

Hermanfried Schubart's text highlights the contribution of Vera Leisner to this collaboration: Georg and Vera Leisner were two German archaeologists who undertook studies of Megalithism in Portugal and Spain. They married in 1909 and after Georg obtained his PhD in 1928 they decided to create a Megalithic *Corpus* of the Iberian Peninsula. They went to Southern Spain systematically recording all the Megaliths, and published the first volume *The South,* in 1943. As the Second World War began, they came to live in Portugal, and in 1954 the Archaeological German Institute funded the publication of the second volume of their *Corpus Megalitichus – The West*. After Georg Leisner's death in 1959, Vera Leisner continued the work alone. In the summer of 1964 and 1965, Hermanfried Schubart accompanied Vera on visits to several archaeological sites in the Beira Alta, Portugal. Vera Leisner, or *Dona Vera* as the Portuguese affectionately called her, was operating almost as a *"reception and distribution center"* (Schubart, 2012) for German colleagues who came to work in Portugal, integrating them in the research of the country. It was Vera who introduced Schubart to Leonel Trindade:

> *"On another trip, on August 16, 1961, accompanied by Vera Leisner, in her*
> *75* *years, and by Leonel Trindade, then director of the Archaeological Museum of Torres Vedras, I was able to see for the first time the Chalcolithic settlement of Zambujal, a visit that originated a research program of the German Archaeological Institute still in progress. (...) Leonel Trindade, who had*

[114] See Appendix A (A-1– 1-media description- oral history).

discovered and collaborated in the excavation of the Zambujal, reacted to the interest shown by the visitors with a generous proposal, to follow up the excavation, which the author would accept promptly, marking the beginning of a later time". (Schubart, 2012) [115]

Following the contact with another German Archaeologist, Edward Sangmeister a protocol was established between several funding entities to begin the campaigns in Zambujal.

b) Photography

Photography made during the second phase of the excavations in Zambujal (1964-94) increased both in quandtity and in quality relatively to the first phase (1946-64). The *German Archaeological Institute* team was very professionalized and had photographers specifically documenting the excavation. On this subject a substantial travelling exhibition was organized by the G.A.I. in 2006, entitled "*Blick, Mira, Olha!* and was presented in Portugal in 2012*"*[116] addressing not only the scientific photography, but also the photographers and their tools. From Zambujal there are several types of photographs: excavation photographs showing archaeological structures, panoramic views including aerial views of the site, aspects of people engaged in excavation and social activities, and photographs of the artefacts[117].

[115] Schubart, 2012, unpublished interview, presented by M. Kunst in 2013.

[116] *Blick Mira Olha! Instantes arqueológicos : arqueólogos e arqueologia em Cascais entre 1940 e 1960*, Centro Cultural de Cascais – 12 Nov-31 Dec. 2012.

[117] See appendix A – photography catalogue with more examples.



Fig. 12) Photographic material and professional photographers from de GAI, from the exhibition "*Blick Mira Ollha!"* (Centro Cultural de Cascais, 2012) © G.A.I.



Fig. 13) Aerial Photography of the central area of Zambujal. © G.A.I.

c) Drawing

Along with the professional nature of the photographic record of Zambujal during the second phase of the campaigns, drawing also assumed great importance in the scientific study and communication of the site. Drawings of this phase include original field drawings housed in the Madrid G.A.I. archive, published drawings in scientific reports, published drawings in general magazines, and two paintings with artistic impressions of the reconstruction of the site[118]. In terms of representation, images of this period include maps, archaeological structures, artefacts and reconstruction of habitats and human activity.

In terms of *media*, field drawings were made with graphite and colour pencil n o paper which were then are prepared for publication using pen and ink on tracing paper, usually in one colour (black) using line and hatches / stippling textures. Typographic techniques used lithographic or etching for image reproduction and a copper etching plate was found in MMLT with scientific illustrations. Colour was used sparsely (blue or red) in scientific publications, whereas in popular science magazines, colour photographs, maps and drawings use more colour. Also the exhibition paintings use richer colour and texture treatment.

Drawings of this phase were produced mainly as a way of recording scientific observations, and to a lesser extent, images to communicate the interpretation of the archaeological site (reconstructions). These images follow the conventions of archaeological scientific publishing using clear line drawing, pen and ink etching or stippling techniques. Reconstructions for scientific publication have fewer colours and have a very technical appearance, while images for public communication use expression, colours and texture.

[118] See Appendix A (A-1-3-Catalogue Drawings).

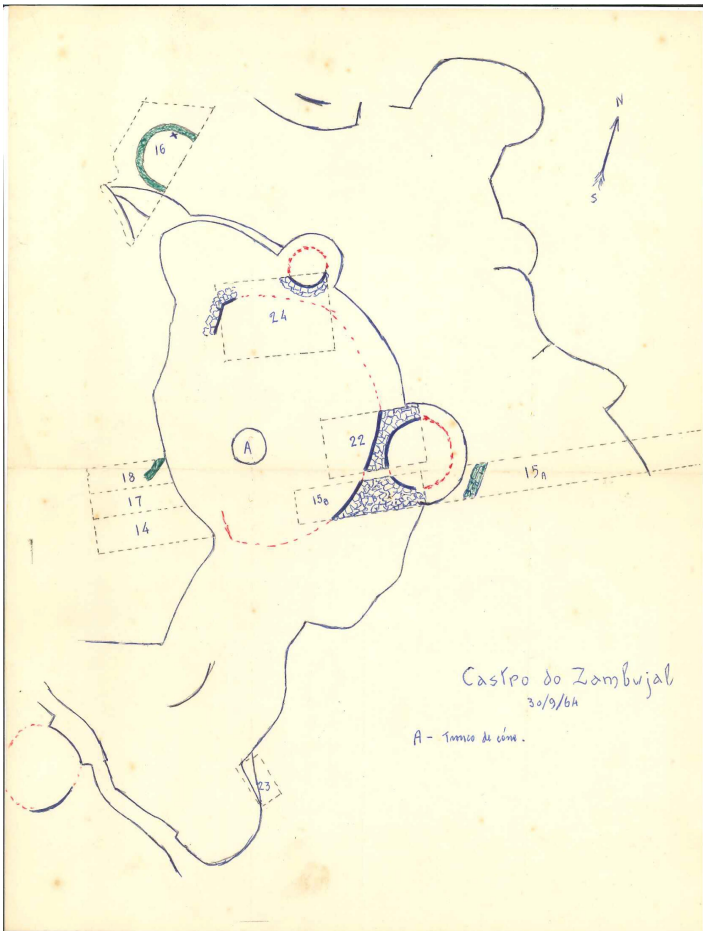
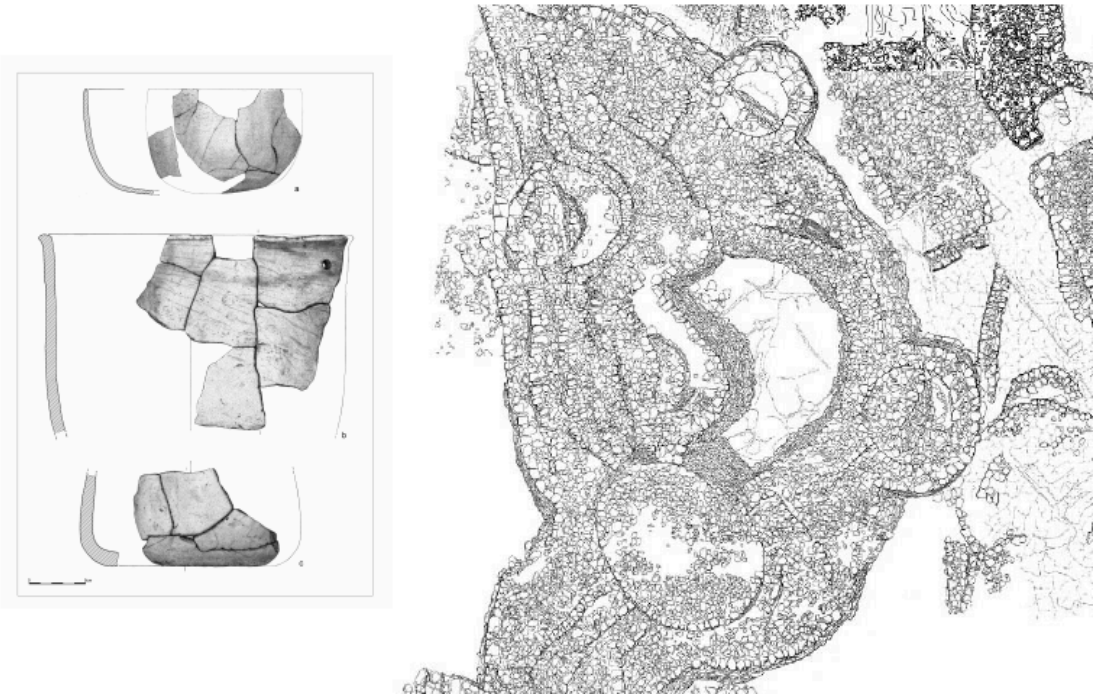


Fig. 14) Map from the 1964 excavation. © MMLT


Fig. 15) Example of finds illustration and field drawing (excavation plan) © G.A.I.

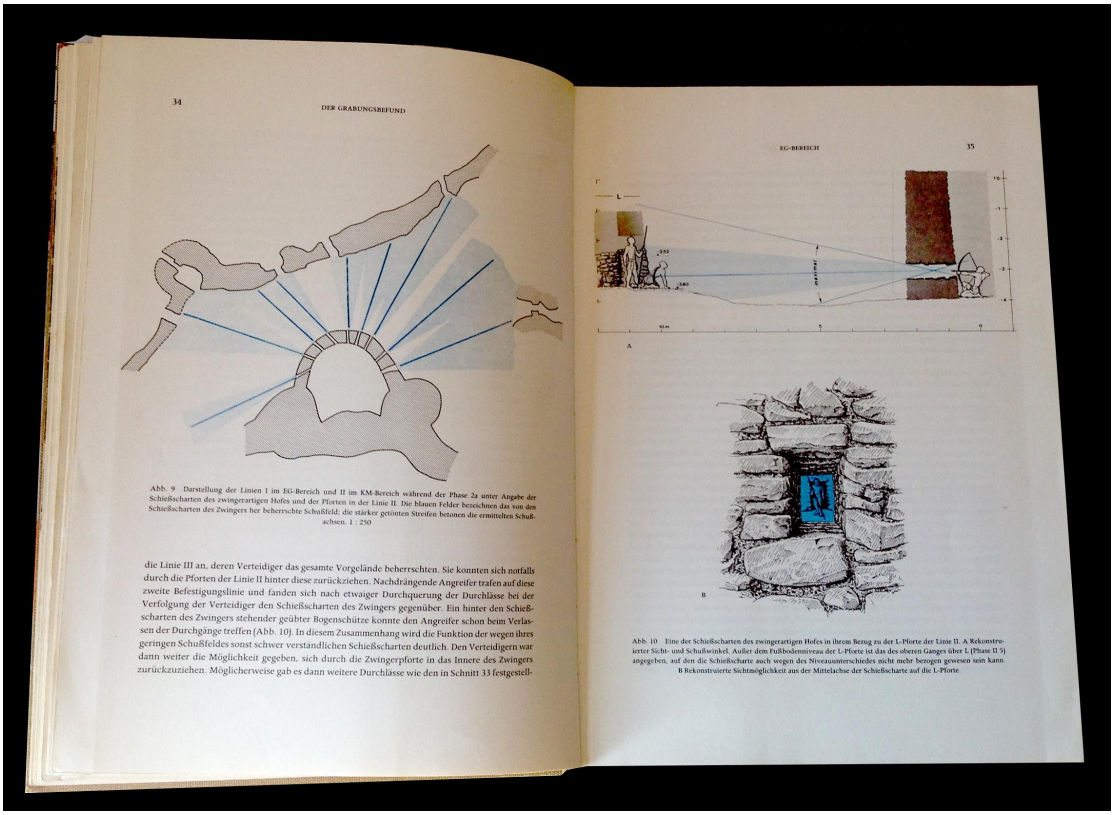


Fig.16) Example of infographic drawing showing the interpretation and the use of space in a scientific publication © G.A.I.

d) Publications

Between 1964 and 1973, after each excavation, all the research-funded work was meticulously reported in scientific publications written in German and sometimes translated to Portuguese (*O Arqueólogo Português*[119]). In these reports the form of writing was academic and well supported with several kinds of images: maps, plans, artefacts drawings and photographs. Towards the end of the decade of 1960s, and beginning of 1970s, Sangmeister and Schubart made the findings available to a wider audience, writing articles in popular science magazines.

[119] *O Arqueólogo Português* is one of the oldest and more consistent magazines for archaeological publishing in Portugal. It was founded by José Leite de Vasconcelos then director of the *National Museum of Archaeology and Ethnography* in Belem, Lisbon in 1895, and has been published regularly since then.

Scientific Publications

To name the most important scientific publications of this period[120], we must refer to the series published in German language in the *Madrider Mitteilungen*, of the *German Archaeological Institute,* Madrid. In 1971 *O Arqueólogo Português* publishes a Portuguese version of the reports with the collaboration of Leonel Trindade[121] who maintained his connection with the site and with the German archaeologists. The article (Sangmeister, E., Schubart, H., & Trindade, L. 1971) starts by presenting the aim of communicating the findings of the excavations in Zambujal led by the *German Archaeological Institute.* It gives an account of more than 7000 artefacts collected, most of which are drawn and described during the excavation and archived in a complete folder of the excavations from 1964-1970 at the *German Archaeological Institute* in Madrid. It continues by describing the excavation work in several areas of the site , illustrated with a very accurate map where all the stones are drawn by hand, and all the walls are identified with letters. The writing is scientific, proceeding with the textual description of artefacts of several materials and is accompanied by scientific illustrations (ceramic, stone axes, flint, copper drops around a bonfire, copper knives). The typologies of the artefacts allow the attribution of a chronology to the site. The article closes stating that the central architecture of Zambujal was clarified and illustrated by a technical reconstruction of the structure.

The article is well illustrated with a general plan with the indication of sections and names of each wall, a scheme to show the interpretation of the barbican, illustrated artefacts, and photographs of the site: general views or closer views in especial of the central barbican, an aerial photograph and views of architectural structures. Below we present small captions of the images that can be consulted in appendices in greater size and detail.

[120] See Appendix A (A-1-4-Catalogue Publications).

[121] Sangmeister, E., Schubart, H., & Trindade, L. (1971). Escavações na Fortificação da Idade do Cobre do Zambujal / Portugal 1970. *O Arqueólogo Português Série III*, *5*, 51–96.

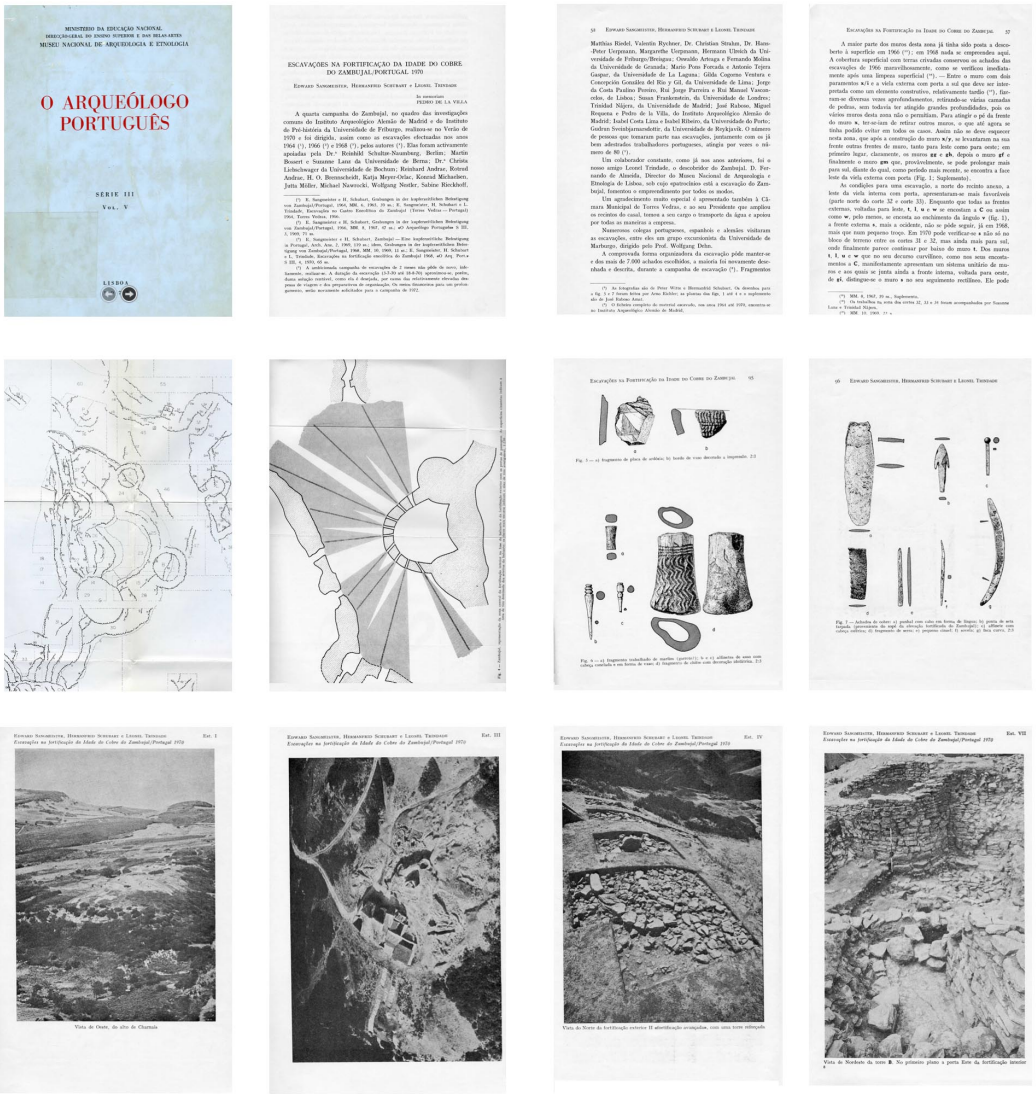


Fig. 17) Selection of pages of a scientific publication showing text, drawing (both a technical general plan and a reconstruction of the use of the Barbican and finds). Photographs are in black and white and show aerial views of the excavation, and aspects of the excavated section. © Sangmeister, Schubart and Trindade 1971

Overall, this article follows the structure of archaeological publishing, using very rich and complete visual documentation with scientific illustrations and photographs.

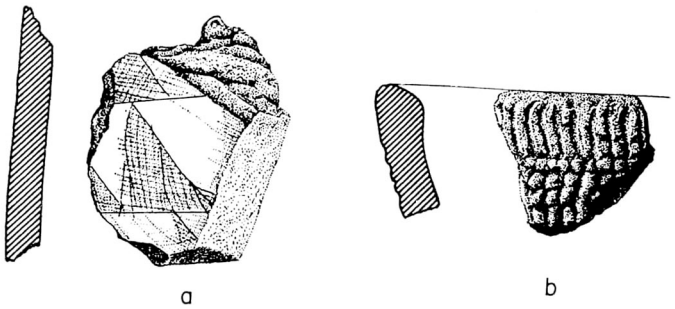


Fig. 5 — a) fragmento de placa de ardósia; b) bordo de vaso decorado a impressão. 2:3

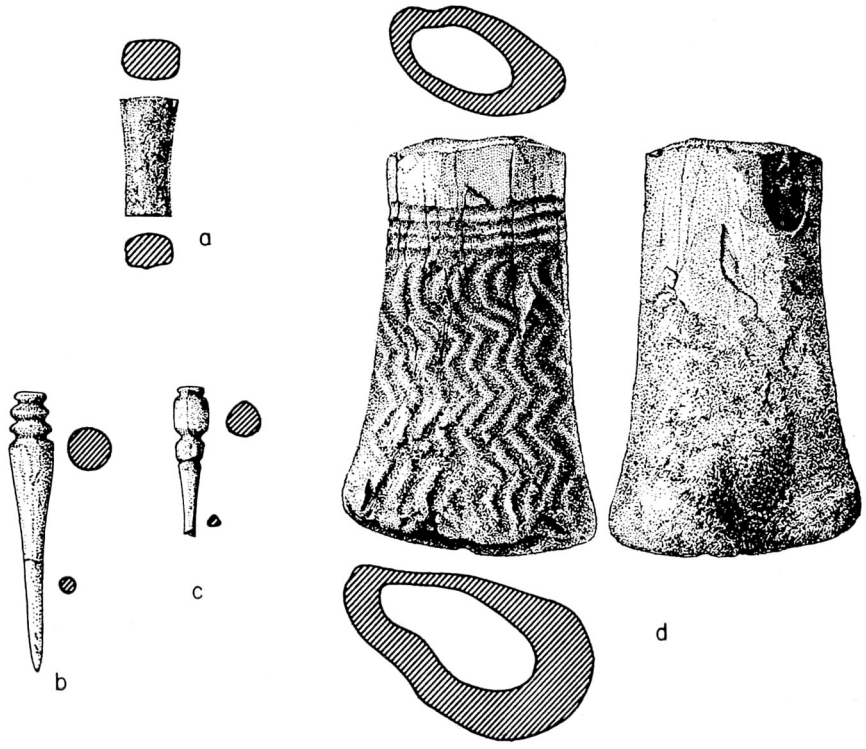


Fig. 6 — a) fragmento trabalhado de marfim (garrote?); b e c) alfinetes de osso com cabeça canelada e em forma de vaso; d) fragmento de chifre com decoração idolátrica. 2:3

Fig 18) Example of scientific illustration of archaeological finds using stippling. Sangmeister, Edward; Schubart, Hermanfrid; Trindade, Leonel (1971), *Escavações na Fortificação da Idade do Cobre do Zambujal/Portugal 1970", O Arqueólogo Português* , Série III, vol. 5, Lisbon, Portugal. © Sangmeister, Schubart and Trindade 1971

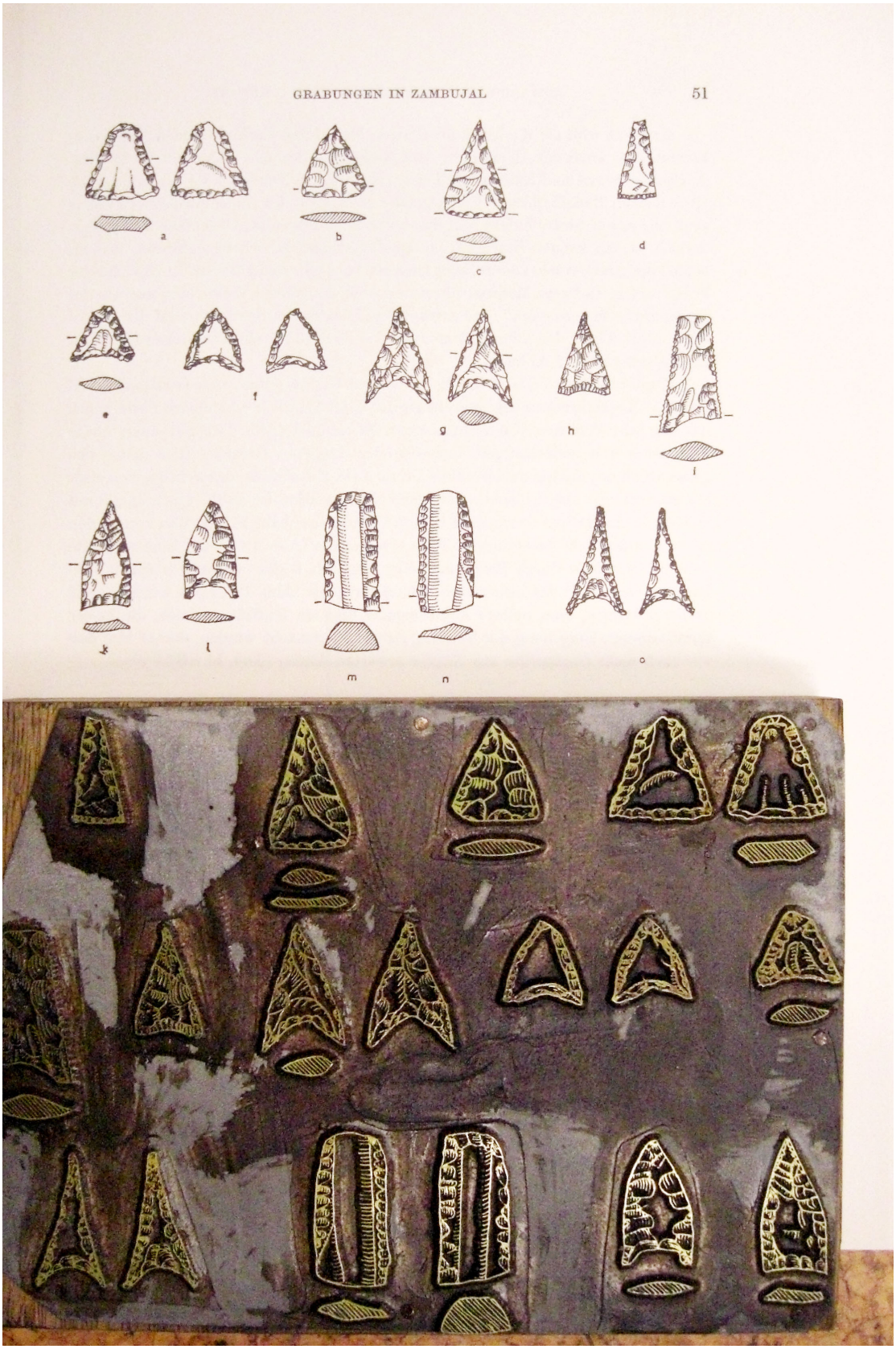


Fig. 19) Example of how illustrations were reproduced using copper plates. The printing technique influences the expression of the drawing ©MMLT

Popular Publications

Besides the scientific publications there was also a concern to make the findings about this archaeological site available to a broader audience. In this period we identified at least two popular publications in general magazines written by Sangmeister and Schubart themselves (Sangmeister and Schubart 1977, Schubart and Sangmeister 1984). In this type of *media* we can see a clear change in the voice, story and graphic images. The popular article focuses mostly on trying to explain what the site was, while scientific publication reports specifically archaeological fieldwork. Differences lie in the narrative itself, text length, and use of more appealing and instructional images.

Regarding the content, the emphasis of communication relies on the contextualization and value of the site, creating a narrative that will be reused in further texts and catalogues, rather than reporting archaeological fieldwork *per se*. In this popular article, the authors address for the first time what we identify as the *Grand Narratives* about the site. According to archaeological research the people that inhabited Zambujal must have originated from the Middle East, such as sailors from the *Aegean* Sea that might have come to construct fortresses as military bases to explore, extract and transform Copper (eventually instructing local people to search for the metal). Copper in the Middle East had disappeared from the surface while underground mining was not yet in use, so a hypothesis is that Middle East people turned to Europe in search of this much sought-after material. Another clue to support this idea was that Zambujal's construction type is very similar to Middle Eastern architecture from previous periods. The presence of copper artefacts indicates that metal transformation must have been the main economic function of the place. Copper mines do not exist nearby, so this metal must have been brought in blocks and transformed here. Exotic objects such as ivory and bone objects very similar to others from the Egyptian and *Aegean* Sea indicate the existence of long distance trade with the Middle East. Daily life must have been based on agriculture and herding, copper melting, and handicraft production such as pottery and textile weaving. All these findings demonstrate a complex society.

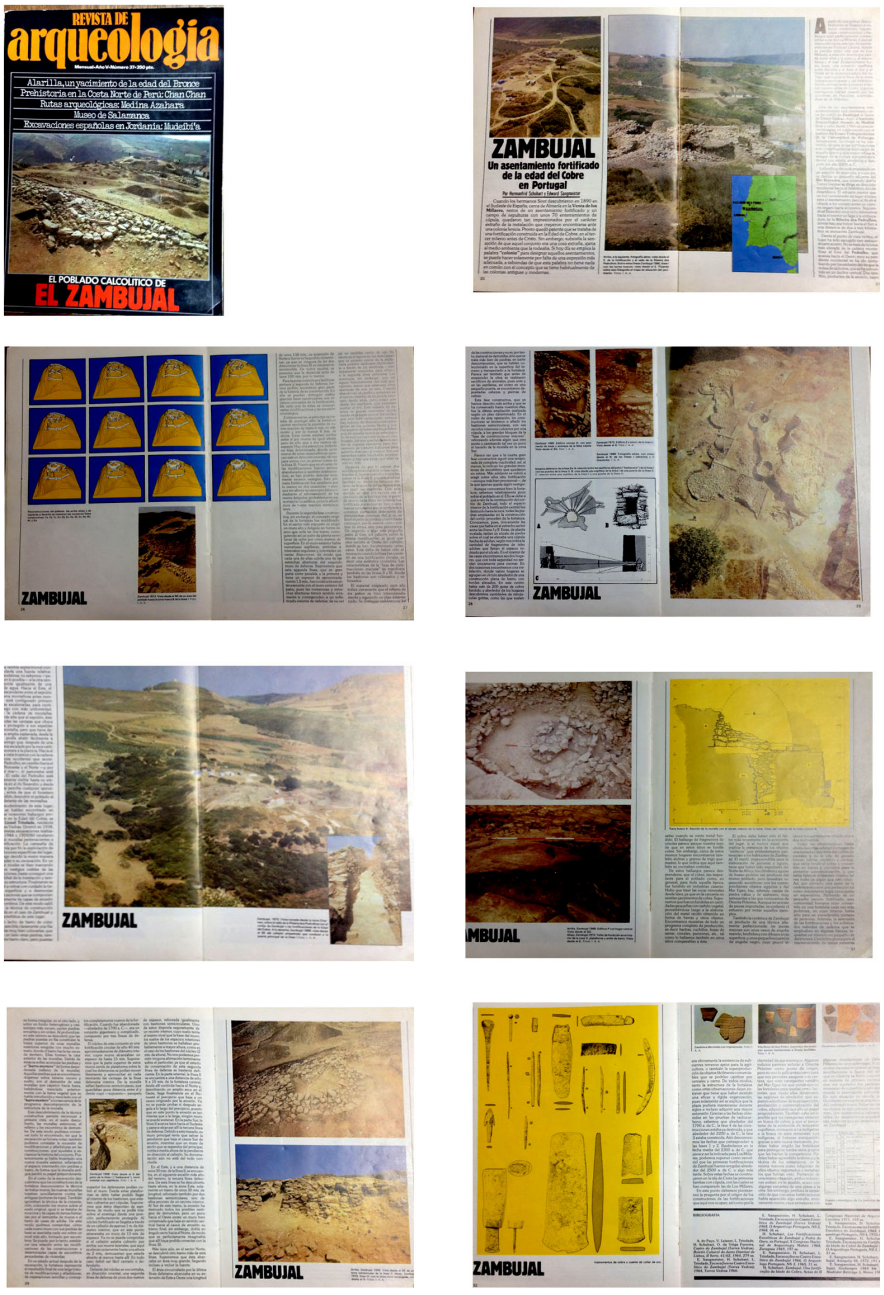


Fig. 20) Spreads of the article published in a popular science magazine. © Schubart & Sangmeister 1984.

In terms of content, the article starts by narrating the discovery by the Siret brothers of a site contemporary with Zambujal - *Los Millares* - in Spain (c.2500 BC) , and the "colony paradigm" of interpretation of recent prehistory:

> *"When the Siret brothers found in 1890 in southwest Spain, near Almeria, in Venta de Los Millares, remains of fortified settlement and a field with graves with circa 70 burials in cupule mound, they thought they were dealing with a*

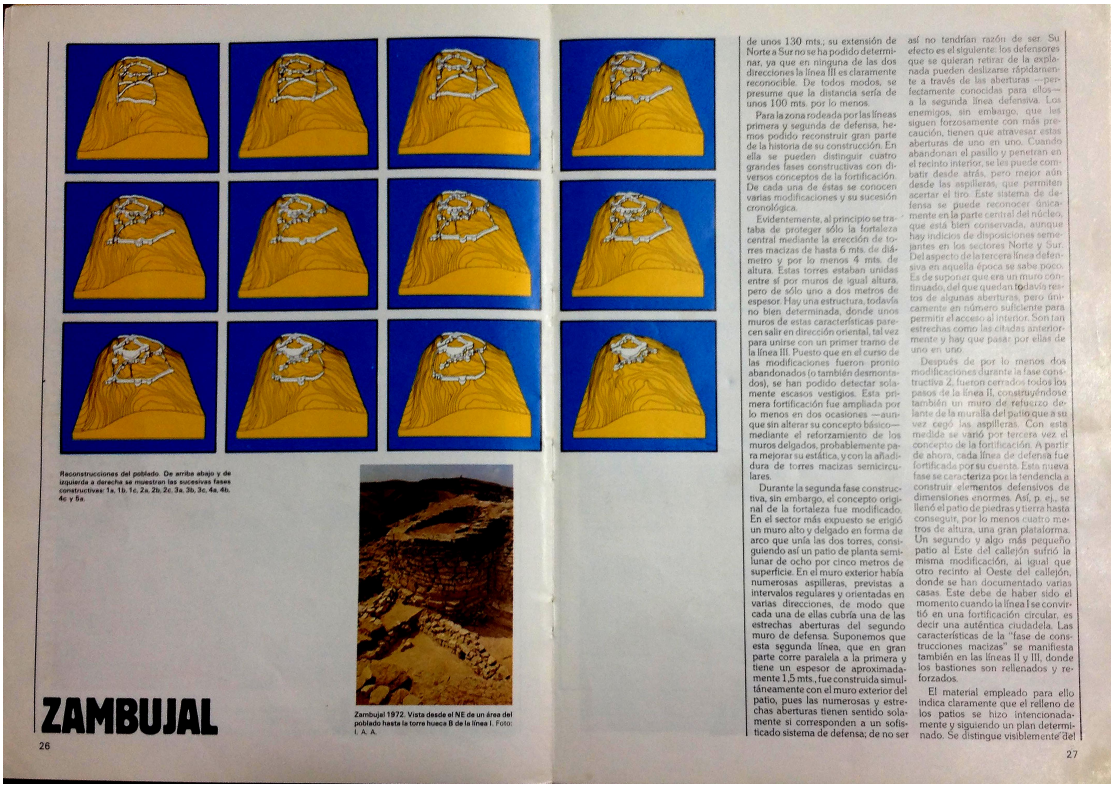
Fenitian colony" (Schubart & Sangmeister, 1984: 20).

Then the authors highlight the importance and uniqueness of Zambujal situating it in time and space. Its geomorphological and strategical situation in a clif over the Valley of the Sizandro river, made it a perfect place for maritime traders to land safely.

A large aerial view colour photograph and a small picture of an entrance door to the settlement are examples of the *Spatial Narratives* in Archaeology. The text moves on to the story of the discovery of the site by Leonel Trindade and the first surveys in 1944 and 1959/60 in what can be considered a *Discovery Narrative.*

It proceeds mentioning the 1964 campaign's aim to understand the specificities of the place in order to choose a strategy of excavation. The archaeologists discovered that the constructors of Zambujal did not know how to fix walls so they would be simply constructed on the plain ground, which led them to fall and be reconstructed in several phases. They perceived a story of a succession of construction phases and morphology (*Interpretation Narrative* of the site): Zambujal comprised four concentric lines of walls with a central barbican with hollow windows pointing to a second line of fortification. The article is illustrated with a series of reconstructions representing the sequence of the defence strategies of the hill fort.

The narrative then focuses on the houses of the settlement, stating that most stones from the central line of Zambujal were reused to construct the 20th century farmhouse that exists in the place. Between line I and II of the fortress a few houses were preserved to modern times. Some of them present evidence of copper melting, with more than 200 copper droplets found in excavation.



Reconstrucciones del poblado. De arriba abajo y de izquierda a derecha se muestran las sucesivas fases constructivas: 1a, 1b, 1c, 2a, 2b, 2c, 3a, 3b, 3c, 4a, 4b, 4c y 5a.

Zambujal 1972. Vista desde el NE de un área del poblado hasta la torre hueca B de la línea I. Foto: I. A. A.

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de unos 130 mts.; su extensión de Norte a Sur no se ha podido determinar, ya que en ninguna de las dos direcciones la línea III es claramente reconocible. De todos modos, se presume que la distancia sería de unos 100 mts. por lo menos.

Para la zona rodeada por las líneas primera y segunda de defensa, hemos podido reconstruir gran parte de la historia de su construcción. En ella se pueden distinguir cuatro grandes fases constructivas con diversos conceptos de la fortificación. De cada una de éstas se conocen varias modificaciones y su sucesión cronológica.

Evidentemente, al principio se trataba de proteger sólo la fortaleza central mediante la erección de torres macizas de hasta 6 mts. de diámetro y por lo menos 4 mts. de altura. Estas torres estaban unidas entre sí por muros de igual altura, pero de sólo uno a dos metros de espesor. Hay una estructura, todavía no bien determinada, donde unos muros de estas características parecen salir en dirección oriental, tal vez para unirse con un primer tramo de la línea III. Puesto que en el curso de las modificaciones fueron pronto abandonados (o también desmontados), se han podido detectar solamente escasos vestigios. Esta primera fortificación fue ampliada por lo menos en dos ocasiones —aunque sin alterar su concepto básico— mediante el reforzamiento de los muros delgados, probablemente para mejorar su estática, y con la añadidura de torres macizas semicirculares.

Durante la segunda fase constructiva, sin embargo, el concepto original de la fortaleza fue modificado. En el sector más expuesto se erigió un muro alto y delgado en forma de arco que unía las dos torres, consiguiendo así un patio de planta semilunar de ocho por cinco metros de superficie. En el muro exterior había numerosas aspilleras, previstas a intervalos regulares y orientadas en varias direcciones, de modo que cada una de ellas cubría una de las estrechas aberturas del segundo muro de defensa. Suponemos que esta segunda línea, que en gran parte corre paralela a la primera y tiene un espesor de aproximadamente 1,5 mts., fue construida simultáneamente con el muro exterior del patio, pues las numerosas y estrechas aberturas tienen sentido solamente si corresponden a un sofisticado sistema de defensa; de no ser así no tendrían razón de ser. Su efecto es el siguiente: los defensores que se quieran retirar de la explanada pueden deslizarse rápidamente a través de las aberturas —perfectamente conocidas para ellos— a la segunda línea defensiva. Los enemigos, sin embargo, que les siguen forzosamente con más precaución, tienen que atravesar estas aberturas de uno en uno. Cuando abandonan el pasillo y penetran en el recinto interior, se les puede combatir desde atrás, pero mejor aún desde las aspilleras, que permiten acertar el tiro. Este sistema de defensa se puede reconocer únicamente en la parte central del núcleo, que está bien conservada, aunque hay indicios de disposiciones semejantes en los sectores Norte y Sur. Del aspecto de la tercera línea defensiva en aquella época se sabe poco. Es de suponer que era un muro continuado, del que quedan algunos restos de algunas aberturas, pero únicamente en número suficiente para permitir el acceso al interior. Son tan estrechas como las citadas anteriormente y hay que pasar por ellas de uno en uno.

Después de por lo menos dos modificaciones durante la fase constructiva 2, fueron cerrados todos los pasos de la línea II, construyéndose también un muro de refuerzo delante de la muralla del gollo que a su vez cegó las aspilleras. Con esta medida se varió por tercera vez el concepto de la fortificación. A partir de ahora, cada línea de defensa fue fortificada por su cuenta. Esta nueva fase se caracteriza por la tendencia a construir elementos defensivos de dimensiones enormes. Así, p. ej., se llenó el patio de piedras y tierra hasta conseguir, por lo menos cuatro metros de altura, una gran plataforma. Un segundo y algo más pequeño patio al Este del callejón sufrió la misma modificación, al igual que otro recinto al Oeste del callejón, donde se han documentado varias casas. Este debe de haber sido el momento cuando la línea I se convirtió en una fortificación circular, es decir una auténtica ciudadela. Las características de la "fase de construcciones macizas" se manifiesta también en las líneas II y III, donde los bastiones son rellenados y reforzados.

El material empleado para ello indica claramente que el relleno de los patios se hizo intencionadamente y siguiendo un plan determinado. Se distingue visiblemente del

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Fig. 21) Sequence of construction phases. © Schubart & Sangmeister 1984.



de las construcciones y no es, por tanto, material de derrumbe, sino que se trata más bien de piedras, en parte descompuestas, que se habían coleccionado en la superficie del terreno y transportado a la fortaleza. Parece ser también que antes de emprender la obra se realizaron sacrificios de animales, pues ante y en las aspilleras, así como en una pequeña puerta, se encontraron depositadas cabezas y piernas de cabras.

Esta fase constructiva, que ya hemos descrito más arriba y que se ha conservado hasta nuestros días, fue la última ampliación realizada según un plan determinado. En el curso de esta operación, los constructores se limitaron a añadir los bastiones semicirculares, con sus recintos interiores cubiertos por una cúpula, a los grandes bloques de la "fase de construcciones macizas", reforzando además algún que otro punto y cambiando tal vez un poco el trazado de la muralla en la zona Sur.

Parece ser que a la cuarta gran fase constructiva siguió una temporada de completa inactividad; así, al menos, lo indican los grandes montones de escombros que quedaron sin retirar. Más adelante se volvió a eregir sobre ellos otra fortificación —aunque más bien provisional—, de la que apenas queda algún vestigio.

Aunque conocemos bien la fortaleza, sabemos relativamente poco sobre el poblado en sí. Ello se debe a que a raíz de la construcción del cortijo de Zambujal, todo el espacio interior de la fortificación central fue destruido hasta la roca: todas las piedras empleadas en la construcción del cortijo proceden de la fortaleza. Conocemos, pues, únicamente las casas que había en el estrecho sector entre las líneas I y II. Estas, de planta ovalada, tenían un zócalo de piedra sobre el cual se elevaba una cúpula hecha de adobes, según nos indica la cantidad de fragmentos de tales adobes que llenan el espacio rodeado por el zócalo. En el interior de las casas encontramos sendos hogares, que con toda seguridad no servían únicamente para cocinar. En dos ocasiones encontramos una instalación, donde varios hogares se agrupan en círculo alrededor de una construcción plana de barro, con bordes elevados. En este centro había más de 200 gotas de cobre fundido, y alrededor de los hogares descubrimos cantidades de minúsculas gotitas, como las que suelen

Zambujal 1968. Edificio circular D, con pavimento de losas y arranque de la falsa cúpula. Vista desde el SO. Foto: I. A. A.

Zambujal 1973. Edificio Z y torre L de la línea II. Vista desde el O. Foto: I. A. A.

Zambujal 1968. Fotografía aérea, con vistas desde el N. de las líneas I (derecha) y II (izquierda). I. A. A.

Sistema defensivo de la fase 2a. A: relación entre las aspilleras del patio ("barbacana") de la línea I con las puertas de la línea II. B: vista desde una aspillera de la línea I de una puerta de la línea II. C: relación entre una aspillera de la línea I y una puerta de la línea II.

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Fig.22) Page spread with reconstruction drawing. © Schubart & Sangmeister 1984.

e) Exhibitions

Two exhibitions were made during the second phase. The first was held in 1987 at the *Comercial Association of Torres Vedras* in the context of an international conference about prehistoric archaeology in the Iberian Peninsula (*Primeiras Jornadas Arqueológicas de Torres Vedras).* The second exhibition was held in 1991 at the *National Museum of Archaeology* to commemorate the 20 years of the Portuguese branch of the *German Archaeological Institute* in Lisbon. Both exhibitions have catalogues[122] which are very helpful to reconstruct and study the museum display and the storylines. For both events 3D models were created (a reconstruction of the barbican and of a house floor in life-size in the first exhibition; a life-size model of a door and a model of Zambujal in 1/500 scale in the second exhibition). In both cases reconstruction paintings were commissioned from artists, the first showing a reconstruction of the environment and the second showing a reconstruction of a figure of an archer attacking with bow and arrow in Zambujal.

1st EXHIBITION

"Zambujal", Associação dos Comerciantes, Torres Vedras, December 1987.

The first exhibition about Zambujal was held in the *Comercial Association of Torres Vedras* where an Archaeology conference was taking place[123]. The target audience was archaeologists and students who participated in the conference.

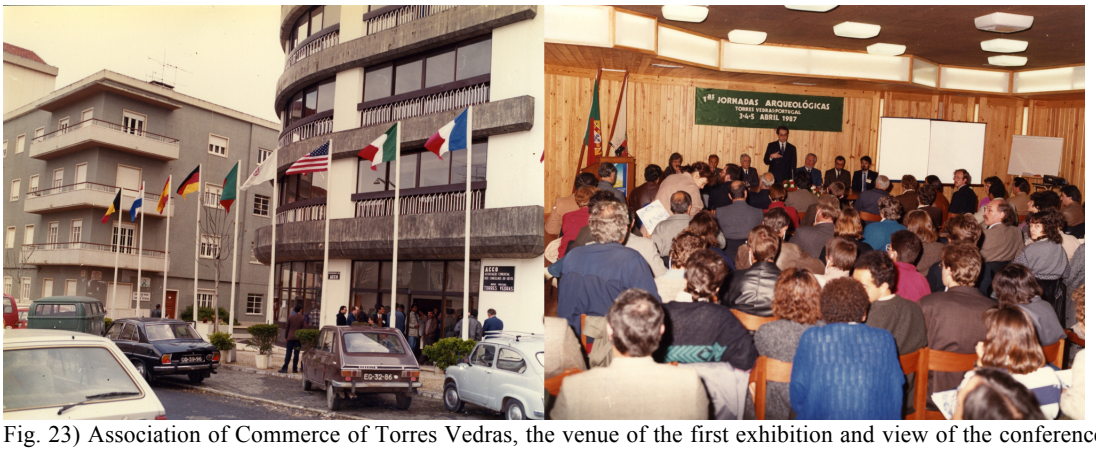


Fig. 23) Association of Commerce of Torres Vedras, the venue of the first exhibition and view of the conference. © M. Kunst

[122] See Appendix A (A-1-5 Catalogue Exhibitions),

[123] Primeiras Jornadas Arqueológicas de Torres Vedras.

By analysing the photographs and the catalogue of the exhibition we could identify a series of storylines that we will see as being common to subsequent exhibitions: the geographic location of Zambujal indicated by maps; a history of the discovery and the identification of the main archaeologists responsible; chronology of Zambujal and characterization of the Copper Age; chronology of the site in its five distinct phases of occupation; morphology of the site through the general plan of the structures found in the excavation; narratives about the use and function of the site, identified as a fortified settlement, illustrated by an artistic painting with the reconstruction of the natural habitat with fauna and flora of Zambujal in prehistoric times (see Fig. 25).

The exhibition walls were painted with strong colours, and the information panels were handmade with photographs and typewritten text. Two models were identified (House "VX" and the Barbican wall, see Fig. 26)



Fig. 24) General view of the exhibition with strong colours. © M. Kunst



Fig. 25) Life size model of the barbican structure and house in Zambujal created by Leonel Trindade Junior © M. Kunst



Fig. 26) Artist impression: habitat, landscape and fauna of Zambujal © MMLT

2nd EXIBITION

"20 years of Presence of the German Archaeological Institute in Portugal"
Museu Nacional de Arqueologia, Lisbon, December 1991
Museu Municipal Leonel Trindade, Torres Vedras, 7-15 March 1992
Museu de Peniche, Peniche, 9 Oct.- 6 Nov. 1992

The second exhibition was held in the *National Museum of Archaeology* in Belem, a Gothic and Renaissance building. In the entrance of the exhibition, Leonel Trindade Junior built a life-size model of the walls of Zambujal, creating an environment into which the visitor would be immersed. The visitor had to pass through a door to enter the exhibition, just as if entering Zambujal itself. A 3D model in 1/500 scale representing Zambujal was also built by Leonel Trindade Junior, showing the hypothetical reconstruction of Zambujal in its second phase of fortification (c. 2650 BC – 2600 BC). This model is still used today to explain Zambujal to museum visitors.

The information panels in this exhibition had text printed in Screenprinting in *Aresta* Design Studio and images illustrating the text. A painting was commissioned from Pedro Sobreiro, an artist from Torres Vedras, to give life and colour to a scientific illustration depicting the archers of Zambujal shooting arrows in the first

defensive lines. This painting was made over a scientific drawing, published by Sangmeister and Schubart in 1971 (see Fig. 67). In terms of content, the exhibition followed the same storylines of the previous: narratives of place, of time, of use of space, and of discovery of the site.

The exhibition was subsequently held in two other places, Museu Municipal Leonel Trindade, Torres Vedras, 7-15 March 1992 and Museu de Peniche, 9 Oct.- 6 Nov. 1992.



Fig. 27) The entrance on the 1991 exhibition in National Museum of Archaeology was made through a life size model of Door J created by Leonel Trindade Junior © M. Kunst



Fig. 28) View of the exhibition in National Museum of Archaeology © M. Kunst



Fig. 29) Model of Zambujal in Phase 1 of construction created by Leonel Trindade Junior © MMLT

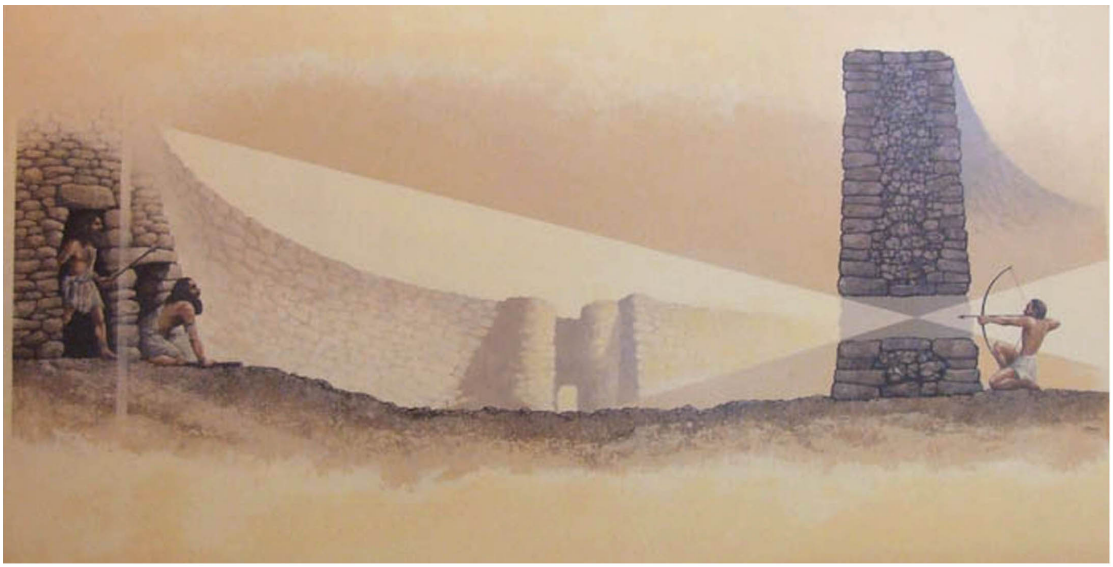


Fig. 30) Painting by Pedro Sobreiro © MMLT

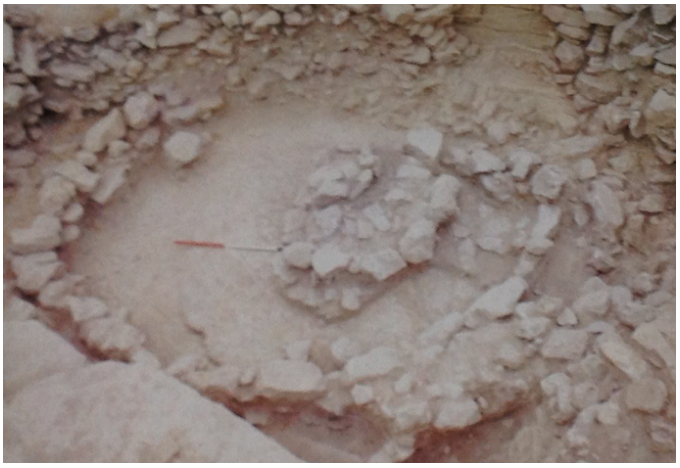


Fig. 31) Example of a photo of the house base found in the excavation. © M. Kunst

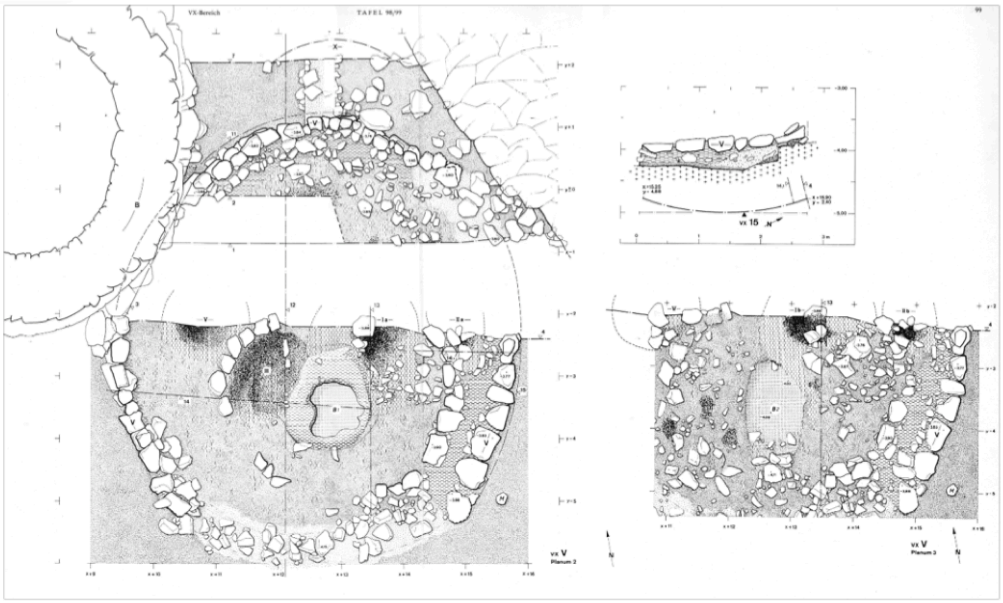


Fig. 32) Example of a drawing of a house in a scientific publication (Sangmeister and Schubart 1981). © Sangmeister and Schubart



Fig. 33) Life size model of a house floor made for the first exhibition about Zambujal in 1987 created by Leonel Trindade Junior © M. Kunst

3.3.3. Third Phase (1994-2018): The Technologists

Excavations in the third phase, took place in 1994, 1995, 2001, 2002, 2003, 2004, 2007 and 2012. Results were published in several scientific publications, thesis, popular magazines, TV documentaries and exhibitions.

Scientific research was oriented towards understanding the fourth line of the fortification and also focused on the area between first and second lines, in the denominated *AP area*. Excavation methods were much more precise than in the previous phases, hence the excavation pace slower, not excavating so much in area, but in detail. Excavation campaigns involved students from Portugal, Spain and Germany. They were long, lasting near three months during the summer, and the results were published in following years.

In the context of excavation many *media* was produced: field notes, photographs, drawings and maps like before, but as technology evolved years, there were new tools available, and people started using them. The first innovation was the video camera that since 1994 was used to record aspects of the excavation and laboratory work. The audio recorder was also used to record interviews with local people related to Archaeology.

Since 2002 the appearance of digital photographic cameras produced an increase in the quantity of photographs taken during the excavation. Regarding laboratory photography, new opportunities for editing the image with digital software started being applied.

Since 2007 there was another noticeable change with the availability of smartphones and the generalized use of social *media*. In the case of Zambujal we noticed that participants in the excavations become in touch more frequently (through *Facebook* platform, for example), exchanging messages and images.



Fig. 34) Three generations of archaeologists: Hermanfried Schubart, Leonel Trindade, Michael Kunst © M. Kunst

a) Oral History

We acknowledged the information about the third phase of excavations by talking to Michael Kunst in personal communications[124]. After 1973 there was an interval of nearly 20 years until excavations were lead again in 1994-1995. The pause in the 70's was due to the need to publish results as the monograph is published only in 1981. From 2002 to the present, several campaigns involving more than a hundred participants among which specialists, workers, students, artists, photographers were held. Due to new available technology, Michael Kunst was able to use video and sound recording and make two important interviews to local men about contexts of discovery related to oral history.

b) Sound recording

Although not made with a clear publishing goal, Michael Kunst had the opportunity to make an audio interview to Mr José, the inhabitant of Zambujal farmhouse. In this interview Kunst asks questions about the use of space inside the

[124] We participated in excavations in Zambujal since 2002 as an illustrator and surveyor.

farmhouse and Mr José describes his memories of the house, now partially in ruins. The aim of the interview was to look for clues that could lead to archaeological information - as the farmhouse is constructed on top of the most important area of Zambujal, the central area. The interview is not conclusive about archaeological findings, but nonetheless constitutes a valuable document of the memory of those who inhabited the house resting literally on top of the Zambujal ruins. In this interview, Mr. José describes one room at the time, the interior of the house at the beginning of the 20th century, and recalls how he used to play on the earth mound that was covering Zambujal. This type of material can be worked using interactive media, for example, by selecting one room of the house on a map, an excerpt of the audio interview can be heard.

c) Video recording

As video cameras became more affordable, people started to use them (Hi8 format). Some video footage was made in different contexts in Zambujal. Video recording was used from 1994 onwards as another way of recording the excavation. For example, M. Kunst used to hire a plane in Santa Cruz airport at the end of every excavation and fly over Zambujal to take aerial photos, and from the 90's on, video began to be used.

Altogether we identified and analyzed five archival video files[125]. Content shows people working in the excavation engaged in several activities such as topography, field drawing, note taking, taking measurements, as well as doing laboratory work. Later, when we produced an interactive exhibition prototype, we edited and used excerpts of this video material. There is also another document worth mentioning, a video interview where M. Kunst talks to Mr. Hermínio about his discovery of *Tholos da Borracheira*[126]. In this video, a local farmer describes how he was with some friends *clearing stones to build a road* when they found something strange: a small pottery artefact, some stones, and human bones inside a circular stone structure. They stopped the works and took the pottery artefact to the museum,

[125] See Appendix A (A-1-6- Catalogue Video and Sound) for a full description of the artefacts.

[126] See Appendix C (C-1-4 Sr. Hermínio, mov)

showing it to the museum technicians who then visited the site and ascertained that they were in the presence of a *tholos*, the *Tholos da Borracheira*. We edited this video to present it in the 2016 exhibition about Zambujal. At least two TV documentaries were identified featuring Zambujal. One on RTP 2 is called '*O Mar e a Terra*' and another one is a BBC 2 production called '*The Stonehenge Enigma'*, where Michael Kunst appears giving an interview where he explains the importance of Zambujal as a central producer of the Bell Beaker culture, exporting a pottery style to all of Europe, and being contemporary with Stonehenge, an archaeological site well known to the general public.



Fig. 35) Video screenshots of excavation. © M. Kunst



Fig. 36) Video screenshots of interview with Sr. Hermínio © M. Kunst



Fig. 37) Video screenshots of TV documentary (*The Stonehenge Enigma,* Ancestors, Dan Kendal) © BBC 2004

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While reflecting on the use of video during this research, and in the context of the preparation of the 5th exhibition about Zambujal (in May 2016), some new video was produced with the clear goal to feature as documentary content in the exhibition and in our virtual prototype (detailed in chapter 6). These recordings were made with a clear intention, using tripod, and following a semi structured script. We filmed an interview with Leonel Trindade Junior, M. Kunst filmed some artefacts that would be on display in the exhibition rotating in 360º, with the intention of creating an interaction on iPad for visitors to interact virtually with the artefacts on display. We edited some archival videos into four experiences (available as digital movies in Appendix C[127]).



Fig. 38) Video screenshots of interview with Leonel Trindade Junior, and artefacts' video. © G. Casella / M. Kunst

d) Photography

Photography in the third phase of the excavations continues with the same thematic categories as previously: aerial photographs, excavation photographs, artefacts photographs and social life / ethnographic photographs. The main difference is the change in technology, if in the second phase only existed black and white film, in the third phase colour slides and photographs, as well as digital photography later on, start being used along with analogical photography (which continues to be taken occasionally). The result is an exponential growth in number of photographs taken during an excavation, what leads to a greater need to work on the cataloguing and archiving of the photographs in databases. Using metadata to easily retrieve the files need is a time consuming process, so what was gained in lowering the costs of photography, is now time and resource demanding.

Adding to the official photographs of the excavation there is now a growing

[127] See Appendix C (C-1-1-RIZOMAS.mov; C-1-2-ARQUEIRO.mov; C-1-3-PEDRAS DE RAIO.mov; C-1-4-SR HERMINIO.mov).

amount of pictures taken by the participants of the excavation who have their own digital cameras and smartphones. These images provide different views such as documenting daily life and parallel cultural activities made during the campaigns such as convivial meals or fieldtrips. These are *media* artefacts on their own right still not under scrutiny but that should might an expression in the future, as they tend to circulate online in social *media* or personal blogs, as we will see further in the text.

Another type of imaging that arises in the third phase is the magnetogrametry, a process that allows the creation of visualizations related to the magnetism of the soil, producing an image of the land similar to an X-Ray. These images show more contrasted areas in places where the levels of disturbance exist, and if superimposed onto maps of the excavation or aerial photographs, can indicate the presence of archaeological structures (see Fig. 39). They are valuable in the determination of future excavation strategies and in so called *non invasion survey techniques*.[128]

Magnetograms of Zambujal can be added to other graphical elements with computer imaging software producing a new kind of hybrid image visualization. Still not used in Zambujal (such as photogrammetry) but worth mentioning is the RTI (Reflection Transformation Imaging) a technique that uses multiple photographs of the same object with multiple light sources. This data can be manipulated to see aspects of an object not visible with the naked eye.

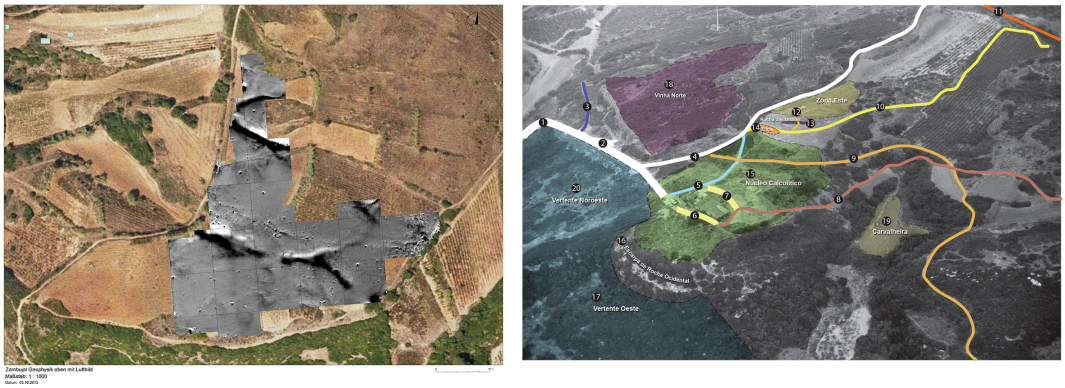


Fig. 39) Examples of Photography manipulation with digital layers © G.A.I.

[128] A project in Stonehenge is currently in course using this type of image visualization, and is worth considering for Archaeology. Stonehenge Hidden Landscape Project: http://lbi-archpro.org/cs/stonehenge/



Fig. 40) Example of artefacts Photography in high quality colour © M. Latova / G.A.I.



Fig. 41) Social photography: local people and inhabitants of the farmhouse, excavation teams, tourists and visitors.© M. Kunst

e) Drawing

Drawing in the third phase continues within the tradition introduced in the second phase. Field drawing is made during excavation, using a grid system with X and Y coordinates. Each stone is drawn in 1/20 scale, meaning one meter in reality corresponds to 5 cm in the graph paper. For each level excavated in depth, a new plan of the area is made. Every drawing is identified with a scale, a north indication, date, name of the draughtsman, and other useful references for the subject depicted. This drawing made in the field is made in pencil on graph paper, and the sediments' hues are indicated with color pencil. In the end, with the aid of theodolites, several absolute heights are taken and indicated in the drawing (see Fig. 42).

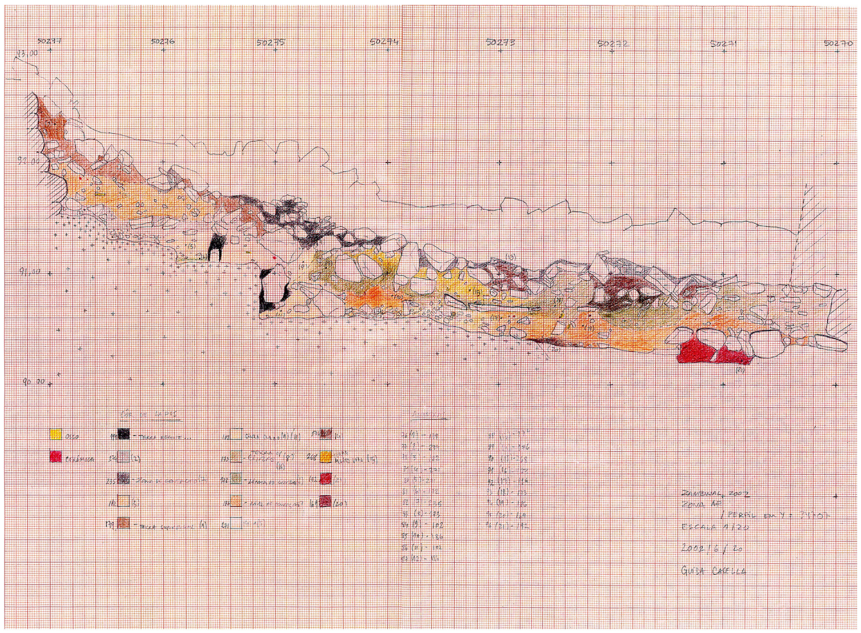
In the laboratory, each field drawing is digitized and redrawn using computer software. The digital drawings can later be manipulated in several combinations. They can be arranged in a mosaic in order to create the general map of the excavation. The weight of the lines can be changed and the colors of the earth can be represented in black and white shades or patterns, according to the publication.[129]

Artifact drawings continue to be done manually as in the previous phase. Despite the existence of new technologies, scientific illustrations are still used in Archaeology. This type of representation follows certain conventions that allow the comparison between several studies.

Reconstruction drawings in the third phase were based upon accurate scientific studies. For example, to reconstruct a tower in a life-size model for the 2007 exhibition (tower B), several architectural studies were made. To reconstruct in a digital painting a view of Zambujal in 2016 the landscape was depicted based on archaeobotanical studies that confirm the existence of certain types of plants based on the seeds that were found. [130] (see Figs. 43, 44).

[129] During our research we also did an experiment of creating an interactive piece with several drawings from the same excavation area. By clicking on buttons the viewer could access maps of different depth levels. (See Appendix C – Interactive 2) Method described in Ch. 6.

[130] See Appendix A – Drawings.



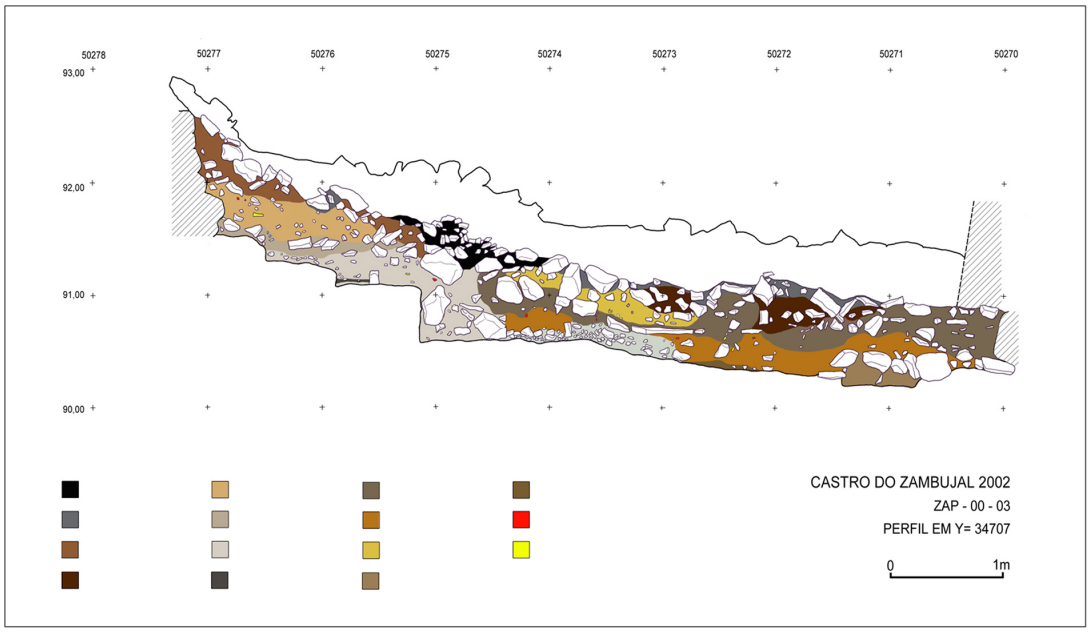


Fig. 42) Example of field drawing in the third phase: paper and pencil, digital drawing. © G.A.I. / G.Casella

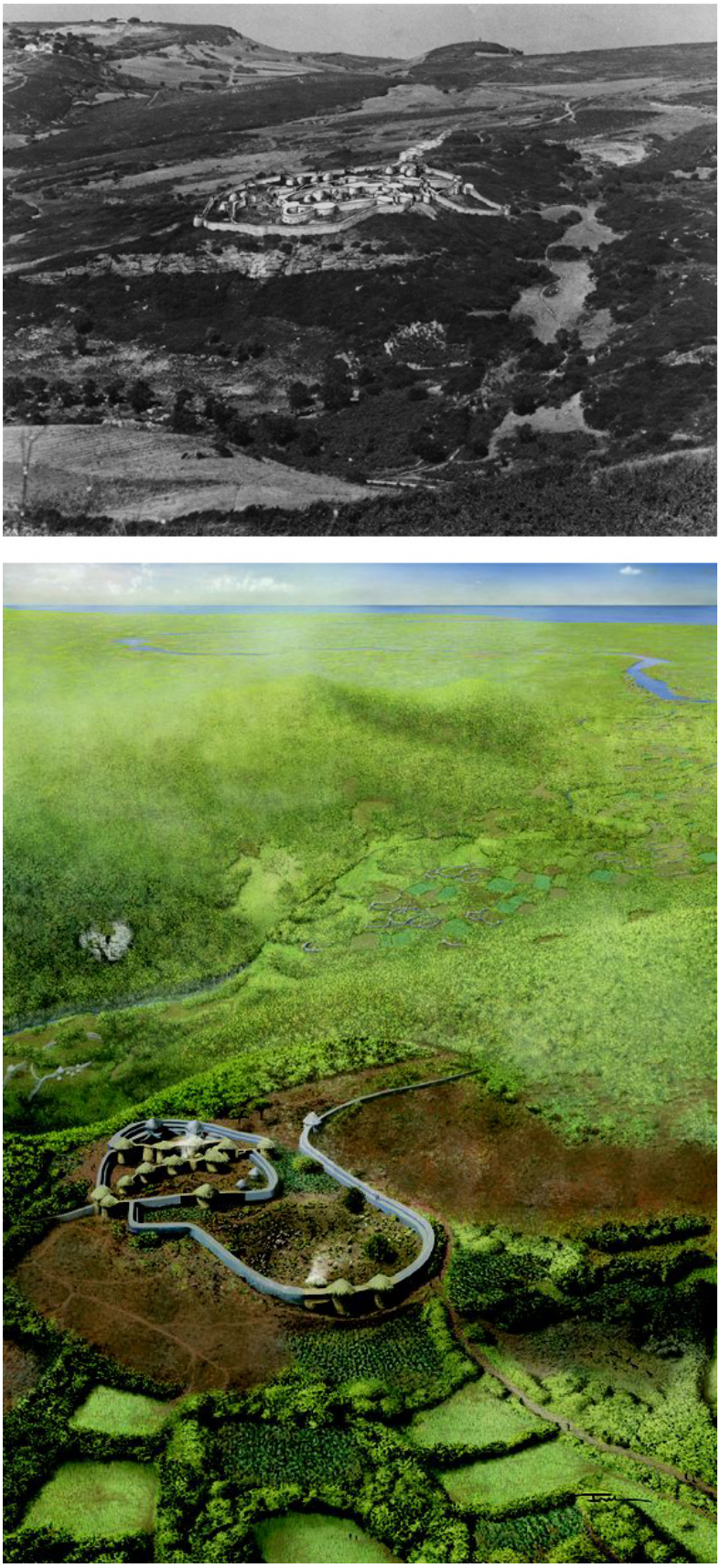


Fig. 43) Example of reconstruction drawing from 1981 (drawing over photo) and a reconstruction made with digital painting in 2015 by Ivan Gromicho. © G.A.I.

f) Publications

During the third phase (1994-2018) there were many new scientific publications about Zambujal. One example of a scientific publication is the 2011 article in O *Arqueólogo Português* (Kunst and Arnold, 2011). In this article, Michael Kunst (the director of the excavations) and Felix Arnold (an architecture archaeologist), in an inter-disciplinary effort, combine their skills and knowledge to support scientific arguments about the possible shape of the archaeological structure called *tower B*. The article is illustrated with schemes, maps, plans, and photographs of 3d scenography made for the 2007 exhibition. This is a good example of how archaeologists use reconstruction, not as a merely decorative picture, but as a support for an argument, scientifically studied, as in the case of the re-constructed cupule of *tower B*. Publications reflect recent studies in several interdisciplinary areas: botany, zoology, architecture, landscape, geology, mineralogy, etc.

In this phase we identified only one popular science publication (*Deutschland magazine, 1998*), but the creation of three new exhibitions, TV documentaries and Internet publications fulfilled the task of popularizing knowledge about the site.

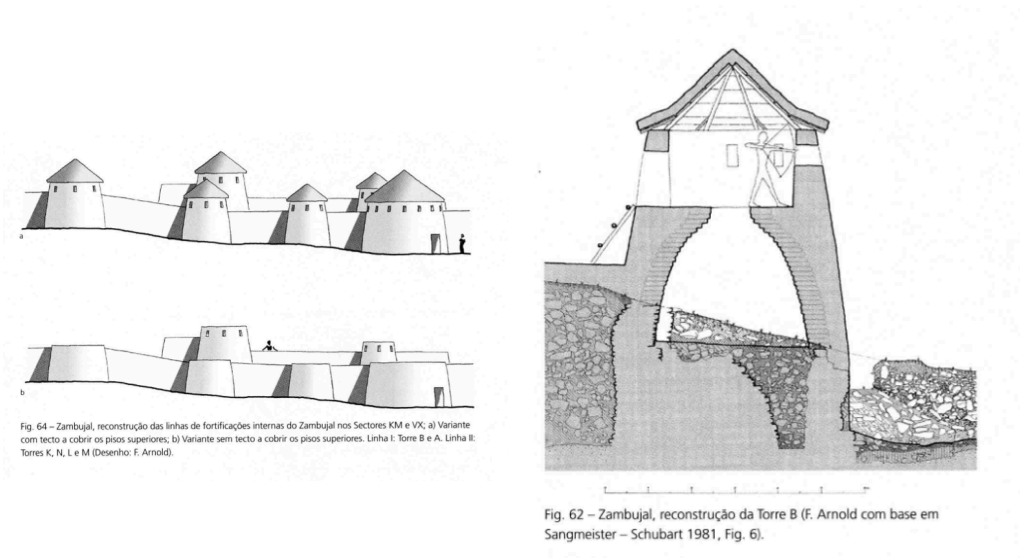


Fig. 44) Scientific Publication: accurately sustaining the interpretation and reconstruction © Felix Arnold / G.A.I.



Fig. 45) Popular publication from 1998 ©Deutschland Magazine

g) Web Presence

In the third phase of excavations, a new typology of representation and narratives concerning Zambujal is the web presence. For the purpose of this work we did a small online survey to understand how Zambujal is represented on the Internet, identifying several types of publication. We should start by stating that the *Google* search for the term "Castro do Zambujal" in 2018-08-03 returned 111.000 results. We found several kinds of entries, from institutional to non-official publications. The first entry is a Wikipedia page both in Portuguese and English. Although incomplete (particularly in the bibliography), it is carefully crafted and we suppose that it was written by some institution. The text contains accurate information and is divided into 6 sections: Excavations, History, Architecture, Current Projects, Similar Sites, and References (incomplete). It also has a general explanation, an abundance of images and an animation of the different phases of construction of Zambujal.

We identified three main kinds of online publications. In the first we considered the *institutional websites and databases.* In this category, information is clear-cut and professional, but has few updates due to the lack of resources and specialized staff in institutions dedicated to maintenance of digital content. They are not aiming for use by a general audience, but are very useful for professionals.

The second kind includes *commercial websites and apps.* These sites present fewer and more superficial information, usually location, chronology and typology. Sometimes they merely offer ways of finding services, while others perform a more

persuasive narrative to involve clients in cultural tours and walks.

The third kind of entry is the *user generated content* websites. In this category we found a variety of approaches that alternate between accuracy of information and entertainment. Self-motivated online publications can produce very interesting personal blogs, based on serious research, often self sponsored. Another kind is the amateur posting of videos on YouTube, that can vary from, for example, family visits to experiences with *GoPro* cameras and 360º photographs. Players of games like *Geocaching*[131] share information online to make community building. There is also a social *media* group on the *Facebook* platform where people who excavated in Zambujal exchange ideas and photos.

Institutional Entries (Databases and Websites)

Institutional databases are more useful for archaeologists than for the general public. "Endovélico"[132] is a database in the site of the DGPC (*Direcção Geral do Património Cultural*) which inludes all the Portuguese Heritage available in a standardized way. The entry for Zambujal displays information such as the government decree which confers on this site the status of National Monument (Decreto nº 28/2012, DR, 2.ª série, n.º 224, de 20-11-2012), a technical description of typology, location, and two images, as well as a general photograph and map with the protected area. "Portal do Arqueólogo" [133] [Archaeologist's Portal] is another online database. It presents more complete information such as bibliography, photographs and reports from the excavations.

The German Archaeological Institute of Madrid[134] (which has conducted the excavations since the 1960s) has a page dedicated to Zambujal, integrated in an interactive map showing all the excavations of the Institute. For Zambujal there is a

[131] Geocaching is an activity or pastime in which an item, or a container holding a number of items, is hidden at a particular location for GPS users to find by means of coordinates posted on the Internet.

[132] Endovélico: http://www.patrimoniocultural.gov.pt/pt/patrimonio/patrimonio-imovel/pesquisa-do-patrimonio/classificado-ou-em-vias-de-classificacao/geral/view/70158/

[133] Portal do Arqueólogo http://arqueologia.patrimoniocultural.pt/index.php?sid=sitios.resultados&subsid=55518

[134] *German Archaeological Institute* Website https://www.dainst.org/projekt/-/project-display/43762

textual description and downloadable files with academic contributions.

The website of the *Câmara Municipal de Torres Vedras*[135] (Torres Vedras City Hall) used to have a description of Zambujal. It was recently updated and now has news related to activities in Zambujal (walks, recreations, exhibitions).

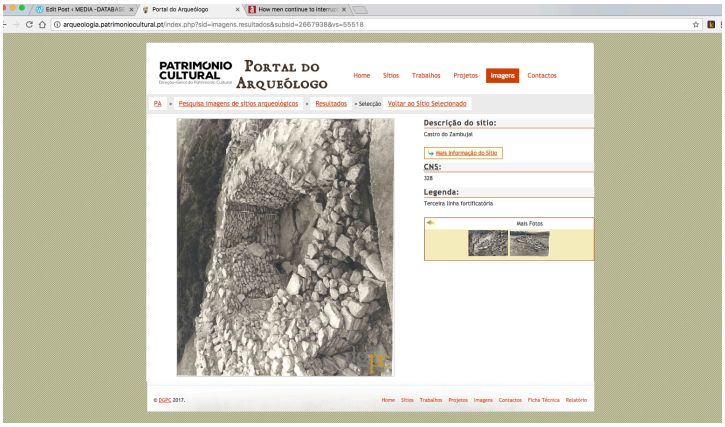


Fig. 46) Portal do Arqueólogo [Archaeologist's Portal] (retrieved from Internet in 2013-08-03)

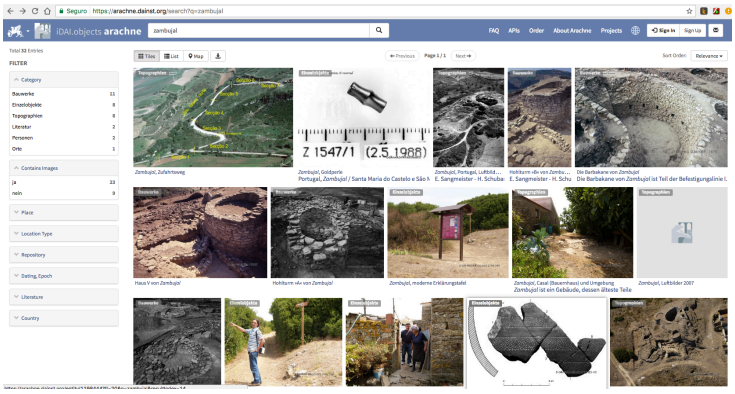


Fig. 47) Photography database of German Archaeological Institute excavations in Zambujal in Arachne website (retrieved from Internet in 2013-08-03)

As a general observation we consider that the official or institutional websites, although they are very useful and accurate, have little engagement appeal. This is probably due to the poorly defined communication strategy. Institutional Communication is not a very developed field. Its resources stay in a rather conservative environment with little space for creativity.

[135] Website from Câmara Municipal de Torres Vedras (Torres Vedras City Hall) http://www.cm-tvedras.pt/agenda/detalhes/61047/



Fig. 48) Website from Câmara Municipal de Torres Vedras (Torres Vedras City Hall) (retrieved from Internet in 2013-08-07)

Commercial Content

There are now several way-finding apps directly related to Cultural Tourism in Portugal that give location information often associated with commercial services (offering cultural or recreational tours, or advertising restaurants and accomodation). One example is *Tripadvisor* [136] or *Izitravel* where it is possible to upload content to previously established frameworks, and customize, often subject to advertisement as a way of maintaining the service. It is possible for example in *Izitravel* to personalize an audio tour like Montemor-o-Novo did.[137] Zambujal is found in a similar site, *Guia da Cidade.* [138] Content is limited to general information and photographs.

[136] Tripadvisor (https://www.tripadvisor.pt/) or Izitravel (https://izi.travel/)

[137] Montemor-o-novo audioguide in Izitravel https://izi.travel/en/ffe8-castelo-de-montemor-o-novo/pt

[138] Guia da Cidade https://www.guiadacidade.pt/en/poi-castro-do-zambujal-16098

User Generated Content

User generated content is any kind of content produced by users of a service or system and made available online. This includes blog posts, wikis, videos, comments and social *media* online publishing. This kind of material appears online generally without traditional gatekeeping. Reliability is obtained by peer revision. For Zambujal we identified several instances of user generated content. Starting from the blogosphere, we found accurate personal blogs by historians or archaeologists. Isabel Luna's blog "Vedrografias" [139] presents several articles on local History, including entries relating to Zambujal. We also found "Estudos do Património" [Heritage Studies][140] personal blog with an interesting visualization of a proposal for the musealization of Zambujal, along with very accurate and complete contextual information. Another similar site is the blog from a cultural association, "Histórias de Torres Vedras" [141] which also provides good information. The design of these kinds of websites is based on available templates from the platform they were built on (blogspot).

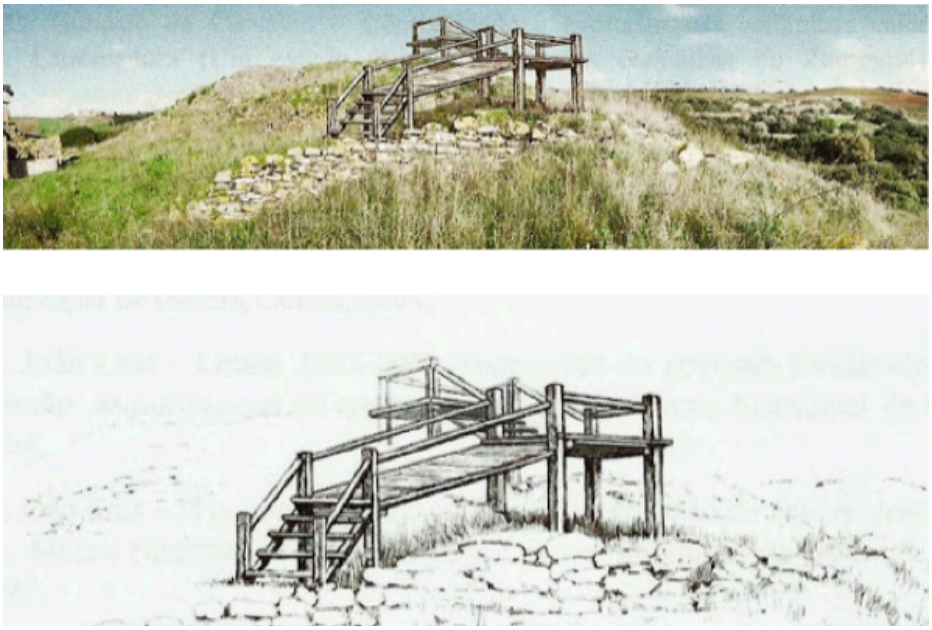


Fig. 49) Museography project in a personal blog "Estudos de Património" (retrieved from Internet in 2013-08-07)

[139] Histórias de Torres Vedras https://historiasdetorresvedras.wordpress.com/2012/04/17/aurelio-ricardo-belo-e-a-investigacao-arqueologica/

[140] Estudos de Património http://estudospatrimonio.blogspot.pt/2014/09/asvelhas-torres-do-zambujal.html

[141] Vedrografias – http://vedrografias2.blogspot.pt/2009/04/castro-do-zambujal_30.html



Fig. 50) Personal Blogs with content about Zambujal made in blogspot (retrieved from Internet in 2013-08-07)

With regard to social *media*, there are videos uploaded onto *Youtube*, ranging from educational interviews (Katina Lillios[142]) to local people who enjoy a walk or assist a Historical recreation, to experiences with a *GoPro* camera (Oliraf and Joao Gomes[143]). Most videos have an instructional motivation, except for the *GoPro* video, which has a humorous, engaging and entertaining look and feel. One amateur video[144] is misleading as it dates Zambujal to the Paleolithic.

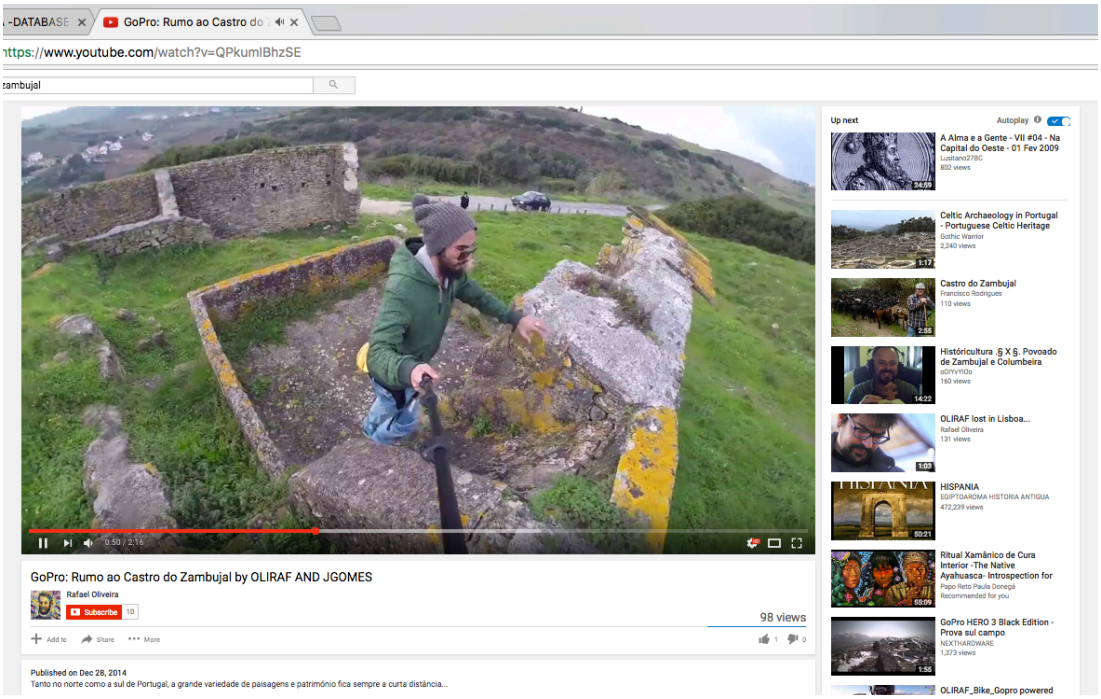


Fig. 51) Video with a *GoPro* camera, just walking around the ruins (retrieved from Internet in 2013-08-07)

[142] Katina Lillios interview https://www.youtube.com/watch?v=TkESb_4i2K8

[143] Amateur video with go pro https://www.youtube.com/watch?v=QPkumIBhzSE

[144] Amateur Video about Castro do Zambujal (erroneously dating it to the Paleolithic) https://www.youtube.com/watch?v=SuJ7VdJkQDs&t=174s

Collaborative sites such as the group game *Geocaching*[145], an online game where participants should find a box (*cache*) in a place are often connected to archaeological sites[146]. The *cache* about Zambujal attracts visitors but can be a danger if people don't respect the safety and hazards rules.

A collaborative map of Portuguese Archaeology promoted by *Al-madan*[147] archaeological magazine is a good example of a citizen science project applied to Archaeology. Participation relies on mutual confidence, as in Wikipedia, where information is reviewed by members of the public.

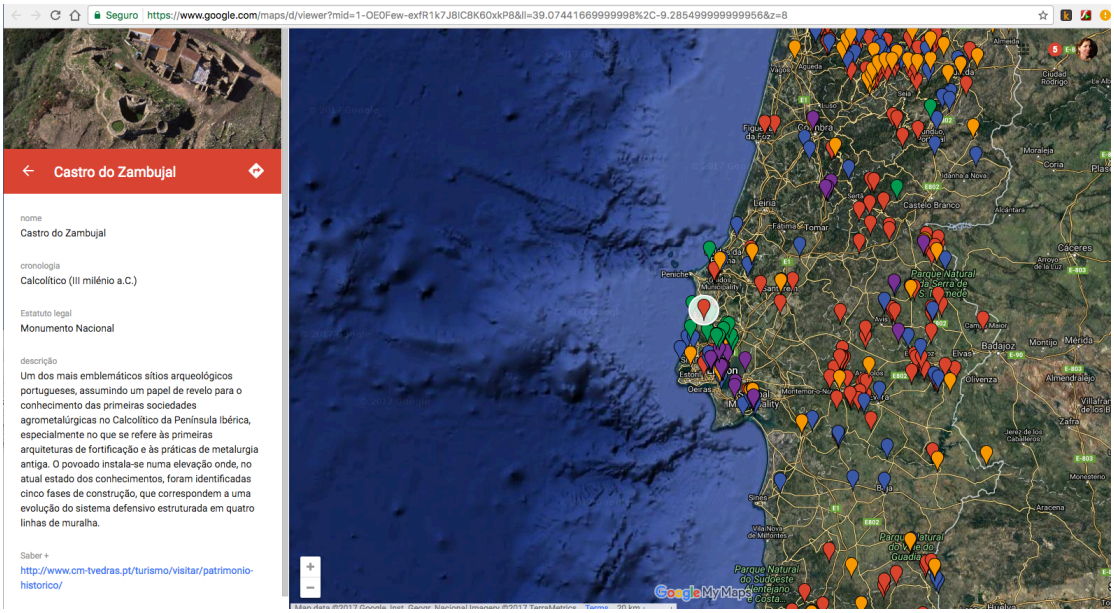


Fig. 52) Archaeological Sites in Portugal Google Maps produced by Centro de Arqueologia de Almada, For the magazine Al-Madan, N.º 20 (2016) (retrieved from Internet in 2013-08-09)

A Facebook group called "Zambujal" [148] was created for the people who participated in the excavations. There they exchange photographs, memories, and their personal affection for the place. Artists like *Urbansketchers* (a group that makes drawings in sketchbooks in open air locations) are now moving their attention

[145] Geocaching Website https://www.geocaching.com/geocache/GCZ5KE_castro-zambujal-torres-vedras?guid=06561553-6a45-4794-ad41-e23367567bd6

[146] Another game that conducts players to Heritage sites is *Pokemon Go* https://www.pokemongo.com/

[147] Archaeological Sites in Portugal Google Maps produced by Centro de Arqueologia de Almada, For the magazine Al-Madan, N.º 20 (2016) http://www.almadan.publ.pt.

Interactive Map: https://www.google.com/maps/d/viewer?mid=1-OE0Few-exfR1k7J8IC8K60xkP8&ll=39.07441669999998%2C-9.285499999999956&z=8

[148] Facebok group "Zambujal" https://www.facebook.com/groups/30096341822/

towards heritage sites, and Zambujal is no exception, having received groups of sketchers to depict it from an artistic point of view. The idea obtained by observing the web presence of Zambujal is perhaps that there are more people visiting this place than is perceived by the local management who estimate some 3.600 visitors a year. We also observed a great difference between institutional communication, - very sober and theoretically supported - and the spontaneous and entertaining approach to the site held by general visitors, now with more means of communicating and sharing content among them on the Internet.



Fig. 53) The Facebook group "Zambujal" a closed group for interaction among people who excavated in Zambujal. (retrieved from Internet in 2017-03-09)



Fig. 54) Two Facebook posts addressing Zambujal and showing how people relate to the place in entertaining ways: a urbansketcher showing a drawing on location, and archaeological students fieldtrip group photo. (retrieved from Internet in 2013-08-09)

h) Museography

Between 1994 and 2018 three exhibitions were made about Zambujal in *Museu Municipal Leonel Trindade*, one in 2006, one in 2008, and one in 2016. By the end of September 2018 Zambujal was subject to a valorization project with information panels and an audio guide app, already beyond the scope of this PhD although with our collaboration in a professional context.

As mentioned by the City Council president Carlos Soares Miguel in the catalogue of the 2006 exhibition of Zambujal, ,a new exhibition model was adopted by the museum at the turn of the millennium. The permanent display of Archaeology is replaced by several temporary exhibitions:

The exhibition "Zambujal, Life War and Commerce in the 3rd Millennium BC" brings to the eyes of everyone what we want to be the Museum Leonel Trindade to be in the future: a mediated expositive itinerary, appealing, easy to read, renewable. (...) We are working on the global physical and exibitionary agenda of the museum. In this context of transitions we wanted to highlight Castro do Zambujal, because we conceive it as the best way to show a new image of the Museum. (...) The current exhibition is the first step in a long walk that we want to be long but renewed, rigorous but interesting, of our past but with future. Leonel Trindade Museum opens the doors for you! (Miguel, 2006)

The three temporary exhibitions (2006, 2008 and 2016) were made after the adoption of digital *media* in the layout design. The walls are fully used as *medium*, by the use of digital printed canvas. Let us describe in detail each one of them.

3rd EXHIBITION: War and Commerce
"Zambujal, Life War and Commerce in the 3rd Millennium BC"
Museu Municipal Leonel Trindade, Torres Vedras
26 September 2006 to 30 September 2007.

This exhibition provided an opportunity to rebrand the museum of Torres Vedras, which was trying to change its policy from one of having a permanent exhibition to a model of temporary exhibitions that would attract visitors more regularly. Zambujal, as an *ex-libris* heritage monument from the region, already well

known nationally and internationally, was an ideal subject to make the local community aware of its heritage. The exhibition was organized by Michael Kunst, the director of the excavations since 2002, Leonel Trindade Junior, son of the discoverer of Zambujal, who built a life-size model of *tower B* (see Fig. 56) and Olga Moreira who created the overall design and branding in a new style where the use of computer editing and digital printing facilitated a rich visual component. From now on, the walls of the exhibition provide a surface onto which are incorporated both text and image. A scenography with plasterboard and acrylic glass allowed the creation of niches for the display of artifacts.



Fig. 55) Entrance of the 2006 exhibition in MMLT © M. Kunst

This exhibition was also a great opportunity to undertake a review of the narratives concerning Zambujal and recollect its scientific past. The main themes of the exhibition were "life, war and commerce". We identified several storylines based on the photographs of the exhibition and in a small brochure (a leaflet) in which a text presents the overall communication strategy:

> " *Zambujal, Life War and Commerce in the 3rd Millennium BC" has the aim of disseminating a summary of the last 60 years of archaeological and*

interdisciplinary investigations in this Chalcolithic settlement and its surroundings."

The entrance of the exhibition is narrow so as to give the visitor the sensation of entering Zambujal through its very narrow doors. After that, the exhibition opens itself to the main room, just like the small corridors in the walls of Zambujal would open to small yards.



Fig. 56) View of the life size model of tower B created by Leonel Trindade Junior © M. Kunst

The exhibition was divided into 2 rooms. In the first room there was an homage to Leonel Trindade, the discoverer, and to other contemporary archaeologists from the 30s who studied Portuguese Prehistory. Another section was dedicated to characterize the Era known as the "Chalcolithic", illustrated with two glass cases with objects from this period. The first room also comprised a semicircular wall on the right side presenting the timeline of all the excavations undertaken in Zambujal, illustrated with group photographs of the excavation teams.

In the second room, from left to right, was had a section dedicated to the evolution of the Sizandro valley, where Zambujal is situated, focusing on changes in the landscape. Then three glass cases displayed objects and wall chart information. In the front wall there was a life-size model of the *tower B* (see Fig. 56), and on the left side, glass cases illustrate and display artefacts from the five different phases of the

construction of Zambujal.

The main storylines explored in the exhibition are the following: 1) "The Precursors", dedicated to the great researchers of 19th century Archaeology in Portugal such as Carlos Ribeiro, Estácio da Veiga and Leonel Trindade (the discoverer of Zambujal). 2) "Architecture" which addresses the funerary practices and the settlements of that period, presenting materials from chalcolithic graves from the region of Torres Vedras with materials similar to the ones found in Zambujal. 3) "The Environment" which presents information about the remains of fauna and flora found in the archaeological excavations, many of which are no longer found in Torres Vedras and some are even totally extinct. 4) "War, Peace and Commerce" were the main themes of this exhibition, and present the walls of Zambujal, hundreds of spearheads, and five major alterations to the walls' strategic defence which indicate that there was war in Zambujal. 5) "Daily Life" presents archaeological findings (ceramic, stone, bone, Copper) suggestive of a pacific daily life.

In all epochs of the occupation of Zambujal there are traces of copper work The raw copper probably came from present-day Alentejo and Spain. There were no copper mines nearby. A gold bead and some ivory objects indicate that the site may have been occupied by an elite class.

4th EXHIBITION: Bell Beaker
"*Bell Beaker Pottery – Symbols of a Cultural Community in Europe 5000 years ago"*
Museum Municipal Leonel Trindade, Torres Vedras 30th April-30th August 2008
Museu Nacional de Arqueologia, Lisbon 15th May -15th September 2009
Fábrica da Pólvora Museum in Oeiras

Only one year after the the "*War and Commerce"* exhibition in Torres Vedras closed, another thematic exhibition was organized having the Bell Beaker pottery of Zambujal as central theme, as a symbol of a unique culture. This exhibition was prepared in the context of a conference about the *Bell Beaker* pottery in Torres Vedras. The importance of *Bell Beaker*[149] cultures has to do not only with a certain type of ceramic shape in the form of an inverted bell, but it also represents a symbol

[149] *Bell Beaker* culture is part of Chalcolithic or Copper age. Copper age follows the Neolithic revolution.

of a culture that existed on the European continent (Sicily, Portugal and Hungary) and North Africa (Morocco) in circa 2500 BC. The exhibition shows how this type of object circulated in Europe, revealing a network of transportation by boat, horse and coach. Most authors state that there is a technological revolution of secondary products – the "Secondary Products Revolution" - like wool, milk, cheese and beer in the chalcolithic. It is the time of the first warriors and fortified cities. Typical archaeological artefacts of this period are the archer's bracelets, bone buttons to close jackets with V perforation, artefacts in gold, and copper weapons.



Fig. 57) View of the 2008 exhibition in MMLT © M. Kunst

This exhibition was made on the basis of printed panels that can be moved thus facilitating transport to other venues for exhibition, as happened in *Museu Nacional de Arqueologia* [National Archaeological Museum], the archaeological section of the *Fábrica da Pólvora Museum* in Oeiras, where there is an exhibit concerning another contemporary fortified settlement at Leceia..

The panels and the model produced for this travelling exhibition are now housed in the reserves section of MMLT, near a single glass and wood window case with some artefacts. It is not a permanent exhibition, but it is used in some educational activities. A small catalogue produced for this exhibition helps us to make the reconstitution of the museography.

It reads:

Part 1- Distribution of Bell Beaker Vase in all Europe: In the first room ivory objects testimony long distance trade. Also schist plaques with decorations common in Portugal as well as in Switzerland indicate a shared culture.

Part 2 - Bell Beaker Culture in Portugal: Bell Beaker in Portugal is associated to "Ponta de Palmela" a copper arrowhead with a certain Bay leaf shape. Copper, Gold and Ivory artefacts indicate the birth of Elite class, demonstrating a social stratification with high class. A map shows a distribution of Bell Beaker in Europe. The patterns in these artefacts could well be used on the clothes of people from this period.

Part 3 - Castro do Zambujal: Castro do Zambujal is a witness of the passage of time from the beginning of the copper age until the Bell Beaker culture in Portugal. The life-size model of "Tower B" in the exhibition was designed by the architect Felix Arnold, in collaboration with Kunst.. The chronology of Zambujal is 2900-1700 BC. A model of Castro do Zambujal inits last phase (c. 1700 BC) is basically a small citadel surrounded by strong walls.

In sum, smaller in size when compared to the previous exhibition, this travelling exhibition addressed the same archaeological site from a new perspective. Instead of focusing on war and commerce, it focused on the cultural production of a certain type of ceramic design.

5th EXHIBITION: Stories of Zambujal

Stories of Zambujal: 50 years of the German Archaeological Institute in Torres Vedras, Museu Municipal Leonel Trindade, Torres Vedras, 27th May 2016

The fifth exhibition about Zambujal was prepared during the course of our research. We have participated in the meetings related to its production and contributed with the selection and production of visual and audio-visual content. The introductory text of the exhibition reads:

> *Stories of Zambujal: 50 years of the German Archaeological Institute in Torres Vedras: Of the Holocene (10,000 BC until the present) of the valley of the river Sizandro; Of the Chalcolithic fortification of the Zambujal (3rd millennium BC); The evolution of the Zambujal siege to the present day; The*

discovery of the site by Leonel Trindade and early archaeological research; Of the first archaeological investigations, on the recent prehistory, in the Municipality of Torres Vedras (Cova da Moura, Cabeço da Arruda, etc.) and the beginning of the investigation in Zambujal; Of the archaeological excavations of the German Archaeological Institute, from 1964 until today. Following the geological surveys in the Sizandro River Valley, the major climatic changes have been addressed during the last 10,000 years, such as the rise in temperature and the increase in the mean sea level, and the consequent adaptation of man to the new environmental conditions, Culminating in times of instability and war, of which stands out the so-called "phenomenon of the Bell Beaker Vase" and the first warriors from the III millennium BC.



Fig. 58) View of the design panel of 2016 exhibition in MMLT © M. Kunst

The structure of the exhibition was well established from the start in three main areas. In the first room the discovery of the site was addressed. Then a passage between the first and second room had a dark corridor dedicated to *Cova da Moura* cave. The second room was dedicated solely to Zambujal, covering several aspects (war, daily life, chronology of the site, environment), and the third room was dedicated to contemporary archaeological sites in the Torres Vedras region. This room was divided into the world of the living (exploring artefacts and localization of this settlement) and the funerary world (exploring the necropolis associated with the time of Zambujal).

The exhibition was constructed using printed panels and cumulative display glass cases. For this exhibition, the artist Ivan Gromicho made a new painting

showing the reconstruction of the settlement and surrounding landscape in 'Phase 5' (1850-1750 BC). The painting was made using digital technology, namely iPad painting, allowing several modifications and adaptions[150] (see Fig. 60).

During the last few years Leonel Trindade Junior has been making all the models of Zambujal and other archaeological sites, produced two new 3D models for the purpose of the exhibition. One represents the *Tholos de Barro*, and the other the *Necropolis of Bolores* (Fig. 59).

We accompanied the preparation of the exhibition producing three original videos using archival materials. The first is an interview with Leonel Trindade Junior (Appendix C-1-3) relating how his father discovered Zambujal; the second is a video remix exploring the use of the bow and arrow in chalcolithic times (Appendix C-1-2); and the third video shows an edited part of the interview with Sr. Hermínio describing the discovery of *Tholos da Borracheira* (Appendix C-1-4). We also made a fourth video (Appendix C-1-1) that was used only in the virtual exhibition (described in chapter 6).



Fig. 59) Views of the two 3D models of Necropolis of Bolores and *Tholos de Barro* created by Leonel Trindade Junior © MMLT

[150] This constitutes one advantage of using digital *media*, it allows several modifications and versions of an image. While previously one had to remake the whole painting, now it is possible to alter only a single part. Instead of one fixed original we have several instances of the same representation.



Fig. 60) Views of the 2016 exhibition *"Stories of Zambujal"* showing a reconstruction created by Ivan Gromicho in front, and several settlements of Torres Vedras, on the left © M. Kunst

This exhibition has the particularity of remediating most of the same narratives used in all previous exhibitions. The novelty is the attention given to the surrounding territory showing dozens of other archaeological sites from the same period as Zambujal for the first time. The funerary section was also a novelty. This theme was shown in a smaller and darker room at the end of the exhibition space.

3.4. Discussion of Chapter 3

We now discuss the findings observed during our description of the *corpus* of *media* produced about the archaeological site of Zambujal. In the section "Narratives", we discuss six kinds of narratives identified across multiple *media*: *popular narratives* (folklore associated with the site); *factual narratives* (facts related to the story of the excavation or life-history of the site); s*patial narratives* (spatial knowledge about the site exemplified by maps and landscape models, *genius loci*, space/place); *chronological narratives* (absolute chronology of the site, *palimpsest,* the several phases of construction and occupation); *interpretation narratives* (use of

space and typology of artefacts; what was the site about and what activities took place there?); and *grand narratives* (universal themes such as war, commerce, class, environment, etc. that can be related to the site's interpretation). In the section "Changes and Continuities" we discuss the communication of Zambujal between 1946 and 2018, focusing on the impact of digital *media* in archaeological research documentation and communication.

3.4.1. Narratives

After the extensive analysis of *media* comprising publications, drawings, photographs, videos, websites, oral history, tridimensional models and exhibitions, we were able to identify 6 different types of narratives that are used in the communication of archaeological sites. We shall describe each one in the following order: a) popular; b) factual; c) spatial; d) chronological; e) interpretational; and f) grand narratives.

a) Popular Narratives

The first kind of narrative that we identified in our research was *folklor*e. Popular tales associated with ancient sites, although not scientific, constitute narratives attached to places circulating in the collective memory prior to any intervention of archaeologists. Stories about hidden treasures and haunted landscapes are indicators for archaeologists of the possibility of the existence of archaeological sites. In our case study we identified the legend of *Cova da Moura,* which led to the finding of a necropolis with the same name, and the myth of *thunderstones* as a clue to the finding of Zambujal.



Fig. 61) Screenshot of two video interviews to Leonel Trindade Junior about the discovery of *Cova da Moura* and *Zambujal* and to Mr Hermínio about the discovery of *Tholos da Borracheira* © G. Casella / M. Kunst

Collaboration between artists and heritage management is becoming increasingly common. Creative approaches include performance, historical re-enactment, live cooking, live drawing, concerts, and of course, digital storytelling and digital applications. We believe popular narratives can be addressed and creatively explored in the contemporary forms of valorisation. In our empirical study we noted that the increasing availability of technology (audio and video recording) facilitated the recording of *folklore* and oral history, and it will possibly foster their recollection in the future.

User-generated content in social *media* is highly visual, symbolic and engaging through stories. In a similar manner, popular narratives are rich in meaning, creativity and visual elements. We suggest that they can be integrated in cultural dissemination strategies as 'eye-catchers' to create the necessary engagement prior to delivering the more profound levels of scientific information.

b) Factual Narratives

It is common when communicating archaeological heritage to tell the story of who discovered and who studied a site. This is why "factual narratives" are important elements to consider for storytelling.

The story of the excavations, of the historical evolution of the institutions, of the scientific research, episodes that make part of the people involved, the funding models, the valorization projects, are all facts that constitute the site's repertoire of

narratives, as well as the cultural history of the site. These materials can be transformed into content. Having this in mind, it is important to be thorough with the record keeping of the site's history, both in terms of registering dates and events, but also in documenting public communication. In fact, in the case of Zambujal it was precisely the photographs, exhibitions catalogues, and popular science magazine's articles that allowed us to study the communication of the identity of the site through time.

What we identified as "factual narratives", illustrated by documentation in archives such as photographs that show the daily life of an excavation, can unveil interesting topics that enrich archaeological valorisation projects. Generally they are not printed in scientific reports, but can provide useful information about the era that produced them.



Fig. 62) Example of excavation photograph, Zambujal 1968 © G. A. I.

c) Spatial Narratives

Spatial narratives are very important in Archaeology. An archaeological site is a place in space. Being over a hill, near a river, facing the sunrise, etc. are items of information that reflect spatial data, and should be observed and interpreted in an archaeological context.

Not only the localization of the monument on a landscape, but also each

artefact that is unearthed in an excavation have their spatial location meticulously recorded. Location is important for many reasons. The shape and distribution in place is something that provides information helping archaeologists to formulate hypotheses to interpret the past.

The typical visualizations of spatial narratives are maps. These include location maps, general maps of the excavation and excavation plans. For these kinds of narratives we collected a range of examples, from the first non-general maps, to accurate cartographies using the latest technologies. With the adoption of digital *media,* new tools allow spatial examination. Non-invasive techniques such as magnetograms facilitate the mapping of buried elements and help predict where next to excavate.

Towards the end of writing this thesis, a drone was used to make a photogrammetry of the site, adding a new stage in the recording of images in Zambujal. This kind of technology for survey is being done more frequently with drones. Where aerial photograph and video recording used to work, we now see accurate computer generated image processing.

The contribution of spatial narratives to *digital storytelling* is the possibility of using interactive maps. By clicking on a point of the map, the user can access other layers of information.

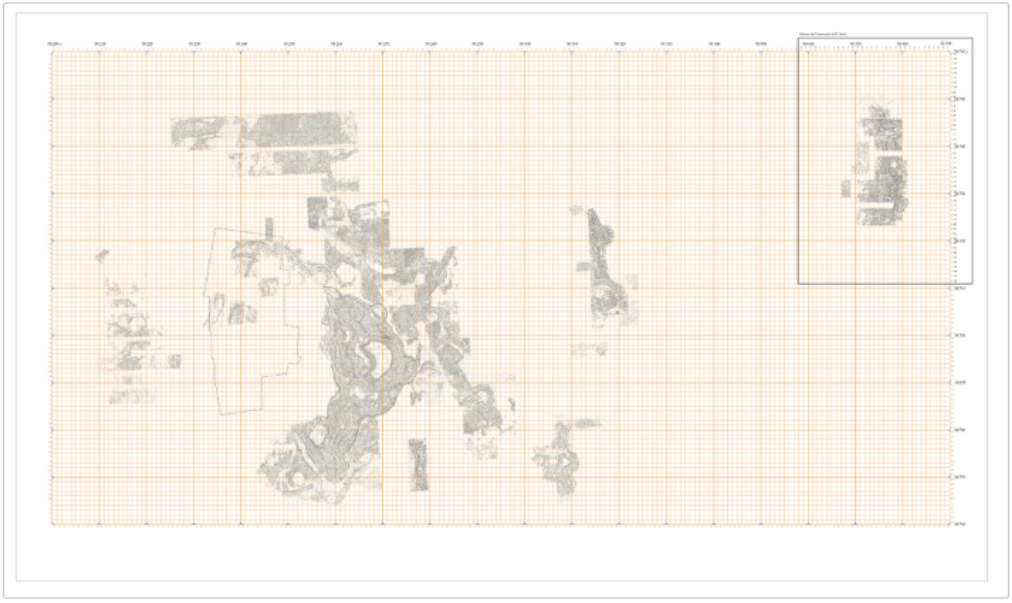


Fig. 63) General Map of the Excavation in 2016 © G. Casella / G.A.I.

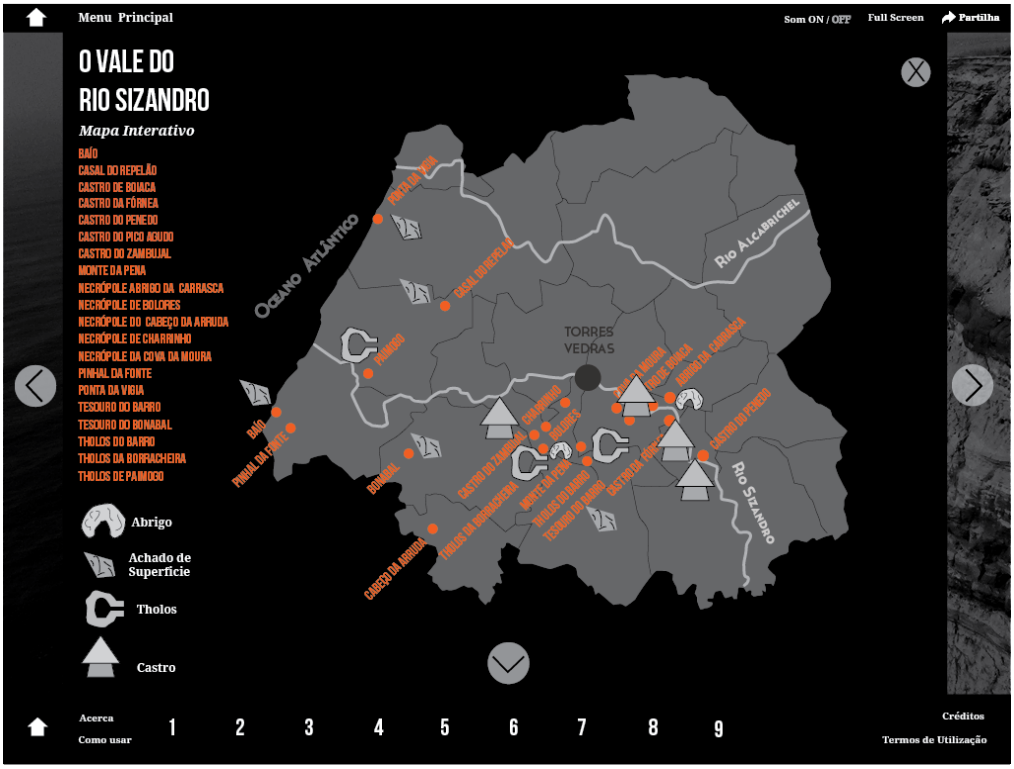


Fig. 64) Example of interactive map for the prototype "Histórias do Zambujal" [Stories of Zambujal] app. © G. Casella

d) Chronological Narratives

Archaeological sites are studied in a "horizontal dimension" that provides information about the distribution of elements both in space, and in a "vertical dimension" that gives information about elements in time. Older objects and sediments tend to stay buried underneath the more recent ones, unless there was an artificial intrusion. The study of this sequence to learn about chronology is called the stratigraphy of the site. Archaeologists use stratigraphic profiles (vertical sections in the excavation and their graphical representation) to observe and analyse possible events through time (see Fig. 65). In our practice-based research experiment (see Chapter 6.2.b. – Pilot Study 2 – Interactive Stratigraphy) we added interactivity to a profile.

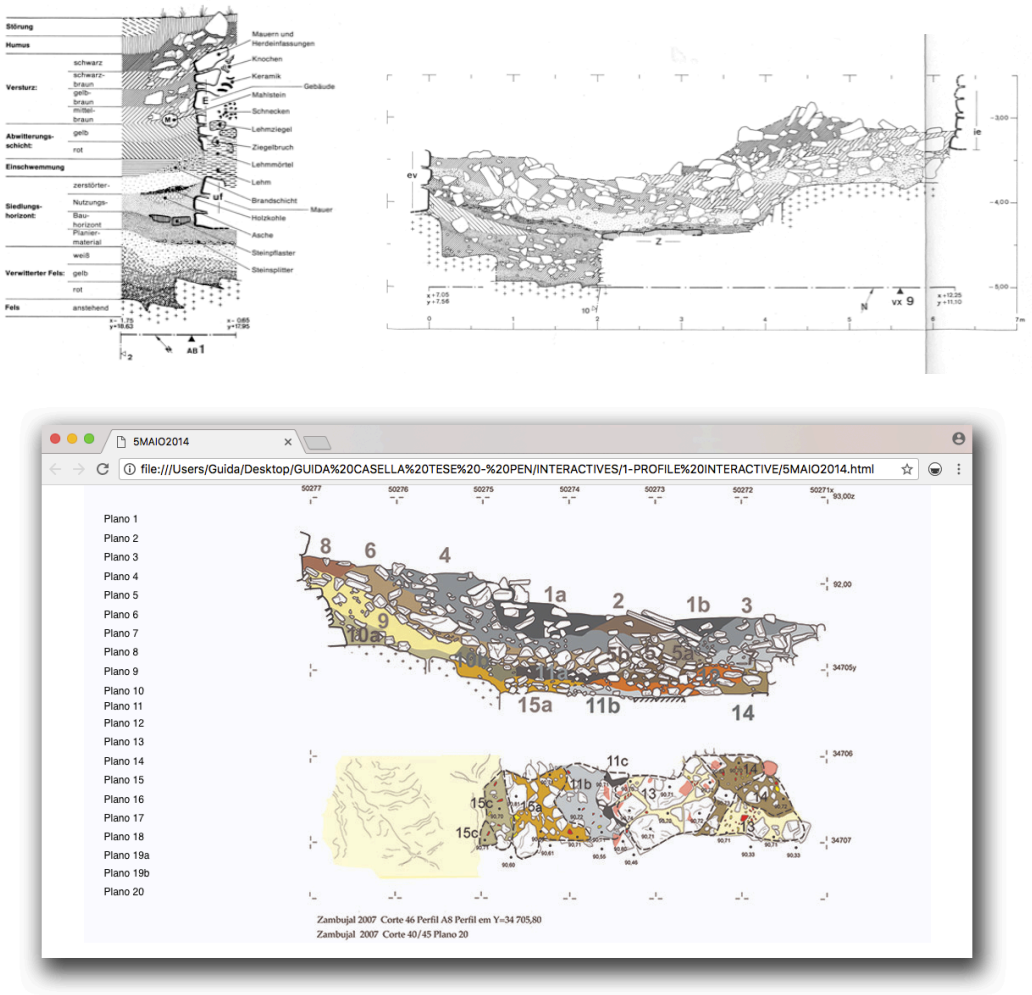


Fig. 65) Archaeological stratigraphy in illustration © G.A.I. and our experiment with interactivity.

Besides stratigraphy, archaeologists also need to represent how the monuments evolved through time. For example, Zambujal had 5 different occupation phases in prehistory, and after that was occupied in the Middle Age and Modern Age. Archaeologists use several tools to achieve this knowledge. One is the analysis of material culture, for which they use scientific drawings of artefacts that allow the definition of a style associated with certain social cultures. To understand better the several occupations of a site, they use hypothetical models, which help to visualize and test hypotheses. The sequence of events in an excavation is a powerful *storytelling* line to explore the 'before' and the 'after'.

Universal timelines are also very useful in communicating archaeological sites. If for an archaeologist or historian it is easy to understand deep time and relate events to specific dates, for the ordinary person it is not so obvious. Timelines are a

fundamental tool in the communication of history and archaeology. In the making of the fifth exhibition about Zambujal, a timeline was produced (see Fig. 69) showing simultaneously climate changes, cultural changes in general and in Zambujal, and forest changes based on archaeobotanical studies.

In the interactive prototype (Chapter 6) we also explored interactive timelines to show universal history and to show changes in the landscape surrounding Zambujal where we can observe variations in the river basin's depth in the past.



Fig. 66) Complex timeline made for the 5th exhibition about Zambujal – It shows the chronology of Zambujal, the chronology of Universal History and the climate changes through the temperature (red dotted line). © Olga Moreira, MMLT, G.A.I.

e) Interpretation Narratives

After the scientific observation and documentation of a site (addressing spatial and chronological data) archaeologists analyse artefacts and the morphology of the site in order to ask what was the site about, what activities were developed there, how was the surrounding landscape. Interpretation narratives comprise all the inductive knowledge archaeologists can extract from based on their scientific study and in comparison with similar sites.

Hypothetical reconstructions made by archaeologists are scientifically questioned and tested before they can be communicated. Two kinds of reconstructions are made. In scientific communication, technical drawings and models are used in an objective manner. Later, if the site is to be communicated to the public, artistic impressions are commissioned from artists, in order to depict human activity and to

reconstruct the landscape and architecture.

Archaeological reconstructions can use different styles according to the context of communication. Sometimes they use a canon differentiation between what is known and what is romanticised or reconstructed (making use of different opacity levels or making use of different colors).

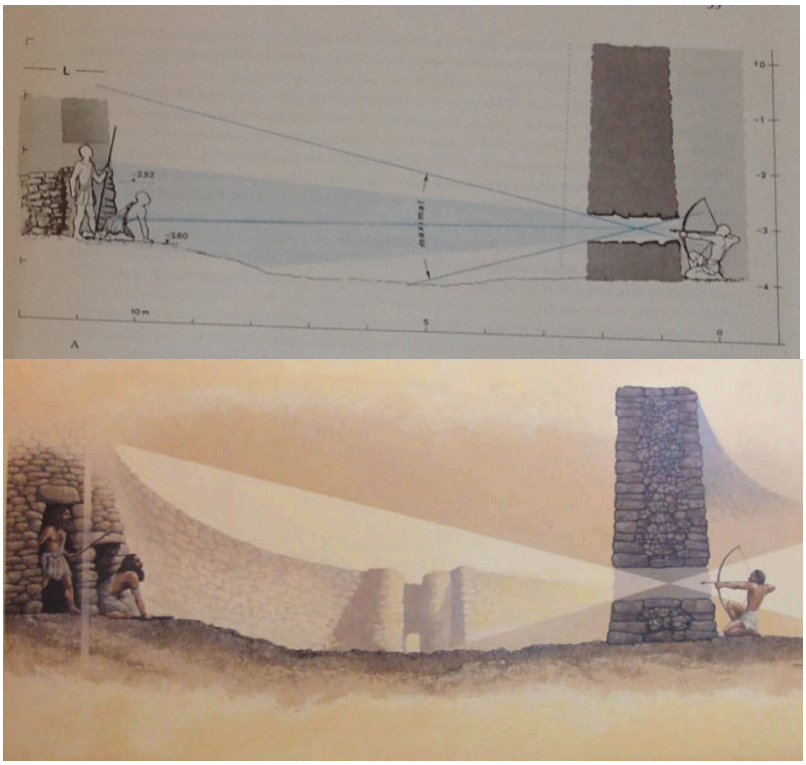


Fig. 67) Example of reconstructions for scientific publications and for public communication © G.A.I. / MMLT

Artistic reconstructions use much guesswork to complete the unknown parts of a picture as it is impossible to determine what something which has been destroyed might have looked like, and it is a considerable challenge to make a scene believable. Many artists and illustrators are very keen to use the past and archaeological data to create reconstructions. The Internet strengthened a network where their portfolios can be appreciated and their work commissioned[151]. This type of illustration is much more appealing for the general audience than scientific images. This is because they often do not have the cognitive tools to understand and decode the scientific visual conventions.

[151] See for example ADARQ https://www.asociacionadarq.org/

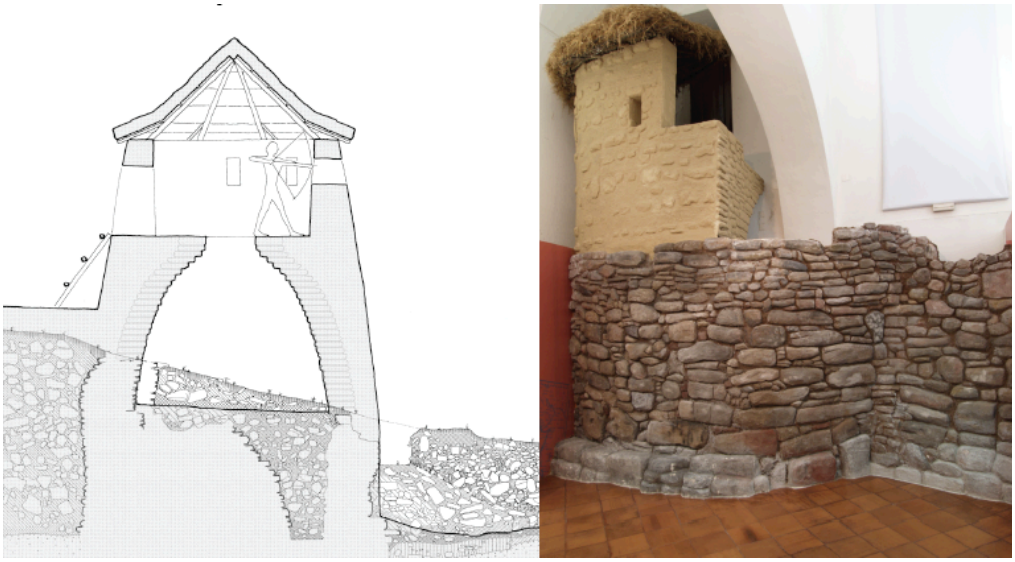


Fig. 68) Example of a reconstruction for scientific publications and for public communication © G.A.I. / MMLT



Fig. 69) Detail of the first reconstruction of the Zambujal archaeological site in 1971 using an overlap of drawing on black and white photography © G.A.I.



Fig. 70) Detail of the most recent reconstruction of Zambujal in a digital painting, 2016 © Ivan Gromicho / G.A.I.

f) Grand Narratives

The sixth typology of narrative that we have identified to communicate archaeological sites is the "grand narratives".Grand narratives appear in the themes or names of the exhibitions: "War and Commerce", "Environmental Changes", "Territory", "Cultural Production", "Transportation", "Funerary World" etc. Through these themes, exhibition planners "package" or "frame" the site, relating it to wider social contexts. These narratives, however, must be based on scientific evidence.

Interpretations about a site change from one generation of researchers to the other, each period imprinting its own worldview onto the interpretation of archaeological sites. In the case of Zambujal we identified changes in time.

In the first phase, Zambujal was interpreted as a *tholos* or *cairn*, as archaeologists were focused upon excavating the funerary world, and this was almost a bias that conditioned their view of the site. They "packaged" it as a funerary monument, and even created a drawing illustrating that view.

In the second phase, after clarifying that Zambujal was a fortress-like structure, the grand narratives revolved around questions of power through the domain of copper technology, of war through the evidence of the architectural typology and the evidence from hundreds of spearheads, of class differentiation evidenced by the concentration of finer decorated ceramics (and rich materials such as gold and copper) in the central part of the fortress versus the simpler ceramics found in the periphery.

In the 2006 exhibition, the grand narrative was War and Commerce. And the emphasis was on globalization, European commerce and how the site imported exotic materials such as ivory and gold, and exported copper.

In the analysis of the 2016 exhibition we identified two grand narratives: the environment, as exemplified by climate change and forestation timeline (see Fig. 66) and the territory, as exemplified by the presentation of several settlements - contemporaries of Zambujal, never shown before.



Fig. 71) Different exhibitions branding created by Olga Moreira © MMLT

3.4.2. Changes and Continuities

Changes and continuities in the research, documentation and dissemination of Zambujal were made evident through our study. Research in Zambujal during the last seven decades changed naturally, adapting to the characteristics and technologies of each time. Without wanting to be technological determinist, we must nevertheless attribute some changes to the modes of doing Archaeology due to digital tools. This tools, besides enabling new practical applications produce changes in behaviors (remembering McLuhan, *First we shape our tools, then our tools shape us*).



a) Changes and continuities in Scientific Research

In terms of scientific research the changes were made evident by the conditions of culture of each period. From the initial phase of Leonel Trindade's identification of the site and making the first surveys, towards a more scientific approach evidenced by the phase of the Sangmeister and Schubart interventions in the 60s and 70s, and a valorisation and dissemination phase at the turn of the millennium with many exhibitions, online presence, and opening of the site to the public in 2018.

The impact of digital technology in archaeological research and dissemination includes several aspects such as survey, storage and analysis of data (databases, GIS programs, etc.), but our study focused primarily on the visual and communication applications, detailed below.

Continuities rely on a maintenance of a scientific posture that always invested in the detailed and professional recording and registering the excavation. Publications both scientific and popular were made in all periods.



b) Changes and Continuities in Documentation

The adoption of digital *media* in the visual documentation of Zambujal began in the early 2000s, with the preparation of drawings for publication using digitization and computers.

In terms of illustrations and graphics, digital technology allowed some innovations that were not previously possible. With digital *media* there is no "original" drawing. If in analogical *media*, a pencil and paper drawing can be considered a unique original specimen, once it is digitized in can be replicated innumerable times. The problem that arises with this change is that digital documents can be transformed with digital software, creating several documents of the same representation. If these changes occur in the storage of digital documents a new name must be given to the new version of the drawing, otherwise there is a problem with retrieving information. A novelty that arises with digital documentation is the need for care in archiving. Data management and archive organization become extremely important.

Some benefits also exist in using digital illustration. Digital images can be combined and produced in many useful variations that in analogical *media* were more time consuming. Ivan Gromicho's reconstruction of Zambujal , for example, is a complex digital painting transformed several times only in small details without the need to recreate the whole image. As new information is scientifically obtained it can simply be added to the digital painting. The editing capacities of digital illustration are a benefit to the traditional workflow, but questions of archiving require special concern.

In the case of digital photography, the question of cost management has decreased. In analogical photography materials were expensive. With digital

photography there is the possibility of taking many more photographs with digital cameras (although color slides and black and white photographs are occasionally taken). The increasing number of photographs and drawings make the archive somehow difficult to manage. The dangers of stability of platforms are a reality. If on the one hand we have a growth in the possibilities of recording (not only digital photography, but also the introduction of video and sound), on the other hand we have a proportionally increasing risk of losing information if there is any error in the computer or if new hardware doesn't read older file formats. A solution to this problem is to keep prints of a selection of drawings and photographs, and publish them.

New technologies for data capture were introduced in Zambujal such as magnetogrametry (magnetic scanning that allows the detection of changes below the surface indicating possible finds), photogrammetry (photographic method that allows the creation of a 3D photographic model of the site) and total station points recording (with total stations). Despite the introduction of new data capture technologies there was a continuity in field drawing, still used today. Aerial photography made every year during the excavation is expected to be replaced in the future by drones. The number of videos taken during excavations is expected to increase as people can increasingly afford multimedia. Introduction of interactivity in site reports (such as our experience with the creation of an interactive field drawing – see chapter 6) may be introduced in the near future.

Documentation of popular and factual narratives is also promoted by digital technology. In our analysis we noted that the increasing availability of technology (audio and video recording) facilitated and promoted the recollection of these stories. The user-generated content in social *media* is an online practice expected to foster the archive of these kinds of anthropological stories related to the site. These new voices, as people are empowered with forms of capturing and publishing information about archaeological sites, can lead to a loss of authority from the traditional scientific gatekeeping, leading to fake or misleading information available online. New views that circulate outside official discourse and which may be shared in social media, might demand the creation of new work ethics.



c) Changes and Continuities in Dissemination

With regard to changes and continuities in the communication of Zambujal to the public, we should start by acknowledging that it is only after a site is properly studied that it can be disseminated[152].

Along with the great scientific contribution of Sangmeister and Schubart in their archaeological campaigns, they did not neglect public communication, exemplified in popular science publications and in the creation of two exhibitions still in the second phase determined by our study (1964-1994). In fact the first exhibition of 1987 was only organized after the publication of the main monograph of Zambujal[153] in 1981.

Our study revealed that Zambujal exhibitions coincided with scientific meetings and commemorations of institutional dates (the 1987 and 2007 exhibitions are related to conferences, the 1991 and 2016 linked to G.A.I. anniversaries), a fact that lead us to consider a *target audience* well informed about archaeology behind the communication strategy. In terms of content and narrative of the exhibitions, there was a constant concern to create pedagogical materials that would show what is not always evident to the naked eye in an archaeological site, amputated by nature. The reconstitutions that function as prostheses which allow one to visualize towers, houses, and the complete architecture of the fortress in what would be its original aspect, information that was only possible through scientific investigation.

[152] A proof of erroneous premature communication is the drawing published in Badaladas in 1954-55 depicting Zambujal as a tholos.

[153] Sangmeister, E., & Schubart, H. (1981). *Zambujal* (Madrider Beiträge, Vols. 1–2). Madrid, Mainz, Zabern.

Surprisingly, 3D models were a constant resource produced in all exhibits, and in some cases they were made on a natural scale creating an immersive experience for the visitor.

At the level of reception of Zambujal's communication to the public we have noticed that over time the public has expanded, including not only people with archeological knowledge but an increasingly wider public. Visitor studies carried out by the museum identified a prevalence of local public such as schools and family groups, followed by foreign language visitors. International visitors such as archaeologists, researchers and archaeology students, writers and documentary filmmakers are motivated to visit Zambujal due to their prior knowledge of its scientific value,.

Much work has been done by the *Museu Municipal Leonel Trindade* to publicize Zambujal, beginning with the change in the museum policies in 2006 redesigned to receive temporary exhibitions, attracting more frequent visitors; the creation of an educational service department with activities; and we should also mention the local community awareness of the regular archaeological campaigns, that create local cultural dynamics.

With regard to the adoption of digital *media* in Zambujal, we concluded that the use of computers began at the level of study and investigation (image capture, databases, image processing) and only later were they applied to public communication strategies (digital painting, web presence, digital museography - to which we contribute with our research). Our analysis indicated that Zambujal online presence strongly marks the third phase of our study (1994-2018). Innovations are marked by the plurality of voices online, where user-generated content and commercial services coexist with the institutional websites. Younger generations, with better digital literacy, will certainly be more inclined to interact and research online information, so institutions will have to respond to those expectations.

It is necessary to inspire archaeologists in digital literacy and usage of the new audiences of Archaeology, and for the potential capabilities as well as threats of these new publishing formats. Identifying this need, or research, will contribute (as described in the next chapters) towards the creation of a prototype of a virtual

exhibition. The reception of information about Zambujal by the public is expected to be from the Internet. So we must adapt our language to this form of distribution. The basis of digital culture should be integrated in archaeological courses curricula.

3.5. Summary

In this chapter we presented the results of an analysis of the visual content of the communication of the archaeological site of Zambujal. Visual media made to convey the Narratives about the site, adapt to the communication *genre:* Scientific publications adopt technical imagery while public communication makes use of artistic illustrations and three-dimensional models. We identified a pattern in the Narrative of the site across all the historical periods, but in the last phase of research, and due to technological innovations, such as video recordings and digital cameras, oral history and daily life of the excavation new narratives about the site are possible.

We discussed changes and continuities in the communication of Zambujal between 1946 and 2018, focusing on the impact of digital *media* on archaeological research, documentation and communication. Digital *media* impacted the communication of Zambujal providing the possibility for creating more accurate survey through data capture techniques, and allowing creative explorations, such as combinations of illustrations and design of exhibitions. The web presence of archaeological sites is addressed not only by institutions but also by amateurs who publish their own experiences about the site.

In the next chapter we shall survey the main digital trends and tools that can be used to communicate archaeological heritage sites.

Chapter 4 – Results

4.1. Cultural Interface Survey

This chapter will look at emerging forms of *storytelling* in cultural heritage sites using digital *media*. It addresses the second research question:

RQ 2 – What are the emerging modalities of presenting the past with interactive digital media?

Our survey of digital technologies applied to Heritage communication was divided in two moments as explained in section 2.2.2. We will start by reporting our pre-analysis of digital museography, through five pilot studies. Our first survey consisted in an *extensive* approach, selecting the maximum number possible of variation in typologies (in gallery apps, mobile apps, physical interaction and interactive kiosks in exhibits). The five case studies have in common the subject of communication (Archaeology and Heritage) and represent distinct modalities: in gallery installation, mobile app for iPhone, mobile app for iPad, and a guided visit.

We describe the ethnographic observation conducted according to three dimensions: technical specifications and target audience; forms of interaction and user experience; balance between physical and virtual experience. In the discussion we identify five distinct typologies: a) the human tour guide (considered here as comparative category with digital *mediation*); b) the *in-gallery* interactive installation; c) the mobile app; d) the iPad app; and e) the desktop online exhibition.

Our second survey adopted an *incisive* approach focusing in one typology of *media* artefacts to communicate Archaeology and Heritage – the desktop interactive documentary, also explained with more detail in section 2.2.2. They have in common the genre and the topic related to heritage and differ in the time of production (from 2006 to 2016) and design choices. We also selected five examples exploring their context of production, communication aim, the general user experience, the document structure and the media elements.

In the discussion of the interactive documentary analysis we address five

aspects to take into account when designing for this format: a) Durability / Digital Preservation, b) Promotion, c) Narrative Structure and d) Content and use of *media.*

The objective of this study is to inform and sustain the design choices that will be applied in the creation if a prototype of a virtual exhibition for Zambujal (our last project described in Chapter 6). But also contributes as a methodology for whoever wants to address interactive narrative from a practice based research standpoint.

4.2. How to study digital artefacts?

Several authors have noted the difficulties of studying digital artefacts (Manovich 2001; Brugger, 2008; Murray, 2012). Digital *media* artefacts are different from analogical *media*, they have graphic interfaces on the surface, but they have a underlying computational structure in digital language that has fragilities regarding its preservation. Older digital *media* such as floppy disks and even some CD-ROMs have a relatively short life when compared with analogical *media.* Nevertheless, these are the cultural artefacts and productions of our present time. We must be able to study and preserve them. Brugger (2008) highlights how digital artefacts are constantly changing, websites can show different versions, sometimes they cease to be available or are made with software that becomes illegible, stressing the need for the creation of an Internet archive, but alerting that not everything born in digital format can be preserved. He suggests preserving versions of websites that show print screens of the several webpages.

Digital artefacts, (websites, applications, databases, games, etc.) are not *static* as an image, or *linear* as a film. They are interactive and have non-linear narrative structures. They often present newer versions periodically, whereas we cannot refer to an "original" but of several instances of the same artefact.

Manovich (2001) focused on the visual language of digital *media* and how it is different from analogic *media*, relating it to the 1920s Avant-garde art movements and its inventions such as *collage*, cinema editing, performance and experimentation with sound technology, dance, and animation. Digital *media* have in fact much in common with the language of cinema, using techniques such as *montage*, cut and paste, graphic effects, movement and time.

Another idea that can be helpful to address in the study of digital artefacts is to consider them cultural productions such as a book or a film (Murray 2012). In this line of thought we can analyse digital interactive narrative as a cultural artefact and apply the methodologies for visual research. Gillian Rose (2001) suggests a methodology for visual analysis from a communication perspective. She recommends looking at the representation in itself (*site of the image*) and describing it in terms of typology, structure, content and aesthetics; then, looking at the *site of production*

(who developed it, with which aim, with what funding, when, how) and finally, looking at the *site of reception*, or *site of consumption (*how is it used and perceived by the final user).

Shannon Mattern (2014) proposed a methodology called *Interface Critique* that can be applied to analyse cultural interfaces (interfaces of systems that communicate cultural content) defining what constitutes an interface and determining how one might critique it. For this author, an *Interface* is the contact zone between the end user and a computational system. It operates at the screen level, and interaction designers should design for usability at this level.

Behind the *Interface* there is usually a "black box", i.e. a stack of protocols and programming systems that are not accessible to users. Users interact at the level of the interface using a language that is culturally shared, adopting affordances from the print *media* such as typography, design, composition; of the time based *media* such as film and animation; and add *interactivity,* allowed by the hyperlink, in which the interactor must impose gestures on the interface (click, swipe, pinch, rub, shake, etc.) in order to activate some action.

To analyse critically an interface, Mattern suggests addressing the following issues: the site's composition, organization, and aesthetics; how it structures the user's experience and navigation, and how intuitive and "seamless" that interaction is; how the site contextualizes the archival material (e.g., does it provide links to robust metadata, does it "animate" the material?); how the site "hierarchizes" the presentation of information (e.g., does it allow users to "dig deeper" for more data if they want it?); the availability of documentation and help for users who want or need it (i.e. does the site provide instructions for its use?). We must acknowledge that interacting with a new system must be effective, the user must understand where to click in order to navigate the website or system.

Although there is some novelty in these artefacts, the gestures and behaviours are also present in other *media* artefacts. To flip the pages of a book, to change the TV channels, etc., are *gestures of interaction* that are familiar to users long before digital *media* existed. However, to design for digital *media* there is a new set of metaphors, gestures, conventions that are culturally used and spread by a sub-group of people

who are digitally informed or have enough digital literacy and experience to relate to it. Janet Murray (2012) gives an example of culturally apprehended conventions, describing how a person entering a kitchen where she/he has never been before, can be able, by using common sense, to know that the fridge must be the large white volume, that the oven must be the one with round elements, that the forks and knifes must be in a drawer, or the glasses and dishes must be in a closet. Similarly, when designing a new interface, for example, a website, an interactive narrative, or a mobile app, there are some affordances, features, design elements and patterns that are usually assigned a certain place. Although there are no fixed rules, there are some design patterns that the users can easily learn and apprehend prior to using the system, usually in an instruction page included in the app. In order to study and understand better these problems we will make an empirical study, analysing different digital *media* artefacts.

4.3. Pre Analysis: Pilot Studies

Our study on interactive narratives started with exploratory observations of exhibitions using different digital mediation formats. We selected 5 experiences that were available to us at the time, related to the proximity or relevance to our topic (archaeological heritage and digital *storytelling*) (see section 3.2.2 for more details).

We started with a visit to *Museu Nacional dos Coches [National Coach Museum]* in Lisbon with our co-supervisor Michael Kunst to experiment a mobile gaming App that was developed for the museum[154] as a first approach to explore what could be applied in the future prototype for Zambujal. Later[155], we went to Madrid on the occasion of the inauguration of the renewed *Museo Arqueologico Nacional [National Archaeological Museum]* that had been closed for two years for refurbishing. Here we had the opportunity to observe the latest trends in archaeological museography and experiment the new wayfinding and audio guide

[154] Museu Nacional dos Coches Game and Guide (https://itunes.apple.com/pt/app/guia-jogo-do-museu-nacional-dos-coches/id579922139?mt=8)

[155] In May 2014

App of the museum[156]. Once in Madrid we had the chance to visit other cultural heritage institutionswhich also had digital mediation. In the cultural complex *El Matadero*, we analysed two exhibitions: *La Biblioteca Nacional de Israel*[157], and *La Villa de los Papiros*[158]. Back in Portugal, we also observed a guided tour about Zambujal in *Museu Municipal Leonel Trindade* in Torres Vedras aimed at children and families, which provided us with an idea of how Zambujal is communicated to this target audience. We did some video and sound recordings that could be used in future digital *storytelling* projects.

Date	Offline Observation Case studies	Typology
25 March 2014	Museu Nacional dos Coches Game and Guide[159]	Mobile app – Game for smartphone
1 May 2014	La Biblioteca Nacional de Israel iPad virtual exhibition[160]	Mobile app – virtual exhibition for tablet
1 May 2014	La Villa de los Papiros exhibition[161]	In Gallery installation
1 May 2014	MAN Museo Arqueologico Nacional way finding App[162]	Mobile App
24May 2014	Guided Visit and Workshop to Zambujal exhibition room[163]	Guided Visit

Table 10) List of observations of digital *media* in museums

The aim of these five case studies was twofold, first to map the technologies available to interpret cultural heritage with digital *media,* secondly to inform the choice of a platform to apply in our practical experiment in Zambujal.

[156] MAN Museo Arqueologico Nacional App https://play.google.com/store/apps/details?id=man.gvam&hl=es https://itunes.apple.com/es/app/man-museo-arqueol%C3%B3gico-nacional/id845542885?mt=8

[157] Constekam, T. (2014) La memoria judía se expone en iPad, El Pais, 05/03/2014 https://elpais.com/cultura/2014/03/05/actualidad/1394047004_090821.html

[158] La Villa de los Papiros http://www.mataderomadrid.org/ficha/2824/la-villa-de-los-papiros.html

[159] *Museu Nacional dos Coches Game and Guide* (https://itunes.apple.com/pt/app/guia-jogo-do-museu-nacional-dos-coches/id579922139?mt=8)

[160] Reference retrieved from the newspaer article: Constekam, T. (2014) *La memoria judía se expone en iPad,* El Pais, 05/03/2014 https://elpais.com/cultura/2014/03/05/actualidad/1394047004_090821.html

[161] La Villa de Los Papiros http://www.mataderomadrid.org/ficha/2824/la-villa-de-los-papiros.html

[162] MAN Museo Arqueologico Nacional App https://play.google.com/store/apps/details?id=man.gvam&hl=es https://itunes.apple.com/es/app/man-museo-arqueol%C3%B3gico-nacional/id845542885?mt=8

[163] This observation was made as term of comparation to virtual experiences.

4.3.1. Mobile App "Audio Guide and Game of Museu dos Coches", Museu dos Coches, Lisbon.

Technical specifications and target audience

The Audio Guide and Game of Museu dos Coches is a native free app available for Android and Macintosh, which was developed by the Portuguese *media* company "Exciting Spaces" in 2012. The target audience of this interactive experience is families and school children, although it can be played by adults too. Information is simple and playful.

Form of Interaction and User Experience

The app can be downloaded through the free Wi-Fi (see Fig. 75) at the entrance of the exhibition. A roll up banner in this space informs the visitors. The experience starts with the landing page where the user can choose to read the instructions or start the experience. The experience starts with an interface with a plan of the exhibition with a numbered sequence of 15 points of interest that are related to different physical places in the museum creating a *location based narrative* (see Fig.76). To experience the tour, the user must move through the gallery approaching the spots with content, indicated in the map. *Interaction* happens upon clicking on the number on the map. For each number there is a description of the museum artefact (several coaches from the 16th to 20th century belonging to Portuguese kings) followed by a quiz with a multiple-choice questionnaire. In terms of *multimedia*, there are points with short animations, others merely with text and photographs; another shows a video (Queen Elisabeth of England being driven in the coach during a visit to Portugal in an archival movie from the 1950s).

Balance between Physical and Virtual Experience

The visitor who responds to all the fifteen questions finishes the game, and if all answers were correct, he can pick up a prize in the Museum Shop, in a good example of a balance between the virtual and the physical experience. The numbered map is a good basis for following the narrative, guiding the visitor step by stap through the gallery, and information is easy to understand.

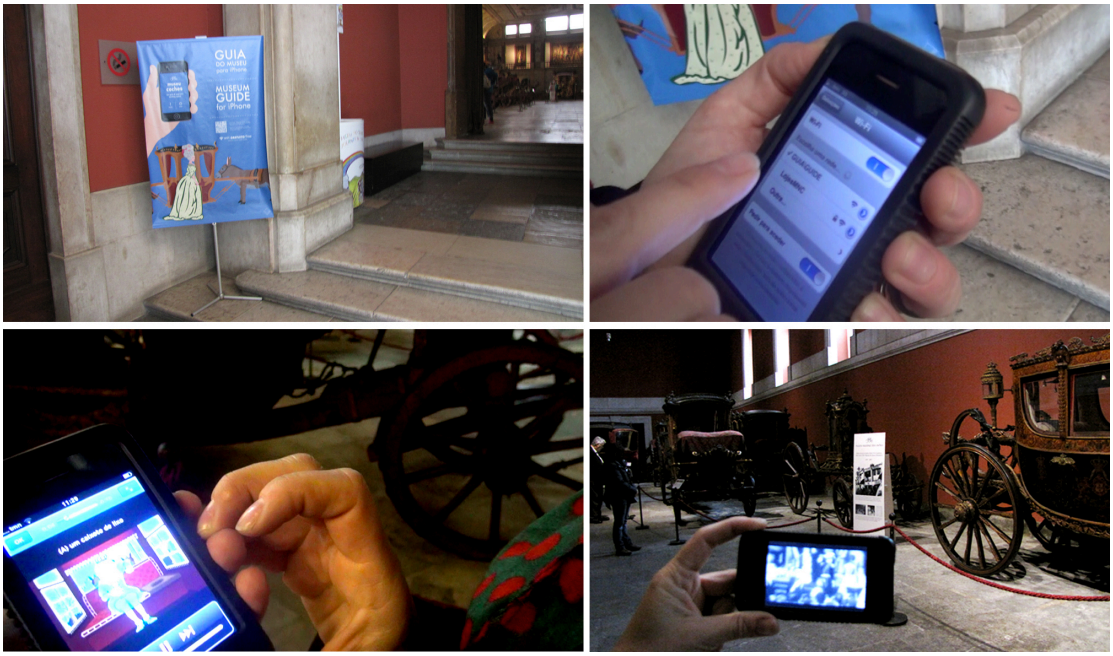


Fig. 75) Interacting with the app: Installation, playing the quiz, watching animations and video © G.Casella

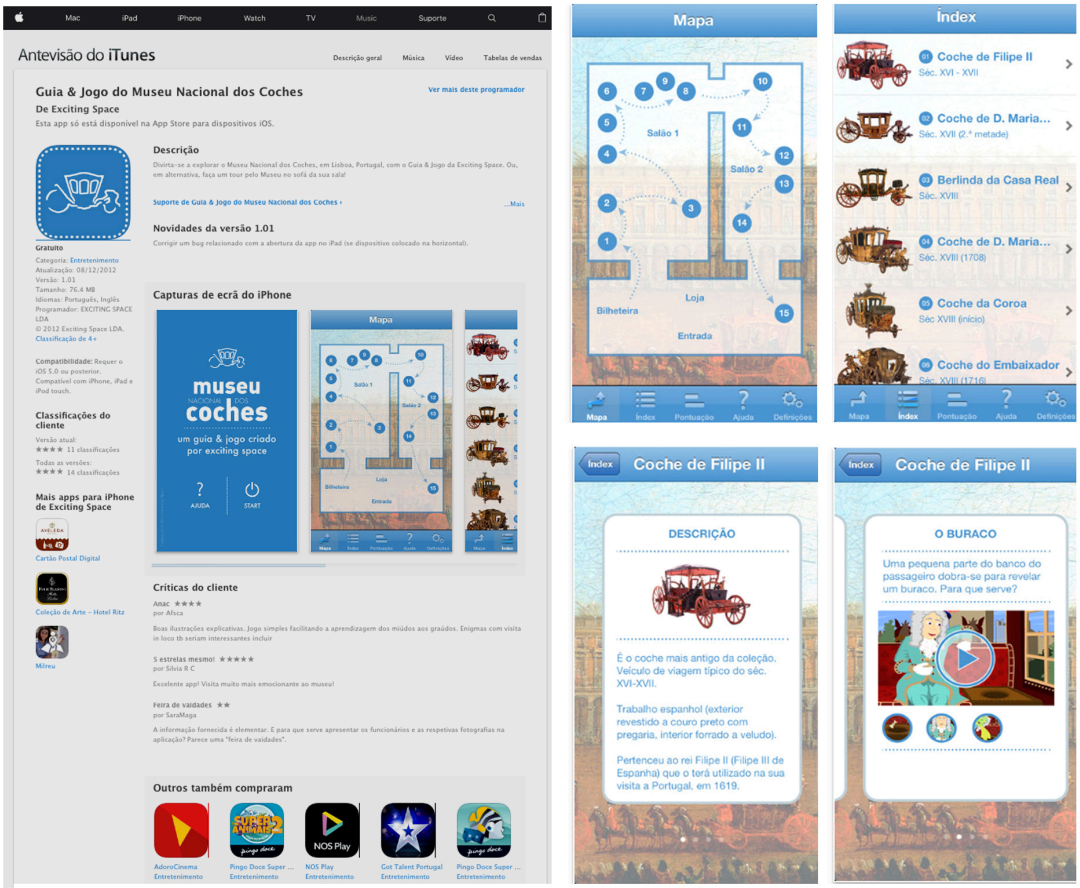


Fig. 76) Appstore page of Guide and Game of the Chariots National Museum and screenshots[164] © Exciting Spaces

[164] Museu Nacional dos Coches Game and Guide (https://itunes.apple.com/pt/app/guia-jogo-do-museu-nacional-dos-coches/id579922139?mt=8)

4.3.2. iPad Exhibition "La Biblioteca Nacional de Israel", Casa del Lector, Madrid.

Technical specifications and target audience

Our second observation was an iPad exhibition for *La Casa del Lector* [165] in Madrid, a public library service situated in the big cultural complex called *El Matadero*[166]. This former industrial butchers' warehouse now transformed into a recreational space hosting several creative enterprises (art schools, galleries, theatres, libraries). This pilot study was motivated by a news article in *El Pais*[167] newspaper, mentioning the launching of the first "virtual-only" exhibition for iPad.

The App *"La Biblioteca Nacional de Israel" [The National Library of Israel]* (5th March-21st September 2014*)* is only available at the exhibition space. A text printed on the wall of the current exhibition reads: "*We want to get closer to the library of the future promoting exhibitions (this is the first one) that could be windows upon big libraries around the world that are adapting to the technological revolution*". This virtual exhibition was meant to be the first of similar initiatives to inform about other important libraries around the world, which could share their collections and processes using digital *media* as a form of engagement. As an institution that promotes reading, *La Casa del Lector* sees in digital technology an opportunity to engage the audiences, for example, they offer free e-books for download if people physically visit the place.

The target audience is a well-informed visitor, familiar with digital technology. The guest book of the exhibition provided different visitors' insight. Some wrote that it was too difficult to use, others mentioned that it was easy. Some said it should be possible to make the download at home, others said it should be made for Android also, and not iPad only.

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[165] Casa del Lector URL http://casalector.fundaciongsr.org/

[166] El Matadero, Madrid, URL http://www.mataderomadrid.org/

[167] Constekam, T. (2014) La memoria judía se expone en iPad, El Pais, 05/03/2014 https://elpais.com/cultura/2014/03/05/actualidad/1394047004_090821.html

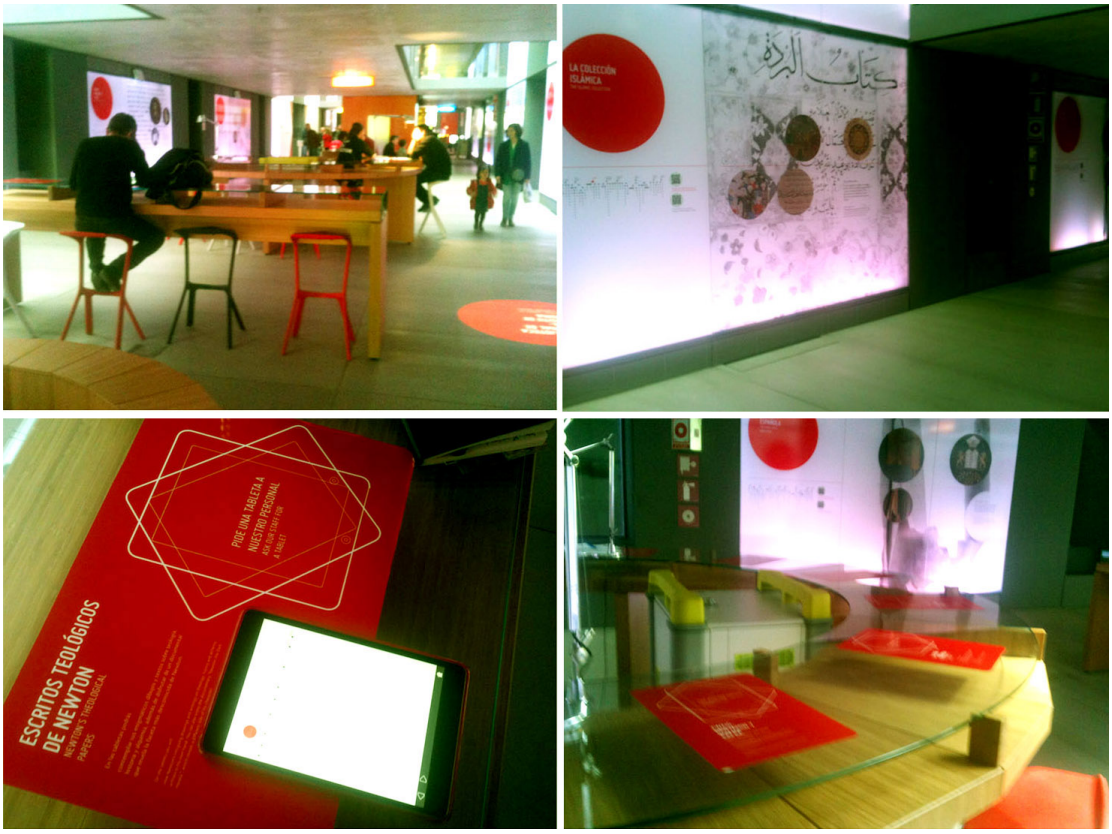


Fig. 77) The exhibition space with tables where the visitor should read the tablet. On the walls big prints with QR Codes indicate the visitor which content should be accessed on the tablet.

Form of Interaction and User Experience

To experience the virtual exhibition, the visitor could either bring his own iPad or rent one of the 30 tablets available at the desk for free. In the introduction of the exhibition a text explains that the visitor can access multimedia content by scanning the QR Codes printed near the wall panels. By moving around the exhibition it is possible to access the several points of interest with different topics that existed as chapters in the interactive iPad narrative.

The wall prints have a visual representation of what can be seen in the iPad, but in the iPad the visitor could see more text, video, audio and photographs displayed as a scroll, accessible by a visual menu.

Regarding content, the iPad exhibition is bilingual (Spanish and English) and is composed by a branched narrative where the visitor can explore several topics of

Jewish culture, such as maps of Jerusalem, the story of a Jewish family deported to Auschwitz, explore a scroll of the Torah, explore ancient manuscripts like the Mishná, a canonical text of the Jewish law. There are also highlights to the historical archives highlighted as heritage of the Biblioteca Nacional de Israel of writers such as Walter Benjamin, Franz Kafka or Stefan Zweig.

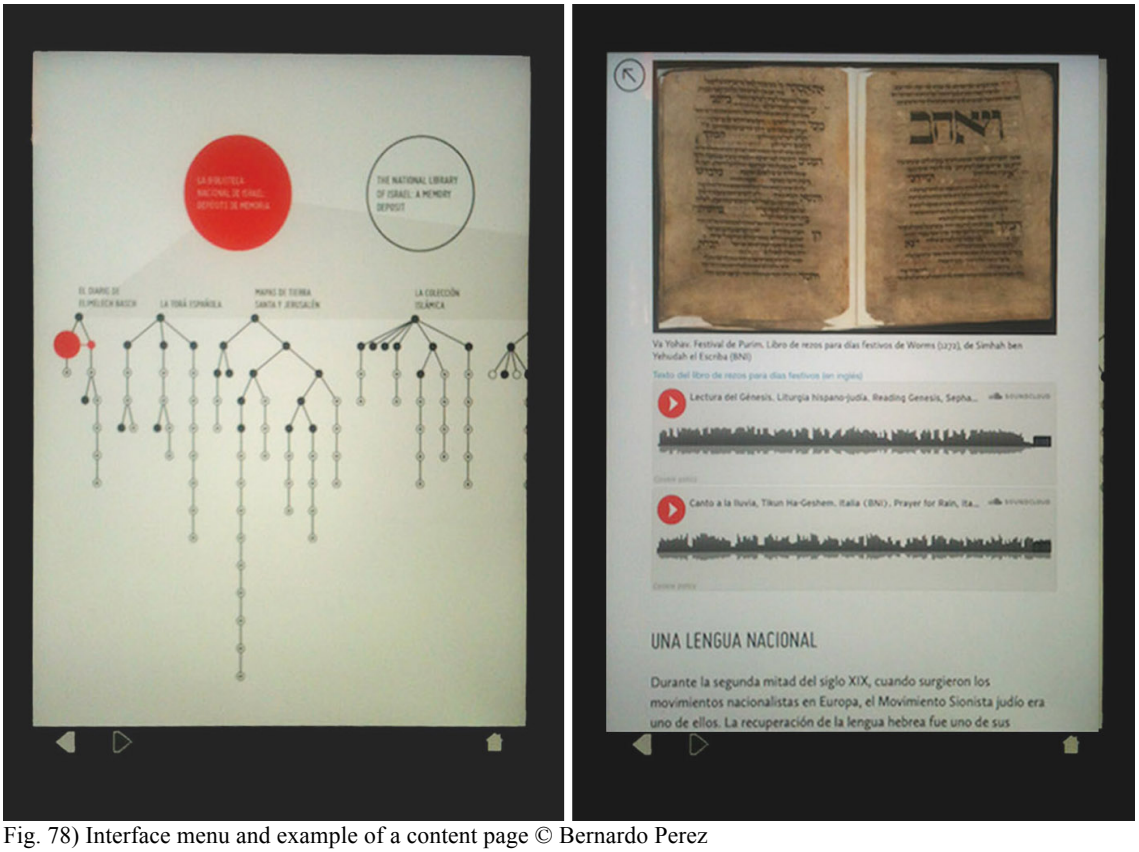


Fig. 78) Interface menu and example of a content page © Bernardo Perez

Balance between Physical and Virtual Experience

In the physical space there is a very minimal scenography that invited the visitor to sit or stand in designed spaces, and on the walls printed references reflected the design of the digital interface. The user either payed attention to the real world or interacted with the screen. In our understanding, the virtual experience should be appreciated in itself as a stand-alone entity and the physical scenarios, such as a comfortable reading zone is a powerful asset to promote the success of the app.

4.3.3. *In-gallery* interactive table "La Villa de los Papiros", El Matadero, Madrid

Technical specifications and target audience

Our third observation was an in-gallery interactive table at the exhibition *"La Villa de los Papiros"*, a documental exhibition about *The Papyri House*, a residence for roman intellectuals from Herculaneum in Italy (56 BC) and its archaeological discovery in the eighteenth century. This house is the only classical library known that has survived to our days. In the excavations thousands of burnt cylinders (carbonized papyri) were found. Some were recovered and transcribed.

The exhibition has a very small quantity of artefacts, but makes great use of scenography and digital *media*. It employs three kinds of *media*: big wall projections of virtual reconstructions of the papyri house, simulating both its interior and exterior in life size; small interactive kiosks with contextual information about archaeological artefacts on display; and a large interactive table where visitors can make a playful exploration of exhibition-related themes.

Form of Interaction and User Experience

The interactive table was the element that we chose to exemplify as an in-gallery app. It consisted of a table type surface with a projection of text that had hyperlinks to deeper levels of content. By clicking on a word, related content is displayed, as in a website presentation of text and image.

Balance between Physical and Virtual Experience

This case study is an example of how exhibitions can be made today almost without objects but with *storytelling* and scenography. Some interactive kiosks had information about artifacts. The passage from one room of the exhibition to the other had wall projections simulating a roman house. An interactive table (see Fig. 80) with a projection and physical interaction seemed to be the most attractive element to visitors who approached it and interacted with it.



Fig. 79) Example of the scenography of the exhibition *La Villa de Los Papiros*

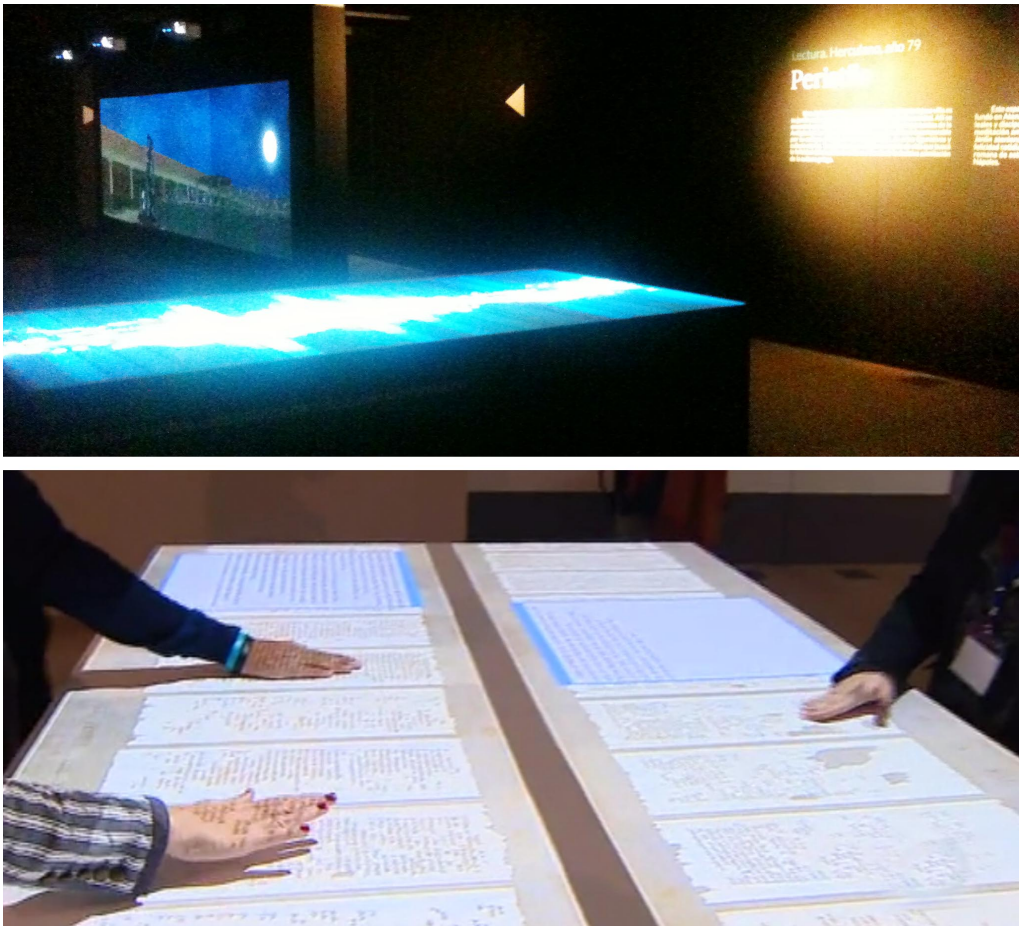


Fig. 80) Example of 3D reconstruction projected on the wall and interactive table

4.3.4. Mobile App for Smartphone “Museo Arqueologico Nacional”, Madrid

Technical specifications and target audience

The *Museo Arqueologico Nacional* [National Archaeological Museum] in Madrid reopened in April 2014 after being closed for reformulation of its organization and display. Along the exhibition, the museum offers several types of multimedia elements: a vertical video screen outside the museum; an online app free for download or the possibility to rent a tablet at the ticket desk; in-gallery interactives; multimedia installations and videos.

Given the variety of applications, the target audience seems to be the heterogeneous visitors of a national archaeological museum. Interactive installations are accessible to people of all ages. Video animations convey information in an accessible way to all ages. The audio app aims at an older audience. The strategy of having different applications for different age groups is a good choice for a museum of this kind.



Fig. 81) Interactive display outside the Museo Arqueologico Nacional, Madrid © G. Casella

Form of Interaction and User Experience

In the main entrance, outside the museum there is a vertical screen with multimedia elements, passing a loop video with photographs of the interior of the museum with its opening hours, clearly aimed at the general public.

On entering the exhibition a multimedia installation shows an impressive giant wall full of screens with videos and photos about archaeology and archaeological research (see Fig. 82). The room has low light and every 3 minutes the hundreds of screens turn off from one point to the other (as if being destroyed) and we hear the sound that resembles the pieces of dominos falling down. After a few seconds in the dark, the screens light up again and we can see hundreds of fragments related to Archaeology, excerpts of film, photographs, and phrases. The overall effect is both aesthetically pleasant and thought provoking, providing the visitor with the mood to learn, discover, and "dig" archaeologically related facts and information.



Fig. 82) Multimedia wall installation in Museo Arqueologico Nacional, Madrid © G. Casella

At the ticket desk a sign indicates the existence of an audio guide saying:

> "*Multimedia Guide – The guide has more than 200 voice clips animations and graphics. It also offers subtitles, gestural language and audio description for people deaf and blind- You have two ways of enjoy it: Renting a Guide or Download the App".* (See Fig. 83)

Visitors can rent a tablet with the installed app, a neck trap and headphones for 2€.

The museum offers free Wi-Fi and the visitors can also make a free download of the app and install it in their own personal devices. The audio guide is aimed at the general public who wants to have a very complete guided visit.

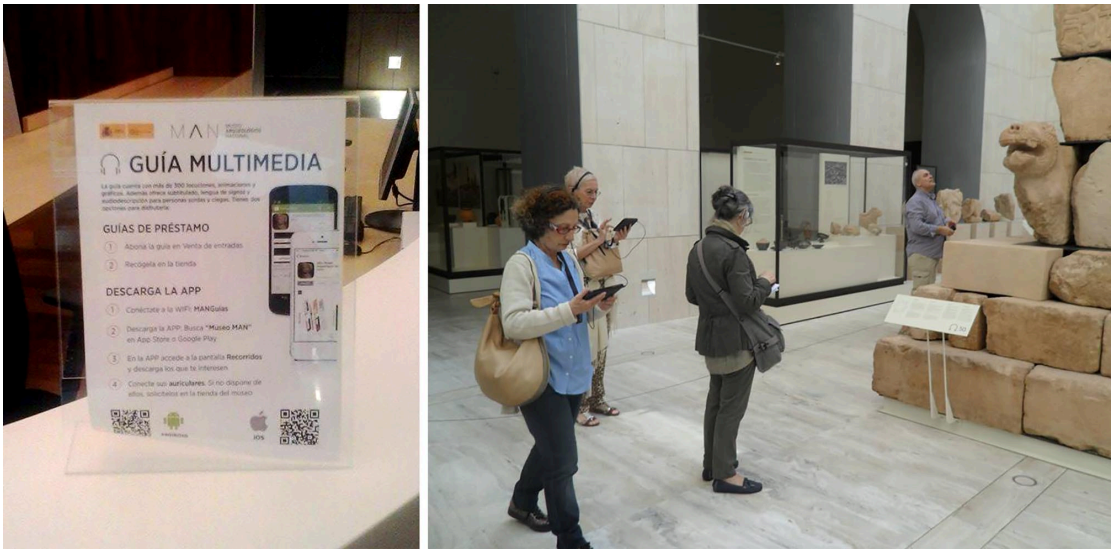


Fig. 83) Multimedia guide used in the Museo Arqueologico Nacional, Madrid © GVAM

After installing the app[168], the main menu is divided into three parts: Tours and Accessibility. In "Start Tour", a voice welcomes the visitor to MNA:

> *"Welcome to the MNA. We present a selection of artefacts of the museum. Connect to the museum Wi-Fi to access exclusive content (only available inside the museum space). In total the guide has more than 300 narrations accompanied by videos and photographs. With this application you can explore the Museum Collection from Prehistory to the 19th century.*

The "Accessibility" button activates audio description for audio impaired visitors. If we press pause in the audio we are directed to the main menu divided in five parts: Home, Map, Index, Keyboard and Info (see Fig.84).

[168] MAN Museo Arqueologico Nacional App https://itunes.apple.com/es/app/man-museo-arqueol%C3%B3gico-nacional/id845542885?mt=8



Fig. 84) App Interface used in Museo Arqueologico Nacional, Madrid © GVA

In the main galleries, exhibition display makes great use of illustration; both in dioramas and in animated videos, which can be played by pressing a button near the screen (see Fig. 85). Videos last between 2 and 4 minutes, and there are more than 20. They are curated by Ruth Maite and produced by the studios 'Sopa de Sobre' and 'Lo Ranchito'. We identified 3 different illustrators that used 2D and 3D animation. Some videos also remix different archive materials, photographs, plans and maps. Each video has a loop intro with an instruction to put the button to start video.


Fig. 85) Examples of displays with illustration, dioramas and videos in Museo Arqueologico Nacional, Madrid © G. Casella

Balance between Physical and Virtual Experience

The case study of the Museo Arqueologico Nacional has several different modes of interacting with the virtual experiences. The information panel outside the museum is used for obtaining information about the museum opening hours and the current exhibitions on display. By having an interactive display the museum can change the information periodically without having to print different posters about the changing exhibitions. It is also a form of entertaining the visitors queuing in line to enter the museum.

The interactive wall in the entrance of the exhibition that changes its display every three minutes creates an immersive feel. Although not informative, it gives clues about what is archaeology. Hundreds of screens showing videos of hands excavating, close ups of eyes opening and closing, old documents and drawings, artefacts, etc., provoke curiosity about several aspects of archaeology. It stimulates the visitor before entering the more pedagogical experience of staying in the galleries.

The interactive kiosks along the galleries allow the visitor to play around with the digital systems exploring maps and timelines. People tend to interact in groups, experimenting the possibilities of the artefact.

The videos with animations across all the galleries only begin if the person pushes a button. The fact that the user needs to trigger this action makes him pay more attention - being more receptive to learn than if the video was simply passing in loop. Besides, the short videos of one to three minutes long are mostly made with animation, creating engaging and amusing ways of understanding otherwise complex and dense stories.

Finally, the audio guide app is a personal experience. People walk around on their own with headphones on, somehow isolated, and constantly shifting their look between the screen and the artefacts on display. Some features of the app only work inside the museum, like the personalized tours. But other content can be seen outside the museum, at home, showing text and image.

In all, the museum has succeeded in pedagogical strategies that enhance learning in amusing and satisfactory ways.

4.3.5. 'Guided Visit and Workshop' to the Zambujal exhibition room, Museu Municipal Leonel Trindade, Torres Vedras.

Technical specifications and target audience

The event entitled *"Oficina e visita ao núcleo expositivo do Castro do Zambujal"* [Workshop and visit to the Zambujal exhibition room] lasting 1h30m was led by Museum educator Carlos Silva in Museu Municipal Leonel Trindade. Although no digital *media* artefact related to Zambujal exists in this museum, there is an interactive table in a temporary exhibition about the Lines of Torres Vedras (Napoleonic Wars). We included this observation in our thesis because it provided an opportunity to see how the site is communicated to a general audience. The target audience of this visit is children and families[169].



Fig. 86) Interpretation center room dedicated to Zambujal and 'Hands-on' workshop in Museu Municipal Leonel Trindade, Torres Vedras © G. Casella

[169] We made a sound recording of the tour and also made some videos of the demonstrations he did in the workshop at the end of the visit. These recordings can be very useful when we develop our own digital story about Zambujal in the third part of the thesis.

Form of Interaction and User Experience

Carlos Silva, the museum guide and educator, used a very simple yet accurate language. He often addressed the audience with questions to foster engagement. During the visit, listening to his voice, we could sense the excitement he transmitted in working daily in a museum with such a rich heritage.

The tour started with the collective observation of the threedimensional model with the reconstructions of Zambujal explaining that it was a fortress made by inhabitants of Torres Vedras County, five thousand years ago. Through a walk among the panels of the 2007 exhibitions which were repurposed in this space (see Fig. 86), he addressed themes such as what the people of Zambujal ate, how they farmed the land and herded cattle, how they made tools to hunt animals but sometimes also to defend themselves against possible attacks, and that they were protecting something important, possibly the technology of copper, that was an innovation in those times. Spear heads and needles were the kinds of tools that Man began to manufacture in the passage from the Stone Age to the Age of Metallurgy. The Neolithic was a period where people changed their way of life from being nomads to settling down and developing agriculture, undertaking crafts such as pottery, weaving, and producing instruments made of animal bones. Archaeological artefacts on display in a wood and glass cabinet from the early museum (see Fig. 11) are material witnesses of those times recovered by archaeologists that enable us to tell these stories.

After the tour in this interpretation centre area, a hands-on activity took place, where Carlos Silva demonstrated how to make knap flints, grind cereals, how to use bow and arrow, and sharing artefacts and replicas that the participants could hold in their hands (Fig. 86).

4.3.6. Discussion of Pilot Studies

After concluding the description we were able to identify five kinds of media: a) the human mediation tour guide (stated here as a term of comparison); b) the in-gallery installation of interactive tables; c) the mobile smartphone app; d) the mobile iPad app; and e) the online virtual exhibition.

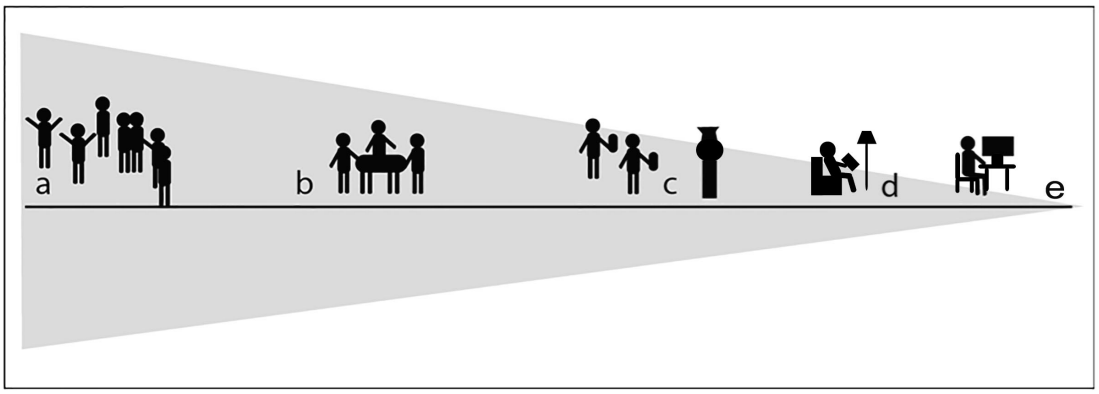


Table 11) Five kinds of engagement: a) human mediated tour; b) *in-gallery* installation; c) mobile application; d) iPad interaction; e) desktop application. © G. Casella

a) The human mediated tour guide

We included this kind of media as a term of comparison to other digital artefact media. In our understanding, the experience of human interaction is very difficult to replace by a technological artefact. Visitors can interact with the guide, pose questions, and make empathy through his passion and knowledge about the referent, always translating the information into small narratives and amusing facts. The guide addressed the audience with questions in order to catch attention. The "live history" moment where he enacted prehistoric flint knapping and showed replicas of reconstructed artefacts contributed to a better understanding of daily life in the past. Interacting with models and replicas, helped visualize how the archaeological site was, and helped place it in time (five thousand years ago)[170]. The human guide mediation is by far the most interactive and engaging when related to digital mediation. Digital technology tries to achieve this degree of enjoyment, by providing information and interaction. But in our opinion, the human contact is still the most impressive and memorable way of communicating.

[170] We noticed one child's response to guess to what time the settlement belonged and he thought it was from the time of dinosaurs (c. 60 or more million years ago).

b) The *in-gallery* installation

During our visit to the "The House of Papyri" we were able to identify a series of digital technology that can be presented inside a gallery as part of the exhibition (respectively, wall projection, interactive kiosks and physical interaction table). Projections on the gallery walls in the "House of the Papyri" exhibition, such as virtual tours and reconstructions are seldom used in archaeological exhibitions, having the same function of illustration reconstruction, but adding a cinematic characteristic as they present a fly-through of a threedimensional model or a virtual world.

The wall installation with hundreds of TV screens in the entrance of the Museo Arqueologico Nacional shows how audio-visual *media* can stimulate other senses besides sight. More than contemplating single objects in a gallery we can hear sounds and sense movement in an installation that is thought provoking and engaging.

Interactive kiosks or interactive tables (observed in both MAN and House of the Papyri exhibitions) are examples of the increasingly common application of these devices in contemporary exhibitions. By means of touching a hyperlink, the viewer can trigger an action and access *media* content (text, video, or gallery of images). In the Museo Arqueologico Nacional we also saw substantial use of video display animations that were activated by pressing a button near the TV screen. Short animated documentaries are a rich format for *storytelling* in archaeology and allow a creative exploration of the subjects. Sometimes they use non-realistic rendering, which in our personal opinion is richer than the hyper realistic treatment of reconstructions and 3D visualizations.

In interactive tables, people interact with the table in groups. They seem fascinated by the possibilities of free associations of loose concepts than spending time reading and interacting with the table.

c) The mobile app

The third modality we identified is the mobile app. The MAN app works as a wayfinding map where a visitor could plan a visit and hear a narrator reading aloud what could also be read in the artefacts captions. This redundancy raises the question of what differences does this function have compared to traditional museum leaflets with the rooms plan. We nevertheless saw how visitors were happy engaging with the artefact. We could observe that there are several models of delivering this type of content: renting the hardware raises problems of maintenance, not to mention health issues in sharing such close contact wearable *media* (headphones).

There is also the case of free / payable content. In the case of MAN one could install the free version and have access to few experiences, while if you pay you could have more and improved quality of content.

In the case of the Museu dos Coches game, we saw an example of how 'gamification' can be applied as a kind of treasure hunt and quiz gaming[171].

d) The iPad app

In the case of the iPad app experience illustrated by La Biblioteca Nacional de Israel exhibition observed in La Casa del Lector, we found it very interesting how an iPad could enhance a physical exhibition. We noticed that the content is more like 'long form journalism'. It is something you can learn and deepen your understanding, but it requires some time to read. The option of having sound and movie clips makes the experience of reading more engaging. Nevertheless, this experience was more like reading a book than being in an exhibition.

We found it interesting that iPad exhibitions can be designed to be experienced at home, with no need to go physically to a museum. We know from literature that the way people interact with desktops, smartphones and tablets is different (Proctor, 2011): while interacting with a desktop the user is usually alone,

[171] Further research should be made on this area, which stands on its own right (location based storytelling and gaming) but it is not our core interest in this thesis.

sitting at a desk, with the screen at eye level and hands on the keyboard, he or she is willing to write on the keyboard or perform actions with the mouse; while interacting with a smartphone people usually see maps, check quick information about for instance museum opening ours, or buy tickets. This can be done while walking or commuting, so it is usually an experience made near other people; finally, the experience of interacting with a tablet is similar to reading a magazine, sitting comfortably on a sofa, with a hot cup of tea.

e) The Desktop Virtual Exhibition

Another category we would like to mention is the Desktop virtual exhibition. For this kind of artefact and experience we will explore a few examples in detail in the next section. This modality of what can be defined as a virtual exhibition has in itself different types. One, is the virtual tour of galleries, many museums offer online tours. Another kind is the simple website of an exhibition that can have buttons with hyperlinks to other sections for reading information. Museums and collections in general also provide online databases, but although the user can interact with the material, it cannot be considered to be a *storytelling* artefact. To have *storytelling* the visitor must be engaged with the pace of the narrative, must feel compelled to explore the boundaries and sections of the work. It must make use of "cinematic" features like full screen views, or background music. The assessment of what constitutes a good or less good virtual exhibition is difficult to make, as it is a very personal qualitative appreciation. But in the next section we will show a few good examples, and point to online repositories where this kind of artefact can be found and experienced.

The following table constitutes an example of what could become a survey in mapping digital technologies in cultural heritage communication. We have included a few examples of each type, but this list could be easily continued at any moment. As we fill the spaces on the two right-hand columns it becomes evident that it is important to define the terms. If we search for "virtual exhibitions" in Portugal, we most likely end up in Museum Websites with access to galleries of images, such as in a database. For us, that is not a virtual exhibition. Let us explore in the next section what we conceive as virtual exhibitions.

TYPE	CASE STUDIES	OTHER EXAMPLES IN PORTUGAL	OTHER EXAMPLES WORLDWIDE
a) The human tour guide	Torres Vedras Museum	- not relevant -	- not relevant-
b) The in Gallery Installation	The House of Papyrus "Casa del Lector", El Matadero, Madrid.	StororicenterLisbon https://lisboastorycentre.pt/pt/content/lisboa-story-centre	Sarah Kenderdine's instalations https://sarahkenderdine.info/
c) The mobile app	Museo Arqueologico Nacional (MAN) wayfinding app	Museu dos Coches Mobile game. https://itunes.apple.com/us/app/the-national-coach-museum-guide-game/id579922139?mt=8 Milreu Audioguide. https://itunes.apple.com/us/app/milreu/id885092048?ls=1&mt=8	Londinium App Streetmuseum https://www.youtube.com/watch?v=raUTJdtpdM8
d) The iPad app	La Biblioteca Nacional de Israel "Casa del Lector", El Matadero, Madrid.	Slavery Museum Lagos https://itunes.apple.com/us/app/museu-mercado-de-escravos/id1118476972?mt=8	Mount St Helens iPad app by Second Story http://archive.secondstory.com/project/browse/featured-work/return-to-life
e) The Desktop Virtual Exhibition	*Becoming Human* (2009) http://www.becominghuman.org/	"Virtual Exibit" bad example http://arquivomunicipal.cm-lisboa.pt/pt/galerias/ "Virtual Exibit" good example http://neoublie.grahams-port.com/	Interactive Garden of Delights Bosch https://tuinderlusten-jheronimusbosch.ntr.nl/en

Table 12) Comparative table of different types of mediation

4.4. Interface Critique of Virtual Exhibitions

In this section we explore different interactive narratives that present cultural content online. To select an operative sample of just five case studies to analyse in the next section, we firstly created a wordpress blog (*iStories* https://istoriessite.wordpress.com/) to curate several web documentaries, similar to other online repositories[173], as explained in section 2.2.2.

This personal database allowed us to keep a personal collection of state of the art examples. In the *iStories* site, we created an entry as a blog post with a screenshot and the URL of the site and add at least three tags that allows us later to perform a search according to theme (ex. Archaeology, WWII, History of Medicine), typology (web doc, interactive timeline), country (Portugal, France), producer (*Arte TV, Submarine Channel, Expresso*, etc.).

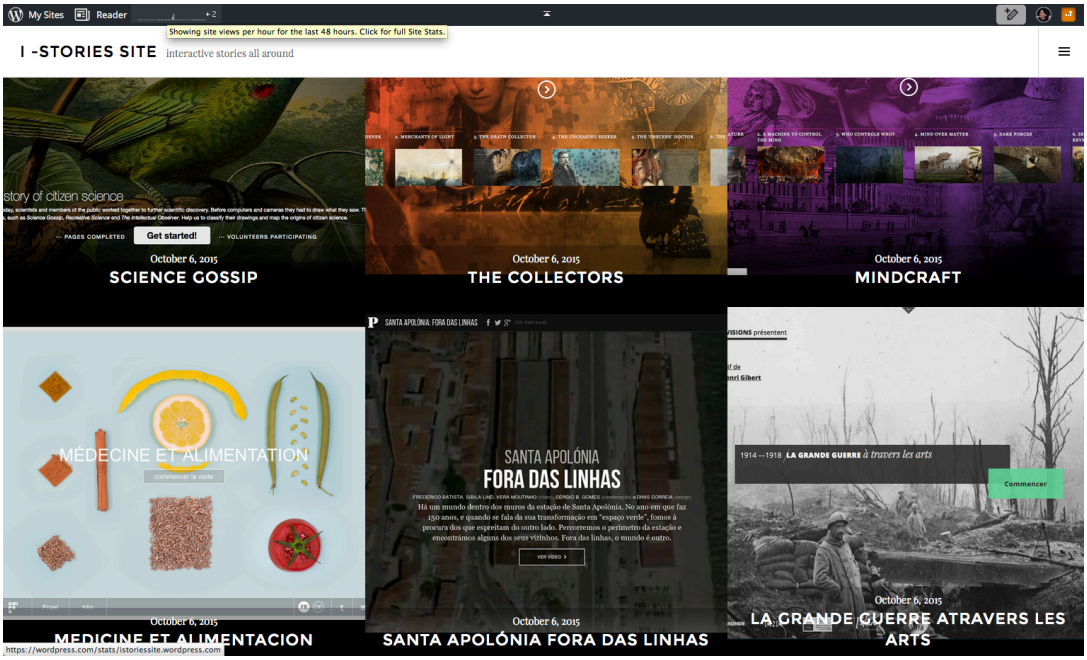


Fig. 87) Screenshot of the database developed in the context of this thesis' research https://istoriessite.wordpress.com/ © G. Casella

[173] To name a few: IDFA Doclab project database https://www.doclab.org/category/projects/ ; MIT Docubase https://docubase.mit.edu/ ; Benjamin Houguet Hall of Fame http://www.benhoguet.com/hall-of-fame/; Other sites where we could find and explore interactive narratives applied to cultural heritage is the Museums and the Web Conference Awards (Best of the Web Awards 2006-2015 and GLAMi awards 2016-present https://www.museumsandtheweb.com/best-of-the-web/).

4.4.1. Case study 1 – Atacama Stories

Context of production and Communication aim

Atacama Stories[174] is a cultural interface developed by Institute for Science Learning, University of North Carolina at Chapel Hill in 2006 to explore the cultural life of the Atacama Desert, the driest place on earth. Content, focus on human activities like mining, handcrafts and cultural traditions, and also in geology and astronomy (being the largest desert on earth it satisfies conditions for celestial viewing).

User experience: document structure and media elements

The experience starts with an introduction that combines music and photograph slideshow, after what we access a five chapters choice. Within each chapter we can explore subsections, profusely documented through text, image video and animation. The overall experience is very rich although the interface resembles early examples of multimedia CD Roms. This was our first contact ever with this kind of narrative and we found it through a blog post from Alberto Cairo, infographics designer and teacher at the University of North Carolina, Chapel Hill. Atacama Stories was the work of one of his students, combining infography with multimedia and taking non-fiction narrative to another level.

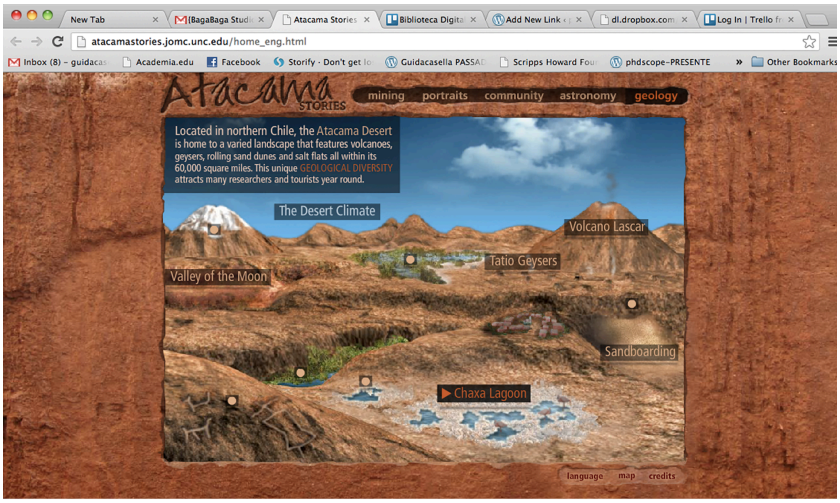


Fig. 88) Landing page of *Atacama Stories*, and interface showing interactive infographics. © University of North Carolina, School of *Media* and Journalism

[174] *Atacama Stories* (2006) http://atacamastories.jomc.unc.edu/

4.4.2. Case study 2 – Becoming Human

Context of production and Communication aim

Becoming Human[175] is an interactive documentary that explores human evolution launched in February 2009. It is the culmination of a project conducted by the Institute of Human Origins, represented by Jay Greene, and Rhino Internet Solutions.

User experience: document structure and media elements

The narrative structure is divided into five chapters that combine short narrated videos and extra interactive features like an interactive timeline and a series of "exhibitions" made with informative interactive content related to human evolution. The overall feel is engaging due to the quality of the content. It identifies specifically as an interactive documentary. The landing page gives us information in specific menus. By clicking in the image, we are directed to the prologue of the interactive documentary and have the link for 5 chapters always visible on the top of the canvas, which remains a small window in the interface (i.e. we cannot see full screen).



Fig. 88) Landing page of *Becoming Human* interactive doc, and interface showing chapters, and interactive timeline © Institute of Human Origins

[175] *Becoming Human* (2009) http://www.becominghuman.org/

The feature of having floating windows doesn't allow an immersive experience as if the screen was totally occupied with the content. We are always distracted by the possibilities of changing chapter. The five chapters are: Prologue, Evidence, Anatomy, Lineages and Culture. In each Chapter we have access to a short video, c.1'30'', clearly indicated in the lower right corner. We considered this example for analysis, as it was the first web doc that we identified specifically dedicated to Archaeology.

4.4.3. Case study 3 – Matera Città Narrata

Context of production and Communication aim

Matera Città Narrata[176] is a cultural interface that explores Matera city in Italy according to different perspectives. It was developed between 2009-2015 by the Italian Cultural Institute (Consiglio Nazionale delle Richerche). It is part of a transmedia strategy to explore a cultural territory which combines the website itself, a database, a game and walking tours in the city.

User experience: document structure and media elements

The website assumes several interactive documentary aspects, in the sense that it presents interviews, information, interactive maps and timelines to document the city heritage through time and space. It also has a self-reflexive section with circa 90 interviews the the team of professionals that worked in the production of the website talking about what it means to make heritage interpretation, functioning almost as a meta documentary.

[176] *Matera Citá Narrata* (2012) http://www.itabc.cnr.it/progetti/matera-citta-narrata



Fig. 89) Interface of *Matera Cittá Narrata* showing the interface with video database © CNR ITABC

4.4.4. Case study 4 – A Global Guide to the First World War

Context of production and Communication aim

A Global Guide to the WWI [177] is an interactive narrative produced by *The Guardian Online* in 2014. It is available in 7 different languages (English, French, German, Italian, Spanish, Arabic or Hindi) thanks to a protocol between the newspaper and the British Academy. This interactive documentary (or web documentary) is one example of many other initiatives undertaken in 2014 to commemorate the 100 years of the First World War using digital *media*. Besides being well conceived and beautifully crafted it presents a novel way to address a Historical subject as it uses the multivocality of 10 different historians, presenting less known stories and archival material.

[177] *A Global Guide to the WWI* (2014) https://www.theguardian.com/world/ng-interactive/2014/jul/23/a-global-guide-to-the-first-world-war-interactive-documentary

User experience: document structure and media elements

Through a series of 7 chapters it presents the story of WWI using film, text, audio and interactive infographics[178]. At the beginning of each chapter there is a short video documentary of about 5 minutes (viewing time is indicated graphically) and a button with the symbol of a little hand links the viewer to additional information material. In these sections there are interactive maps and timelines, audio interviews, and archival material like newspaper articles from those times. This is an example of how *The Guardian* is innovating online, making use of the affordances of digital media.



Fig. 90) Interface of the web documentary *A Global Guide to the WWI* © The Guardian

[178] (Retrieved from: https://www.theguardian.com/world/ng-interactive/2014/jul/23/a-global-guide-to-the-first-world-war-interactive-documentary) *Ten historians from 10 countries give a brief history of the First World War through a global lens. Using original news reports, interactive maps and rarely-seen footage, including extraordinary scenes of troops crossing Mesopotamia on camels and Italian soldiers fighting high up in the Alps, the half-hour film explores the war and its effects from many different perspectives.*

4.4.5. Case study 5 – Magellan

Context of production and Communication aim

Magellan[179] interactive narrative was produced in 2015 for arteTV. In the project description it reads:

> *"Experience the various facets of the first circumnavigation of the globe aboard Magellan's ship and discover the latest research on the subject in an interactive web documentary."*

User experience: document structure and media elements

The experience starts with a video that sets the viewer in the times of Ferdinand Magellan (Fernão de Magalhães) a Portuguese explorer who organized the expedition to the East Indies in 16th century, resulting in the first circumnavigation of the world. After the video, the viewer / interactor is presented with a "logbook", the interface metaphor of the interactive experience. By clicking in one of the 6 chapters on the top of the book, we gain access to multimedia content including text, pictures and video that displays in full screen. The overall experience is very engaging in the use of a game-like mechanics. It makes great use of illustration and animation.



Fig. 91) "*Magellan"* idoc screenshot showing the interface metaphor as a book with six chapters, and the hotspots to access further content © ArteTV

[179] *Magellan (2015)* http://magellan.arte.tv/en

4.4.6. Discussion of Case Studies

After concluding the description of the five case studies of web documentary format to communicate cultural heritage we were able understand the *genre* in order to replicate its framework, which we will test in the development of a prototype for the archaeological site of Zambujal (in Chapter 6).

Our five case studies were selected by their representativity of making interactive documentary to communicate historical related content (we saw many more of them, and continue creating a personal database in the *iStories* site).

The categories that were relevant to our research question of how to design an interactive digital narrative will be discussed below and are the following: a) Durability/ Digital Preservation; b) Promotion; c) Narrative Structure; d) Content and use of Media. These categories constitute a basis to understand this kind of interactive narrative, pointing its main elements and forms of being experienced. This systematization contributes to understand and create this kind of *media* artefact.

a) Durability / Digital Preservation

The first lesson we learned from our survey and description of several online interactive stories was, first of all, that they quickly become obsolete or disappear from their original location. Some of the early examples of interactive stories that we selected for the study ceased to be available online, due to lack of up-date or software support. This observation points to the problem of web archiving: what do we archive and how. Fortunately from the beginning of our research we kept screenshots of the artefacts and the notes about the observations. In the case of "Becoming Human" for example, we can read in the actual site that "the original Flash documentation was transposed to HTML 5 format" but still it wasn't possible to visualize the final two chapters, at the time of writing.

We recommend that prior to planning the production of any digital artefact to communicate archaeological sites, we decide how long it will stay available, and consider what type of up-dates and upgrades are needed for it to become readable.

b) Promotion

Another important aspect to bear in mind is how do people access the artefact? How is it found among so much content on the Internet? In this respect, dissemination, or how it is promoted, is of extreme importance. One form of making it accessible is to produce a press release and send it to *media* channels *(*magazines, radio, TV, or other). To have a splash page or fixed website is also advisable, with instructions, credits, etc. and promote it on social media. For example, if in cinema, people would see a poster outside the theatres, now with digital artefacts, the information must be announced in newsfeeds as well as in analogic press. It is perhaps a demand for a new type of journalism dedicated to review or critique these new *genres* and experiences. There are specialized blogs such as *Nouvelles Narrations* or even databases like *Docubase* that curate this specific kind of production. Prizes and competitions are another way to provide visibility to the project.

In a pilot project we did during our PhD research, although not connected to our archaeology topic, was the development of an interactive documentary about food and architecture called *Mundo Mouraria* [180]. With the support of a *Crisis Buster* scholarship from the *Lisbon Architecture Triennale*, to produce innovative approaches regarding architecture and where we addressed "the kitchen" as an heterotopia related to architecture, resulting in the web documentary Mundo Mouraria (www.mundomouraria.com). In this case, and to promote our artefact, we made an exhibition during the Triennale where we created objects of merchandizing (screen-printed tea towels), and we did live screening projections, especially in the neighbourhood where the stories took place. We also promoted debates about food sustainability, and did community meals to speak about the problem of illegal kitchens and street food- It was a good example of promoting a web project.

[180] www.mundomouraria.com

c) Narrative Structure

We found it very important to analyse the structure of the artefacts. It is this that allows us to understand the totality of the digital publication. Understanding this structure enables the user to fully navigate the experience from start to finish. A way to understand this structure is by taking notes sketching a storyboard (like in Fig.110).

The most important sections that should be included in the making of a web documentary are: Introduction, which should appear after the landing page, usually has a loop of sound clip that enables the user to become immersed in the environment. These sound clips are common to many interactive projects and they set the tone for the general experience. In the introduction a short text presents the viewer with an idea; Instructions page, where we describe the gestures and possibilities of interaction with the system; Credits page, with the technical information, contacts and acknowledgments; Menu page, with links to the several chapters (usually between 5 and 8); And the contents page of each chapter. Some web documentaries have other kinds of features like the possibility to share, or introduce content, but we left those problems out of our study as they needed a kind of investigation more related to engineering and programming to have a two way communication gathering data from the users. Our focus was on the production of digital interactive content only.

d) Content and use of *media*

The use of different *media* in this kind of publication (Text, Video, Graphics, and Illustration) is what makes the experience rich. If in print publications we use text and image, with screen interactive *media* we can add other elements such as video, animation and interactive graphics. Carefully analysing these elements while doing the state of the art is extremely helpful to define future strategic approaches.

The interface metaphor and the structure for navigation (i.e. how many chapters and how are they organized: like a menu, a tree, a mosaic) is also something that should resonate with the general sense and feel of the narrative. Some projects feel more immersive than others. Some appeal to our aesthetic senses or are more

pleasurable than others. Music and sound play an important role in this matter. All the media elements should be optimized for the web. We should compress videos into small videos, compress images to the minimum required, and be carefull in the naming of the files, as special characters may lead to programm errors.

4.5. Summary

This chapter reviewed interactive digital media used in heritage communication. We identified five typologies of interaction: in gallery interactives[181] a) the human tour guide (considered here as comparative category with digital *mediation*); b) the *in-gallery* interactive installation; c) the mobile app; d) the iPad app; and e) the desktop online exhibition. With this study we contributed to understand the plethora of possibilities for cultural heritage digital communication strategies, helpful for further research in this field. By knowing the characteristics of each typology in terms of user experience, we contribute to inform future design options to communicate Archaeology with digital *media*.

We chose the specific *genre* of web documentary as the most indicated to provide information about archaeological sites on the Internet, that allow an engaging experience but also provide the possibility to explore content in depth (similarly to long form journalism).

The web documentary format for cultural heritage communication allows the presentation of *media* in an engaging way, making great use of images, cinematography, graphic design, but also longer texts if needed.

This chapter provided the basis to choose the *genre* of web documentary for iPad and develop a prototype in this framework for communicating Zambujal, described in the next chapter. Carefully analysing these elements while doing the state of the art is extremely helpful to define future strategic approaches.

[181] Virtual Reality applications to cultural heritage communication became a hot topic since 2016, and further studies are needed, we suggest it for further work as we were not able to analyze it in this thesis.

Chapter 5 – Results

5.1. Prototype Development

In this chapter we report the process of developing "Stories of Zambujal" iPad app. This app is an experiment in creating a digital enhancement of the exhibition[182] produced in Museu Municipal de Torres Vedras. We describe the workflow, from the initial moment of the communication strategies definition, aims and target audience, to designing, developing and testing the prototype. With this experience we address the third research question of this thesis:

RQ 3: How can the principles of digital storytelling (and interaction design) be integrated into the traditional workflow of communication in Archaeology and contribute towards its improvement?

For this part of the field work, much was contributed by the preliminary study undertaken in Chapter IV of this thesis, where we identified stories and *media* related to Zambujal and constituted the database that can now be remixed into an online exhibition.

The exercise of remixing the archive of archaeological documentation of Zambujal into a web documentary format originated in a conference presentation and paper publication (Casella 2016, 2017)[183].

To develop the prototype "Stories of Zambujal" it was also very important to

[182] '*Stories of Zambujal: 50 years of the German Archaeological Institute in Torres Vedras: [Histórias do Zambujal: 50 anos do Instituto Arqueológico Alemão em Torres Vedras* 27th May 2016 30 June 2018 Museu Municipal Leonel Trindade.

[183] CASELLA, Guida (2016) *Remixing the Archive*, Webdocumentário- O Paradigma da Interatividade e a Tradição do Documentário, UBI, 31st march 2016.http://labcom-ifp.ubi.pt/files/webdocumentario/#speakers

CASELLA, Guida (2017) Remixing the archive. The use of webdoc format as a medium for science communication, Doc On-line, Revista Digital de Cinema Documentário | Revista Digital de Cine Documental | Digital Magazine on Documentary Cinema | Rèvue Électronique de Cinéma Documentaire, Édition spéciale, pp. 137- 157, 2017 Universidade da Beira Interior (Portugal), Universidade Estadual de Campinas (Brasil), ISSN: 1646-477X DOI: 10.20287/doc.d23

conduct the state of the art survey about digital applications in museums, presented in Chapter 4 of this thesis.

The objective of the practice-based research project described in this chapter is to develop a virtual exhibition for the Zambujal archaeological site. It starts by describing the project background; then the workflow of the project implementation through several experiments until the final satisfactory result. All the images here referred to, are provided in high quality, as well as the interactive files, in Appendix C. The final prototype is available in Appendixes C-3-3-WEBDOC.

5.2. Digital *Storytelling* for Archaeology

5.2.1. Project Background

The primary objective of this practice-based research component of our thesis was to experiment in developing a digital *media* artefact in order to test the framework of digital *storytelling* to communicate an archaeological site. In this interactive narrative we should explore the 6 types of narratives used to communicate archaeological sites and to experiment with the affordances of digital *media* for publication (use not only text and image, but integrate video, sound, graphic design and interactivity).

In 2014 the 50 years of archaeological investigation of the German Archaeological Institute in Portugal were celebrated. On this occasion, the local Museum of Torres Vedras (*Museu Municipal Leonel Trindade*) decided to commemorate the date by presenting a new Archaeology exhibition. The planning and production of this exhibition provided an ideal research setting to develop our practice-based research, in what came to be "Stories of Zambujal" digital *storytelling* project. We have accompanied the production of the exhibition, having in mind the development of digital *media* artefacts that could enhance the traditional exhibition.

The project lasted two years, between 2014 and 2016, and during this time several improvements to the planning of the physical exhibition were developed. The creation of the digital artefact also evolved. We undertook 4 pilot studies experimenting with interaction, described in the next section, and we edited 3 videos to integrate in the interactives, that were also repurposed in the physical exhibition.

5.2.2. Project implementation

The project implementation was rather a long process, starting in 2014 and inaugurated only in 2016, the exhibition planning and production passed through different phases which successively influenced our choices and approaches to the development of a digital engagement strategy and the creation of the interactive narrative prototype.

Our involvement with the project started in 2014 with a meeting in Torres Vedras with Michael Kunst (Director of the Excavation) and Rui Brás (Cultural Department of the City Council in order to set a collaboration protocol. In the first meeting a preliminary plan was set to make a small exhibition in Torres Vedras City hall (with circa 50 m2) a space used by the municipality for temporary exhibitions (see Fig. 92).



Fig. 92) Exterior and interior views of Torres Vedras City Hall building © G.Casella

Planning an archaeological exhibition for this space required creating a scenographic space, mostly relying on printed information display without objects because this place has no surveillance allocated specifically to the exhibitions and is a room of passage for many people.

This approach was planned to be an itinerant exhibition, made with materials that are easy to relocate (such as printed panels mounted on plywood) and having as the central piece the newest visual reconstruction of Zambujal and the surrounding landscape commissioned from illustrator Ivan Gromicho (see Fig.94)

In order to start planning the event and deciding upon the digital strategy to employ, we sketched a space using a “u” shaped structure with printed information, in a corridor like structure, that would have at one end, a large projection of the newest

reconstruction of Zambujal, with which we could interact in some way.

In terms of the exhibition structure and script, it would have on the left side, the history of the excavation since its discovery until today, while on the right side it would address recent studies about the surrounding landscape in the "Sizandro and Alcabrichel" river basin.

The overarching narrative would focus on the environment (biodiversity, archaeobotany) and on the territory (newest findings from the Sizandro-Alcabrichel research project).

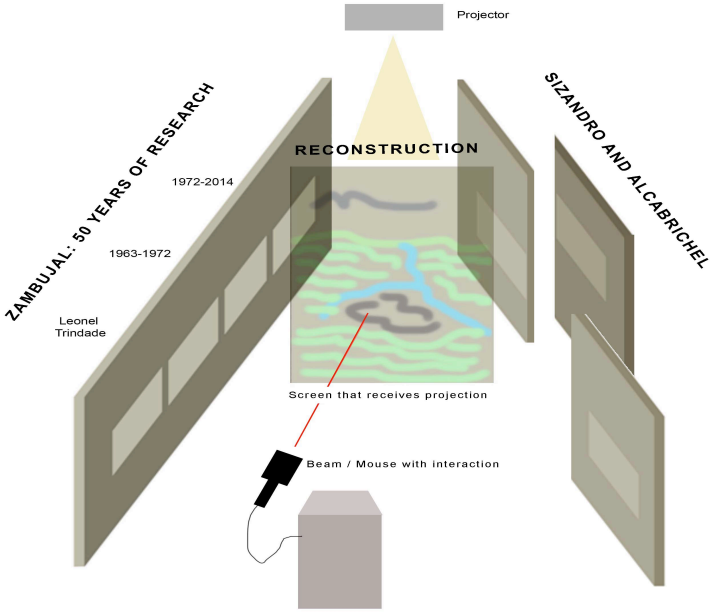


Fig. 93) Exhibition plan design for the Torres Vedras City Hall building © G. Casella

The front wall should have an interactive projection that could be manipulated with a light beam connected to a mouse that would allow clicking and interacting with the wall-interface leading to deeper levels of content. Following this first approach we started sketching interface experiences as pilot studies. The first pilot study was to rethink the illustration of Ivan Gromicho as a map, i.e. it would have hotspots with links that allowed "digging " into deeper levels of information, i.e., to know more about pre determined storylines.

This interactive wall could also be hosted online as a web app, and for this we did a pilot study that allowed us to demonstrate how interactive content could be curated[184].

[184] See Appendix C-3-1-IVAN



Fig. 94) Interactive wall prototype design © Ivan Gromicho / G. Casella

The general thought behind this digital application for Zambujal was to apply the principle of "Deep Mapping" as proposed by Ridge, Lafrenière and Nesbitt, (2013). For these authors the concept of deep maps has to do with exploration of special entities, open ended, allowing space for subjective and humanistic approaches as opposed to merely informational data usually used in cartography. Deep maps

> "*must afford open-ended exploration of a particular place This exploration could be facilitated by a system such as a desktop GIS. A spatial narrative is designed to tell a story. If a deep map requires a commitment to open-ended exploration, a spatial narrative demands a specified point of departure, a particular pathway, and a known end point. Spatial narratives demand a plot. Like deep maps, they reflect the practices that make a place, yet these narratives cannot always remain open-ended. The deep-map- as-archive is devoid of narrative lineaments, the precise ordering and authorial voice that create a narrative. Spatial narratives require these elements.* (Ridge, Lafrenière and Nesbitt, 2013: 178).

So, our first pilot was a website without narrative, just some map where the user could go deeper, by interacting with the hotspots.

a) Pilot Study 1 – "Once upon a time, a valley", Interactive

In practice, we developed our first pilot study prototype as a digital artefact to be accessed online, just like a website, or a web interactive infographics, while we waited for more developments regarding the physical exhibition. This interactive object would then be accessed through a URL link, and would display a landing page (or home page) with general information about the object, and a link for the *about* and the *credits* section on the upper right corner (see Fig. 95).

The rest of the experience consisted in exploring an interface (the digital painting of Zambujal reconstruction) with four storylines always accessible in a menu in the lower part of the interface: Architecture (1), Material Culture (2), Use of Space (3) , Environment (4). Once inside each one of the four chapters there would be the possibility to explore information "pre-scripted". So, under Architecture (1) we would have subpages (Towers, Yards, Houses, Platforms); in Material Culture (2) we exemplified only with one page, but this could be further developed according to other materials; in the Use of Space (3) section we can explore the themes of War, Commerce and Elites; and in Environment (4) Trees, Animals, Cereal, Fences, Broad Beans. (Explore it in Appendix C-3-1-Ivan).



Fig. 95) Interface Design for the second prototype © G. Casella



Fig. 96) Navigation architecture and screenshots of the second prototype © G. Casella

b) Pilot Study 2 – "Interactive Stratigraphy"

Still in the first phase of pilot studies regarding the possibilities of applying interactivity to visual methods in Archaeology we made another experiment in collaboration with the director of the excavation Michael Kunst, developing an interface that would be useful for archaeologists rather than to communicate the site to the public[185].

The result was the creation of an interactive interface to explore excavation plans in relation to a stratigraphic profile, in this case, the so called "profile AP" was presented with a series of links on the left side, that would direct the user to different excavation plans. In this case we can interact with 20 layers of the excavation, usually seen as separate drawings, but using interactivity we can have an experience more similar to the excavation in reality (see Figs. 97 and 98).

[185] See Appendix C-3-2-PROFILE

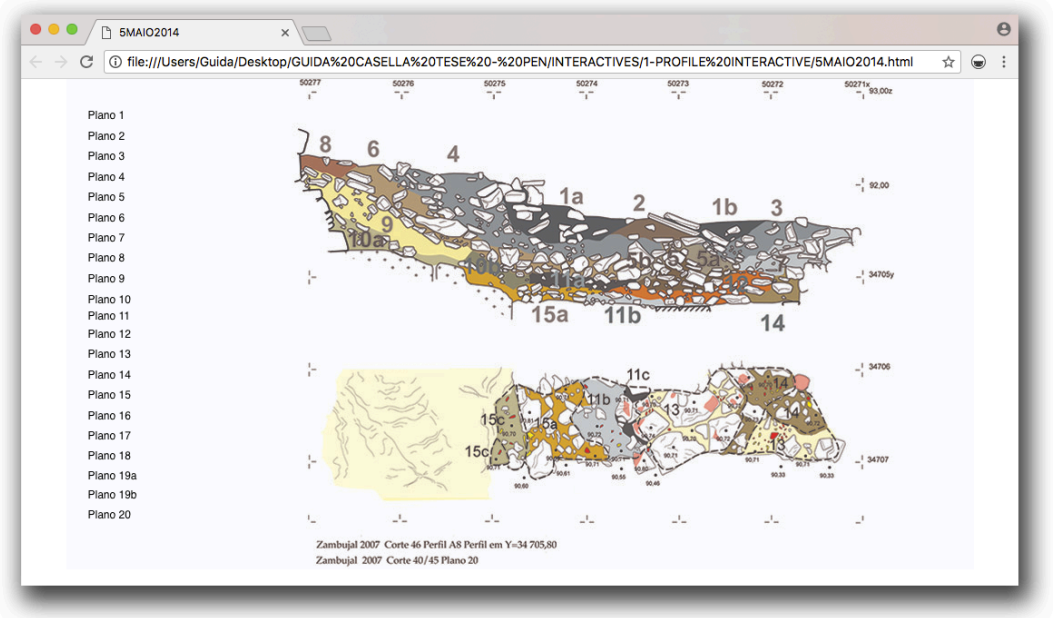


Fig. 97) Interface of the interactive stratigraphic profile. By clicking on the left buttons the interface shows the corresponding excavation plan, changing just as an excavation changes © G. Casella

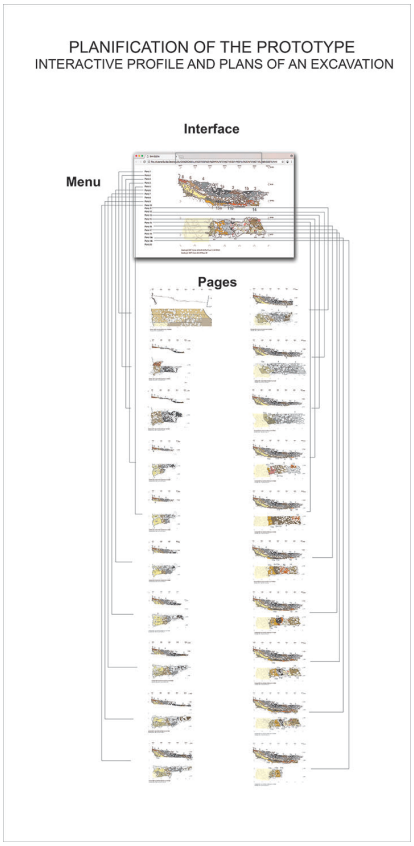


Fig. 98) Navigation architecture and screens of the interactive profile © G.Casella

c) Pilot Study 3 – "Augmented Zambujal"

By the end of this experimental initial phase where we tested a few possible applications of interactivity to visual methods in Archaeology, we had a second meeting in Torres Vedras to decide on future work regarding the exhibition. In this meeting we explored other possibilities of creating a digital artefact such as making guided visits to the archaeological site of Zambujal as a complement to the temporary exhibition, and eventually create a mobile app with a virtual avatar of the archaeologist.

We also addressed questions of maintenance and preservation of the site, and the possibility of creating an archaeological park that could create awareness not only about archaeological preservation but also environmental preservation, as recently there have been botanical studies undertaken in the area. This can be a fruitful approach to the future of archaeological parks bringing together both cultural and natural heritage.

We referred to state of the art sites such as *Butser Ancient Farm*[186] in England, or other prehistoric sites where it is even possible to stay overnight in prepared tipis that allow a touristic experience related to life in the Bronze Age.

Realizing the educational potential of the archaeological site and the effort that was being made for so many years in and around Zambujal as an educational resource for the Torres Vedras region it was decided to plan for a bigger intervention, and the idea of a small temporary exhibition, grew into what was later implemented: a two year exhibition in the Museu Municipal Leonel Trindade. The new project then involved the relocation of the exhibition from the City Hall building to the *Museu Municipal Leonel Trindade*, a space with 200 sq. meters displaying information and objects along 3 different rooms, with the duration of two years.



Fig. 99) Exterior and interior view of Museu Municipal Leonel Trindade building where the second and definitive exhibition was planned.

[186] http://www.butserancientfarm.co.uk/

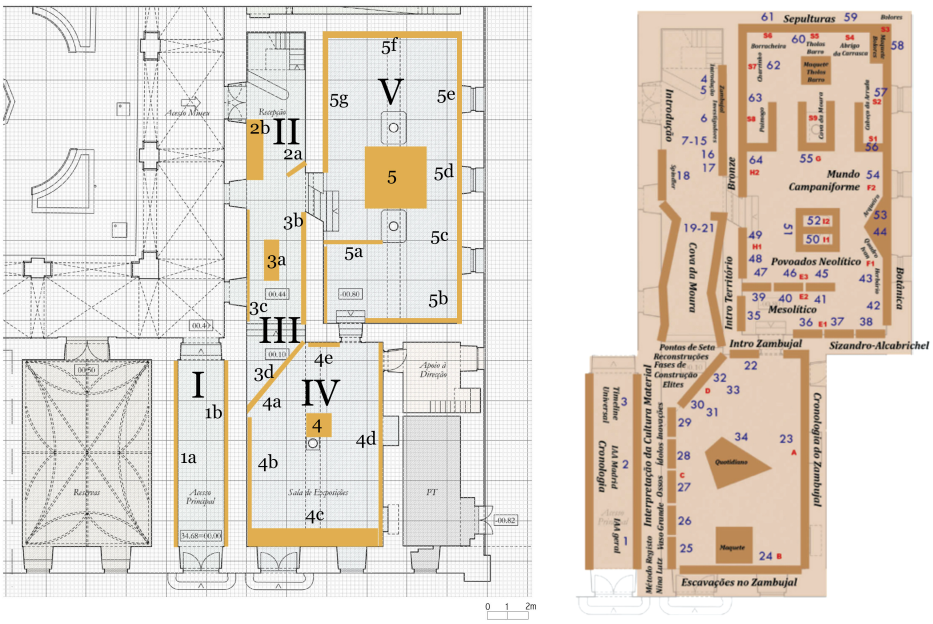


Fig.100) Exhibition areas before and after design planning. Themes are assigned to each room. Walls for panels, show cases and 3D models are numbered in order to organize the museography.

In terms of the message of the new exhibition, it aimed to show not only new findings and results of excavations in Zambujal but also to represent the wider landscape surrounding Zambujal in the 3rd millennium BC incorporating a public exhibition of other archaeological sites contemporary with Zambujal, known in the territory. Several names were proposed and discussed, until the name was fixed in "Stories of Zambujal, 50 years of archaeological research by the German Archaeological Institute".

Later we met with a wider team of archaeologists, managers, educators, exhibitions designers, conservators, and reformulated our digital engagement strategy. We enrolled the exhibition team both as an observant-participant researcher and provider of visual and audio-visual content (we created three videos for the exhibition – see Appendix C.1.Video).

We developed our third pilot study of a virtual exhibition through a rapid prototyping framework. The idea was to accompany the design of the physical exhibition that was being developed through time, and in parallel, to develop multimedia elements that could be accessed during the visit, through some marks on the exhibition, inspired by the Biblioteca Nacional de Israel app (see Chapter 5.3.2.).

For instance by seeing a printed symbol on the wall, the visitor could access different contents in the app, such as access PDF documents to read later, watch a film or listen to interviews about the discovery of the site, explore in detail the biography of an archaeologist, interact with an artefact in a 3D environment, leave a message in a virtual guest book and communicate with other visitors. These are some of the possibilities that could be implemented in the first room.

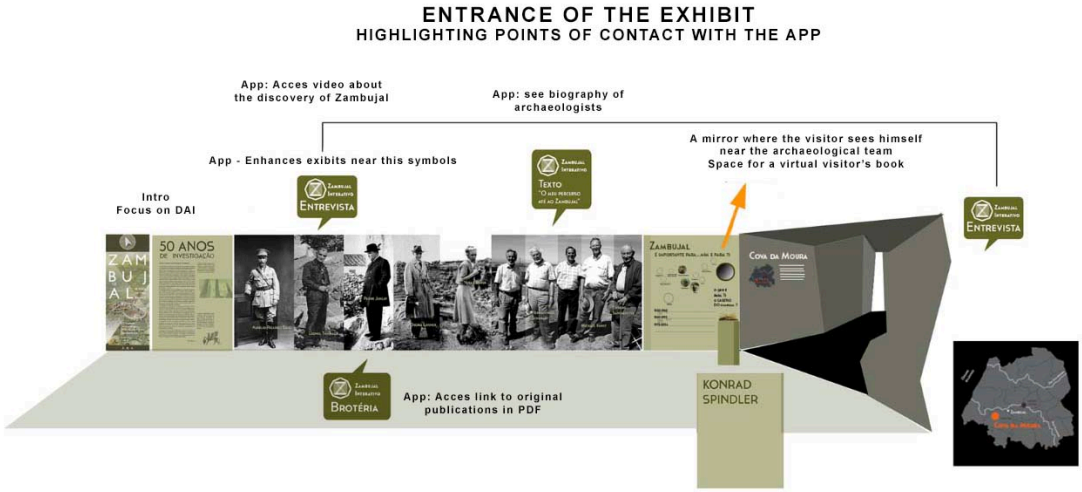


Fig. 101) Prototype showing the interaction points between the exibition and the virtual contents.

d) Pilot Study 4 - Prototype 1st Iteration

As the design of the overall exhibition was a heavy task to undertake, with literally thousands of artifacts to find, texts to write and review, scenography to be made, and changes and adaptations happened all the time as it is natural in a creative and constructive process, we decided to simplify our narrative to a web app, that didn't necessarily depend on the exhibition to be developed.

At this point we had to take some practical decisions to develop a digital *storytelling* piece about Zambujal. Drawing on our studies of the narratives and the archive from the beginning of fieldwork, we had material to develop in a short period a cultural interface that would address the archive of Zambujal.

We drew a rapid sketch of a web app (see Fig. 102) that could display online several types of information, independently of the exhibition itself. The only requisite was that it explored the idea of "digital *storytelling*", i.e. to communicate not only facts but also lesser known, more personal stories and fun facts about the exhibition, and incorporate multimedia and interactivity.

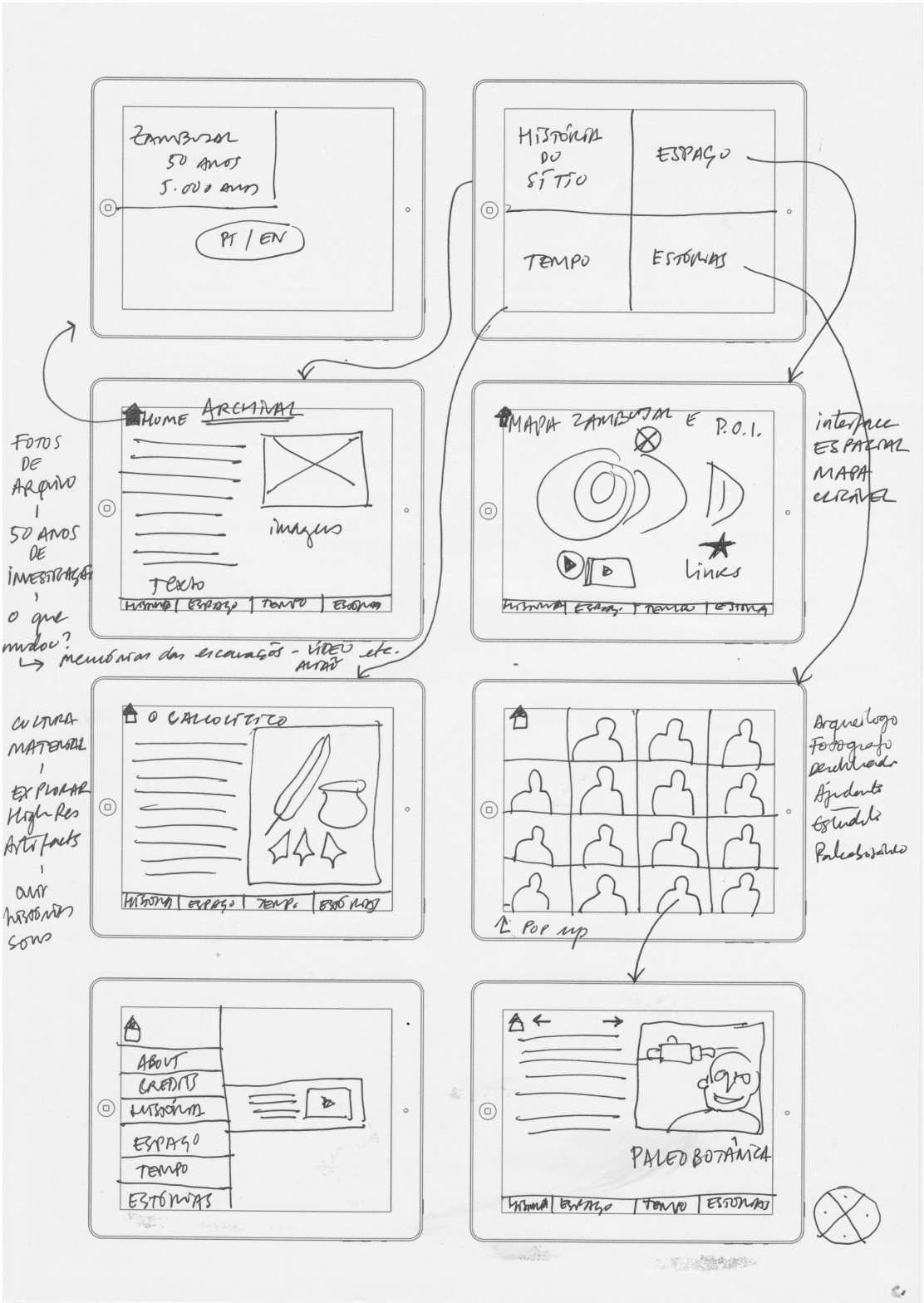


Fig. 102) Storyboard for Stories of Zambujal App © G. Casella



Fig. 103) Design of *landing page* and menu © G. Casella



Fig. 104) Graphic Design for Section 1 © G. Casella

The interface should be divided into four parts that would lead the interactor to four different sections addressing four themes: *Space, Time, Discovery* and *Stories* (see Fig. 103). The target audience would be a general one; we wanted a 'one size fits all' approach, creating a very simple and straightforward arrangement of information.

There would be four sections. The first, about the *Discovery* of the site (see Fig. 104) would present interactive publications with highlights of artefacts mentioned in the text. And it would allow exploration of historical photographs showing daily life in the excavations (see Fig. 105).

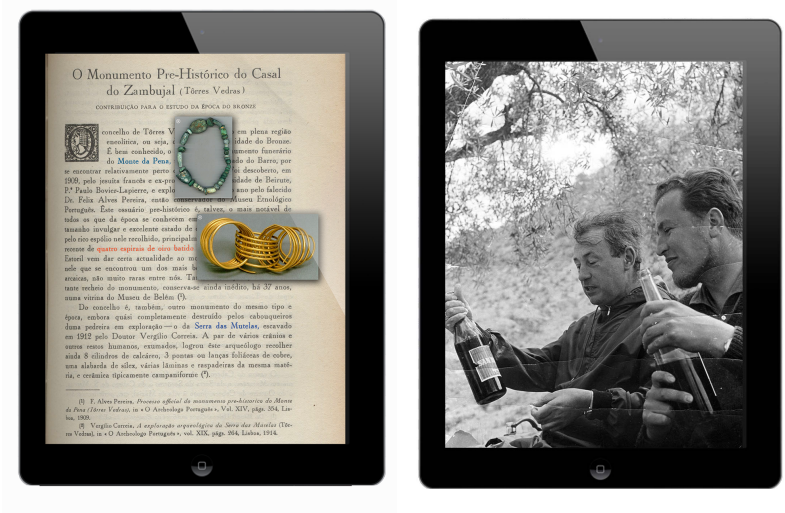


Fig. 105) Exploring the hyperlink in the text leading to photographs that contextualize the narrative © G. Casella



Fig. 106) Graphic Design for Section 2 © G. Casella

The second section, *Space* (see Figs. 106, 107), would allow one to explore an aerial view of the excavation as an interface with a map and hotspots. Upon clicking on the hotspots it would be possible to see short videos, photographs, artefacts, just like in an archaeological dig.



Fig. 107) Aerial view of the excavation as an interface with a map and hotspots © G. Casella

The theme of the third section was *Time* (see Fig. 108), and here the intention was to situate the visitor in the prehistoric times of the Bronze Age. We planned having a timeline, a presentation of other archaeological sites from the same period of Zambujal, and some videos filmed during the demonstration by Carlos Silva in the museum.

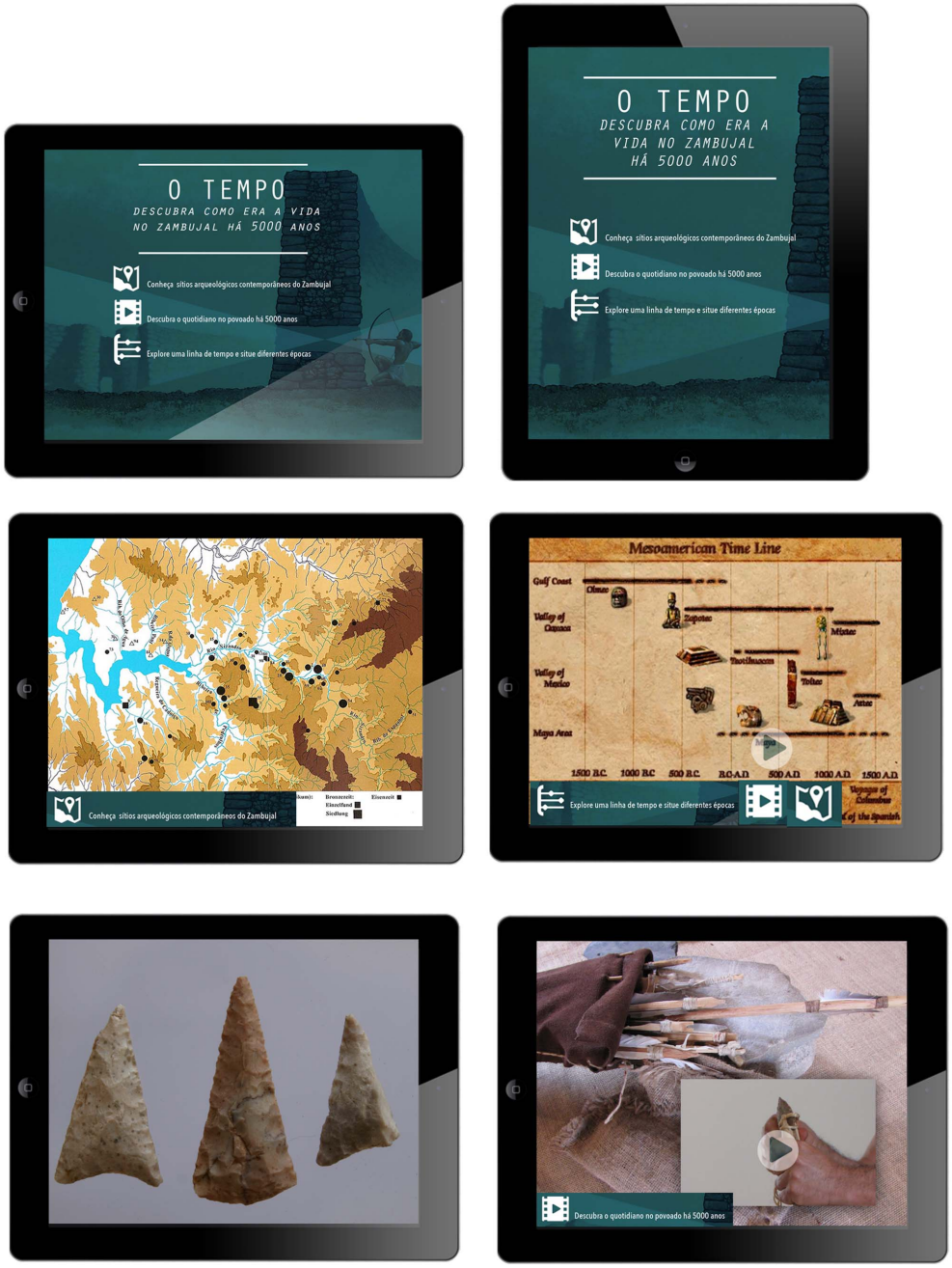


Fig. 108) Graphic Design for Section 3 © G. Casella

Finally, the fourth section entitled *Stories* (see Fig. 109) would be dedicated to opening up the archaeological site to everyone and not only to archaeologists, students, museum professionals, but also we wanted to add the possibility of public contribution. Visitors could upload their photo and add some *media* stating what Zambujal represented for them.

The interface would be a mosaic with portraits, first of all created by us with small interviews with professionals related to Archaeology (topographers, photographers, archaeologists, botanists, etc.). And later, members of the public could also join the conversation, sharing their own experience and feelings about the site.



Fig. 109) Graphic Design for Section 4 © G. Casella

Although this pilot study was not developed further, as we will see below, some of the ideas were repurposed in the final version of the app. In conclusion, we must say that all these steps were necessary for our research. Although this was a trial and error approach, which we believe has much to do with creative practice, it was only possible to finish the way we finished, (with a consolidated prototype of a web doc about Zambujal) after trying all these pilot studies.

Nevertheless, by looking back at the results, although aesthetically pleasing, we realized that a non-linear interface such as the one we were designing was not necessarily a story. We concluded that a story should have a beginning, middle and an end. This led us to the fifth and last iteration in creating an interactive narrative which was to become the definitive digital artefact.

Learning from the previous experiments, successes and failures we were ready to develop the final version of what would become "Stories of Zambujal" web app. We report it in the next section.

5.2.3. How we made "Stories of Zambujal" app

In the implementation of our experiment we followed a common design method, also used to develop any cultural project (Cerezuela, 2011) or any museum exhibition (Lord & Lord, 2002; Serrel, 1996; Smiles, 2001). Every project should have a document that serves as a manual to guide the steps in the procedure.

We also reviewed literature regarding the development of a digital *media* project, which follows more or less the same sequence. (In this case we adapted from Garrett, 2011).

To support our creative approach we consulted literature regarding Heritage Interpretation, which gave us the confidence to make content curation of the archives and stories of Zambujal in a creative manner. The literature in Heritage Interpretation also gives good guidance regarding the narrative approach, as well as developing an interpretation plan, from project, to implementation and testing (Carter, 2001; Ham, 1992, 2013; Veverka, 1999, 2001; Tilden, 1957).

Specifically on the story, type and development of archaeological exhibitions, there is a collection by Trea editorial with several volumes dedicated to practical museography and specifically in archaeological museography and small museums which is mostly the case with archaeological sites (Hernandez, 2010; Cardona &

Ariza, 2012; Matos, 2008).

In the following section we present the complete workflow and results of the fieldwork. We describe the Aims and Objectives of producing "Stories of Zambujal" app (a); how we defined the Target Audience based on the museum's visitor's studies (b); we then defined the Technological Specifications of our digital artefact (c); we then developed the Narrative Design (d) perhaps the most creative moment of the project; once the narrative structure was stabilized we constructed the Interface Design (e) that gives the look and feel to the publication and was later tested with interaction designers; and to conclude the publication we made the Content Optimization and Management (f) which was basically to fill our prototype with the final images, texts, videos, sound, and set the final interactions between the pages.

a) Aims and Objectives

The primary aim of producing a digital interactive narrative about Zambujal was to explore and test the possibilities of digital *media* in archaeological communication. We also aimed at creating a framework for an interactive exhibit that could be applied to other archaeological sites in the future. Besides providing a space for fieldwork and research, the communication aim of the artefact in itself was to enrich the physical exhibition, allowing the interested user to deepen her or his understanding of the site with a complementary experience, after or before the visit to the exhibition. It was decided at this point, that the digital interactive publication should function as an online exhibition, contributing to the marketing strategy in raising awareness both about the site and the physical exhibition. The aim was to produce an interactive publication that would inform about the site in a creative and engaging ways. Inspired by projects from Multimedia Journalism, and Web documentary[187], the aim was to adopt a slow reading, long form journalism approach.

[187] Examples that served as inspiration, to name a few: The collectors, by Wellcome collection http://digitalstories.wellcomecollection.org/pathways/2-the-collectors/; Wellcome to Pine Point, by NFB http://interactive.nfb.ca/#/pinepoint; A global Guide to WWI, by The Guardian https://www.theguardian.com/world/ng-interactive/2014/jul/23/a-global-guide-to-the-first-world-war-interactive-documentary

b) Defining the Target Audience

The definition of the target audience of our interactive narrative was based on an analysis of the museum audience and personal knowledge of the site. The museum' visitor's studies are available for consultation in Appendix C-2. In August 2014 we consulted these documents and by analysing them we understood that most visitors to Zambujal were local people, followed by foreigners on holidays. This influenced our choice of developing our prototype version in Portuguese, that could be translated later to other languages. In terms of age group we decided to aim not at children but to an older group both familiar with archaeology and not familiar (i.e. hence the need to provide enough context).

c) Defining the Technological Specifications

To decide on the technical specifications of our prototype we had to first define a digital engagement strategy[188] and as demonstrated in section 6.2.1. (Project Implementation) our prototype had to be developed in harmony with an exhibition that was being prepared by the Torres Vedras Municipality.

Also, ne of the first decisions was to use software that required little or no coding skills (we used Tumult Hype software). To achieve the elemental skills to develop our artefact was of extreme value for the attendance of a series of workshops held at Universidade Nova de Lisboa during the years of our PhD research, namely the workshops given in the scope of UT Austin Portugal Programme Summer Institute, and Life Long Learning Department at the Faculty of Social Sciences at Universidade Nova, in specific: Multimedia Journalism[189], Interactive Digital Publications[190], Human-Computer Interaction and Interactive Media[191], Cinematography for Documentary[192], Animated Documentary[193], and Usability and

[188] Derby Museums white paper "Digital Engagement Strategy" was a useful resource for this matter. https://www.derbymuseums.org/wp-content/uploads/2017/02/Derby-Museums-Digital-Engagement.pdf. Other interesting framework is http://digitalengagementframework.com/

[189] Multimedia Journalism Workshop *(Paulo Nuno Vicente, FCSH-UNL)* Faculdade de Ciências Sociais e Humanas da Universidade Nova de Lisboa, Jan.2012.

[190] Interactive Digital Publications *(Luis Frias, FCSH)* Núcleo de Formação ao Longo da Vida, Faculdade de Ciências Sociais e Humanas, Universidade Nova de Lisboa, Nov. 2012 – Jan.2013.

[191] Human-Computer Interaction and Interactive Media *(William Moner, UT Austin)* Summer Institute, Faculdade de Ciência / Tecnologia Universidade Nova de Lisboa, Jun.2013.

[192] Cinematography for Documentary *(Steve Mims, UT Austin)* Summer Institute, Faculdade de Ciências Sociais e Humanas da Universidade Nova de Lisboa, Jul.2012.

User-Centered Design[194]. They were valuable contributes to inform our choice.

After bringing together the necessary skills to create an interactive narrative prototype, we established, based on Nancy Proctor's review of possibilities in "Mobile Apps for Museums" (Proctor, 2011) that the best solution would be to create a web app. The technical requisites were to use the technology that allowed little or no programing skills, we used Tumult Hype software. Using BYOD bring your own device model so the museum did not need to invest in hardware. We opted for a web app that could live in a URL online and be accessed through any browser.

In terms of specificity of content, with a digital artefact we were able to present not only text and image, but because of the affordances of screen *media* we could also present videos and audio files, and of course take advantage of interactivity making a publication that would provide non-linear explorations of the archive through the use of hyperlinks. Nancy Proctor, in the book "Mobile Museums" (Proctor 2012[195]), explores the theme of platform determinism. Depending on the device we have, there are different predispositions to consume content. For example, the experience of watching a film in the cinema is a condition of being in front of a big screen, with a good sound system and a dark room. Although we are accompanied to the cinema, the experience is very personal. In the case of watching television, a group of people, for example a family, can interact while watching, and may even be consulting other devices, such as a mobile phone, a tablet, a laptop or a desktop. In the case of the desktop experience, we have access to contents while sitting comfortably with the screen at eye level and with hands on the keyboard and the mouse. In the case of smartphones, the trend is to consult them while moving, or walking, browsing for quick information such as museum opening hours, or the location of a destination. Smartphones are also used to access social networks while commuting to work. It is used to register through photography and video, or share content.

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[193] Animated Documentary *(Geoff Marslett, UT Austin)* Summer Institute, Faculdade de Ciências Sociais e Humanas da Universidade Nova de Lisboa, Jul. 2012.

[194] Usability and User-Centered Design *(Randolph Bias, UT Austin)* Summer Institute, Faculdade de Ciência e Tecnologia da Universidade Nova de Lisboa, May.2014

[195] Proctor, N. (Ed.). (2011). *Mobile Apps for Museums, The AAM Guide to Planning and Strategy*. Washington DC: American Association of Museums.

In the case of the tablet, which emerged in 2010, the experience has been described as something that is done in a moment of pause, reclining on the couch as if we were reading a magazine. To design content for a tablet is more similar to long form journalism pieces in magazines. There is no keyboard or mouse, but an interaction on the touch screen through gestures such as scroll, pinch, or swipe.

Facing these new distribution models, newspapers have adapted the traditional narrative format, printed on newsprint, to digital platforms. To name paradigmatic cases who have the iPad version of *Wired* Magazine, the digital content of the *New York Times*[196], *The Guardian*[197], or *Al-Jazeera*[198] to name a few references of excellence. In Portugal, projects in *Público* and *Expresso* also stand out[199].

The iPad introduced a new model for interface design. The New York Times' *Snow fall* [200] piece in 2013 appeared as a landmark of the kind of innovative format of what could be done, constituting a benchmark for work of excellence, that inspired our work.

d) Narrative Design

For the interactive publication structure we divided the narrative in 9 chapters, following a chronological order and having more *storytelling* titles. Each one of the chapters would explore a theme. Our 9 chapters follow a chronological narrative concerning the archaeological research in Castro do Zambujal. The titles of the chapters were worked into a more poetic manner than just a topic. Our charactes were the scientists and the plot the scientific investigation.

[196] Example of Interactive Graphic in *New York Times,*2014.http://old.seattletimes.com/flatpages/local/interactivebeforeandafterthehighway530mudslide.html

[197]Guantánamo Bay: The Hunger Strikes" animated documentary, *The Guardian*, 2013 .https://www.theguardian.com/world/video/2013/oct/11/guantanamo-bay-hunger-strikes-video-animation

[198] Pirate Fishing, *Al-Jazeera*, 2014 https://webapps.aljazeera.net/aje/custom/2014/piratefishingdoc/index.htmlor Life on Hold, *Al-Jazeera,* 2014 http://lifeonhold.aljazeera.com/#/en/portraits/home

[199] Example of Interactive Narrative in Portuguese Press: Cova do Vapor: Um dia a casa virá abaixo, *Público,* 2014 http://www.publico.pt/multimedia/casa-do-vapor ; Matar e Morrer por Alá: Cinco Portugueses no Estado Islâmico, *Expresso*, 2014 http://expresso.sapo.pt/especiais/jihad/PT/matar-e-morrer/index.html

[200] Snowfall, *New York Times*, 2012 http://www.nytimes.com/projects/2012/snow-fall/#/?part=tunnel-creek

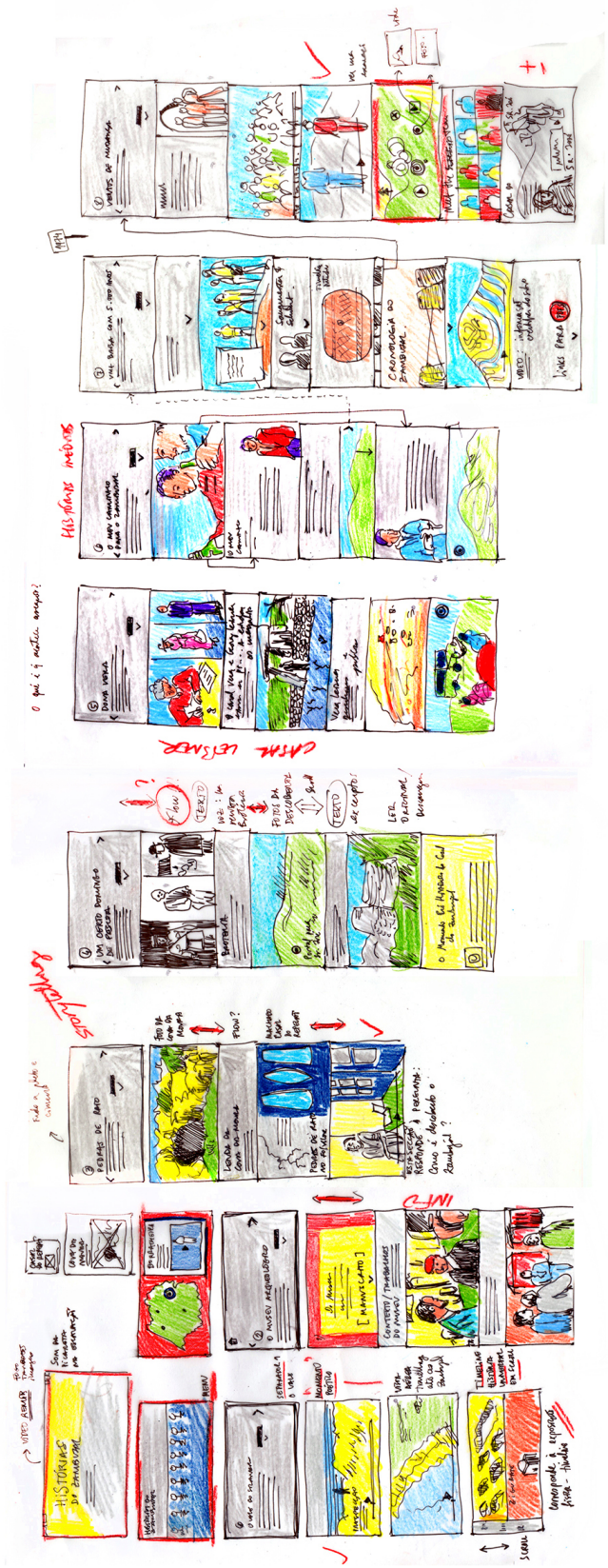


Fig. 110) Storyboard for the final version of the app © G. Casella

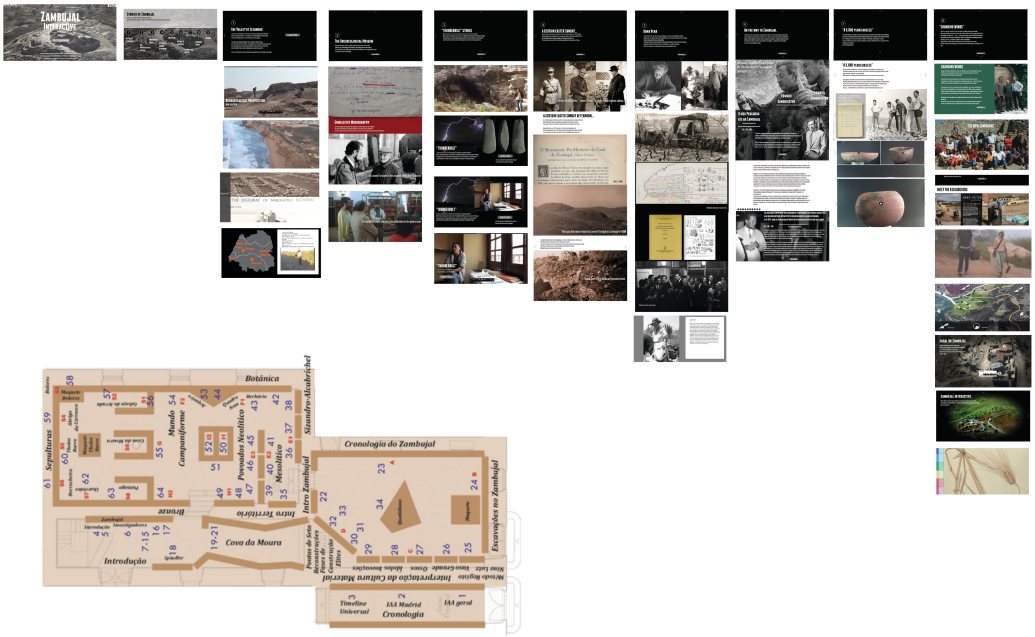


Fig. 111) Storyboard with *media* thumbnails © G. Casella

We now describe content and media of each chapter.



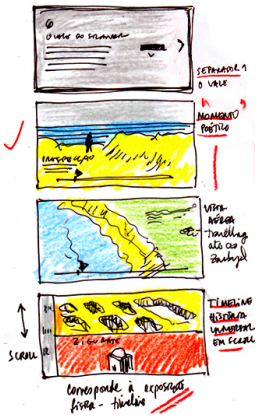


Fig. 112) Screenshot of the "Stories of Zambujal" app © G. Casella

Chapter 1: The valley of Sizandro river

In this section the aim is to introduce the viewer to the territory where Zambujal is located. The narrative starts with an archival video of an aerial view made during an excavation campaign. We are then presented with a menu that allows exploration of an interactive map of the county with several archaeological sites

including Zambujal. Each point of the map has a link to an information page about the sites. Information includes who discovered the site, a collection of artefacts, typology of the site, and links to bibliography. A second button in the menu allows the exploration of an interactive timeline about ancient civilizations situating Zambujal in the timeframe.



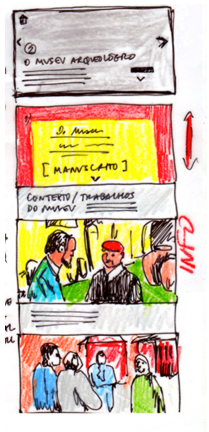


Fig. 113) Screenshot of the "Stories of Zambujal" app © G. Casella

Chapter 2: The archaeological museum

In this chapter we can explore the conditions that facilitated the discovery of Zambujal. In the context of a newly created museum in the 1930s a campaign of making an inventory of archaeological sites of the county. Leonel Trindade was responsible for creating a collection for a new museum of man using materials from that area. The narrative is developed using a scroll movement displaying text, documents and photographs showing different aspects of the first museums.



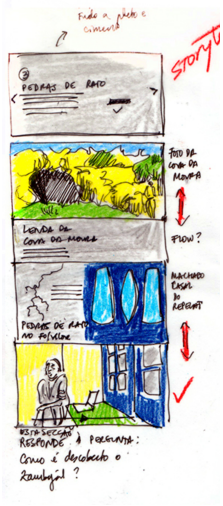


Fig. 114) Screenshot of the "Stories of Zambujal" app © G. Casella

Chapter 3: Thunderbolt stones

This chapter explores folklore and oral history of Torres Vedras. Legends and Myths about enchanted moors and thunderbolt stones usually give archaeologists clues about the existence of archaeological materials.

Archaeological sites are usually known by local farmers and shepherds and are associated with legends. We filmed an interview with the son of Leonel Trindade where he tells how his father found Cova da Moura (a necropolis) and how a worker in the excavation told him about a site with many thunderbolt stones (actually prehistoric hammers) believed to be amulets or fortune makers buried in the ground by thunders[201].

[201] Video can be seen in Appendix C.1.3. PEDRAS DE RAIO



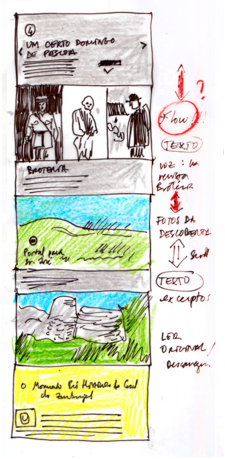


Fig. 115) Screenshot of the "Stories of Zambujal" app © G. Casella

Chapter 4: A certain Easter Sunday afternoon

This title is extracted from a text published in *Brotéria* magazine (1946) where Eugenio Jalhay, a Jesuit priest and archaeologist, writes about the importance of the site. The aim of this chapter was to tell the story and context of the site through the subjective voice of Jalhay, in the style used in that time in popular science magazines. We also show how the site was firstly interpreted as a funerary monument and published in another magazine (*Badaladas,* 1954-55) accompanied by a drawing that supported that interpretation.





Fig. 116) Screenshot of the "Stories of Zambujal" app © G. Casella

Chapter 5: Dona Vera

In this section we present Vera Leisner who was married to Georg Leisner. Together, this couple of German Archaeologists lived in Portugal in the 1940s doing independent research, making a survey and corpus of megalithic heritage sites. This chapter aims to put in evidence the role of women in science, challenging the viewer to deepen their knowledge about the history of Archaeology in Portugal.

It is through the hand of Vera Leisner that the future of excavations in Zambujal by the archaeologists of the German Archaeological Institute, Sangmeister and Schubart, are introduced to Zambujal. Miss Vera, or Dona Vera was the way the Portuguese local workers and collaborators in the excavation, affectionately called her.

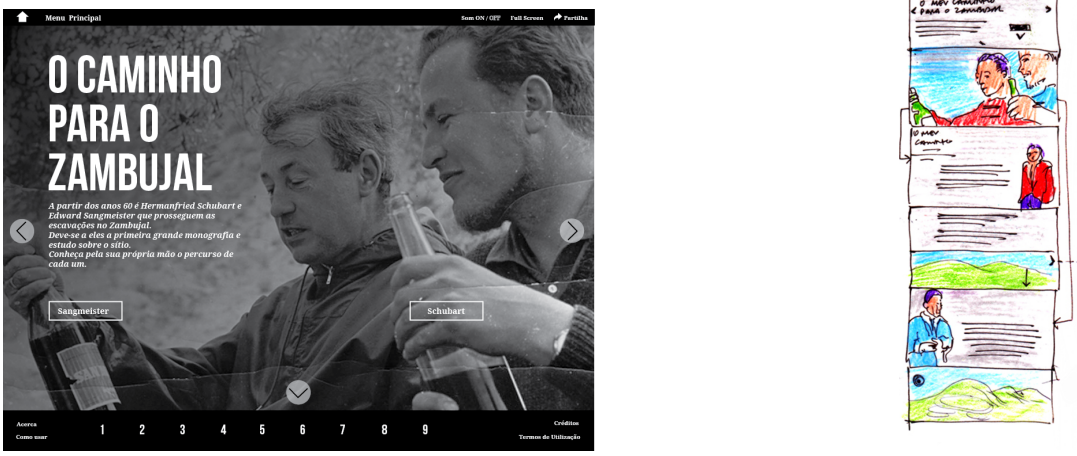


Fig. 116) Screenshot of the "Stories of Zambujal" app © G. Casella

Chapter 6: My way to Zambujal

This section recounts how the two archaeologists Edward Sangmeister and Hermanfried Schubart arrive in Zambujal. The narrative is presented through two unpublished texts that Dr. Michael Kunst gathered asking them to write about their personal experience. It is a form of telling the story through their own voices in the manner of 'show, don't tell'. The writings are interwoven with archival photographs provided by the authors.

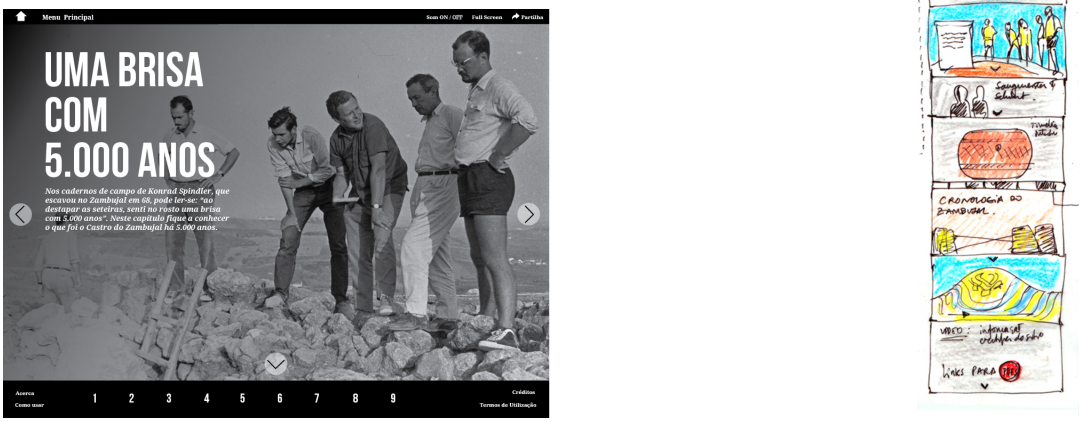


Fig. 117) Screenshot of the "Stories of Zambujal" app © G. Casella

Chapter 7: A breeze with 5000 years

This chapter was motivated by a serendipitous finding in the field notebook of Konrad Spindler when excavating in Zambujal. Spindler is an internationally renowned archaeologist who participated in excavations at Zambujal in the 60s with Sangmeister and Schubart. He is the archaeologist who published Otzi, the snow mummy of the Alps, an important and mediatic archaeological find. In his field notebook, Spindle writes about the experience of excavating inside the barbican walls of Zambujal, and reports that when he opened a window in the wall he felt like a 5000 year old breeze was blowing in his face, adding a poetic tone to a scientific observation. This constitutes what we think is a fun fact that can add engagement to public communication of science. This title gives the prompt to provide information about the scientific campaigns and findings made during the Sangmeister and Schubart campaigns in Zambujal through several kinds of documentation, drawings, photographs and textual interpretations of the site.





Fig. 118) Screenshot of the "Stories of Zambujal" app © G. Casella

Chapter 8: Changing Winds

This section makes the transition to contemporary excavations, showing through different *media* the passage from black and white to colour photographs, videos, and sound recordings made during the campaigns. The highlight is an interactive map of the excavation with hotspots to videos on location. It also features a section with reconstructions (artistic impressions) of Zambujal, and a link to information about 4 exhibitions that were made to communicate Zambujal in the 90s and 2000.



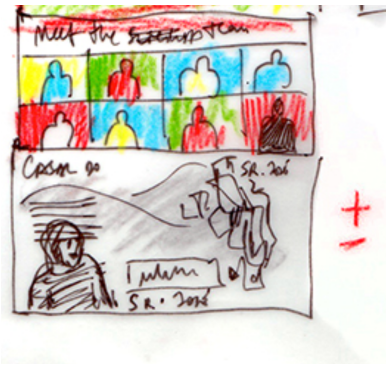


Fig. 119) Screenshot of the "Stories of Zambujal" app © G. Casella

Chapter 9: Rizomes

The last section constitutes a mosaic with many people that passed through Zambujal, highlighting collaboration among different areas of expertize (archaeologists, topographers, biologists, botanists, etc.). In future iterations it would be interesting if this could be a collaborative space where local people could add their testimony about what Zambujal represents for them.

e) Interaction Architecture and Interface Design

To create the interface design of our final prototype "Stories of Zambujal" web app it was vital to undertake the fieldwork reported in Chapter 5 of this thesis, where we explored examples of emerging digital *storytelling* projects.

Based on our observations we understood that the anatomy of an interactive narrative is no different from that of a book or a thesis, having front matter, a body with several chapters, and back matter. In the front matter we have the landing page, or home page. Like the cover of a book this section must engage the viewer (or interactor in the case of a web app). Here we set the tone of the experience. In our case, we opted for an aerial view of Zambujal, the title of the experience "Stories of Zambujal", a tagline that should frame what is about to be presented, and a well visible button or place to click in order to move forward in the experience.

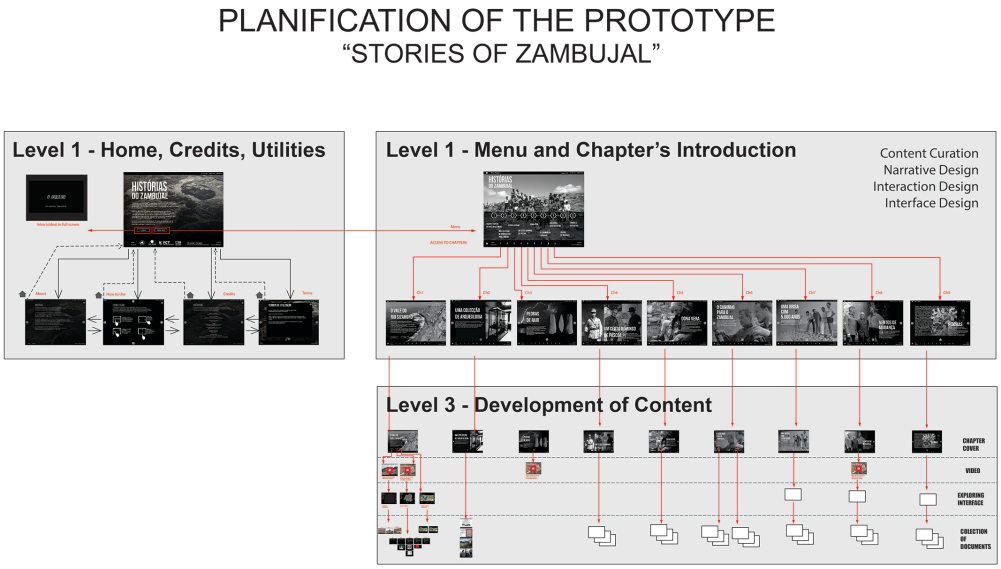


Fig. 120) Navigation Architecture of the final app © G. Casella

In the case of a book, it is common sense to open the cover and see the following pages, such as the credits and the index, then the preface, etc. In the case of an interactive narrative we need a button, or an arrow, something in the interface that invites one to move forwards. In our case we decided to place two buttons: '*Enter*' and '*Skip Intro'*.

'*Enter*' lead us to a preliminary video, a remix of several elements related to the use of bow and arrow in Zambujal. The place is best associated with a defensive fortress, and thousands of flint arrowheads that were found. So we start with this idea that the place had many activities related to arrow shooting. This video was produced for the physical exhibition and in the interactive was repurposed.

Secondary information in this '*Home*' page is in the top section: some features I would like to see implemented in the future but were left aside for time management issues (the language option, the sharing option, the full screen option and the sound on/off option). For the landing page we would like to have the sound of archaeologists digging, the hoes and daggers clinging on earth and stone, over a nature soundscape of birds and bees. It was also possible to have an animation of clouds passing by, giving the illusion of being in an airplane taking the aerial photographs so common in the excavations.

The '*Menu*' and '*Home*' button on the top left side of the screen is a link that appears in all pages of the digital publication, but probably does not make sense to appear in the home page itself.

In the lower bar, we included the visual logos of all the funding entities related to the development of the app, both in the funding of my academic research and in the heritage resource side. It is also located in the lower bar - what I called the "front matter" information.

We included four links: '*About'* (context of production); '*How to use'* (gesture indications, probably soon this will not be needed in interactive projects, but now it is still common to inform the interactor about how he/she should interact with the system); '*Credits*' (the section with acknowledgements about the team involved, usually digital projects are made by interdisciplinary teams, and usually they are not small); and finally the '*Terms and Conditions'* (section where we mention copyright issues).



Fig.121) Showing the main 'Menu' with two design hypothesis © G. Casella

f) Content Management and Optimization

Content management in our project was a question of putting together all the content that was planned. With a digital artefact we were able to present not only text and image, but because of the affordances of screen *media* we could present also videos and audio files, and of course take advantage of interactivity making a publication that would provide non-linear explorations of the archive through the use of hyperlinks.

After having the specific model of the interface, and the narrative structure defined, content management was a matter of filling in the spaces with images and texts in a unified manner. Pictures should have the same resolution. Videos should be compressed so as not to occupy too much space.

As we used *Tumult Hype* application to mount the interactive, we had to have all the "scenes" prepared previously as .png files. In commercial situations, we could have a database with all the images, but as we opted for a simple way of creating the prototype, this was the best way to achieve the desired result.

All content was developed in relation to the exhibition. The scheme below shows how parts of the interactive connect to the physical exhibition. We never developed too much this idea but it is worth sharing to rethink in the future how we can graphically represent and conceive these connections.

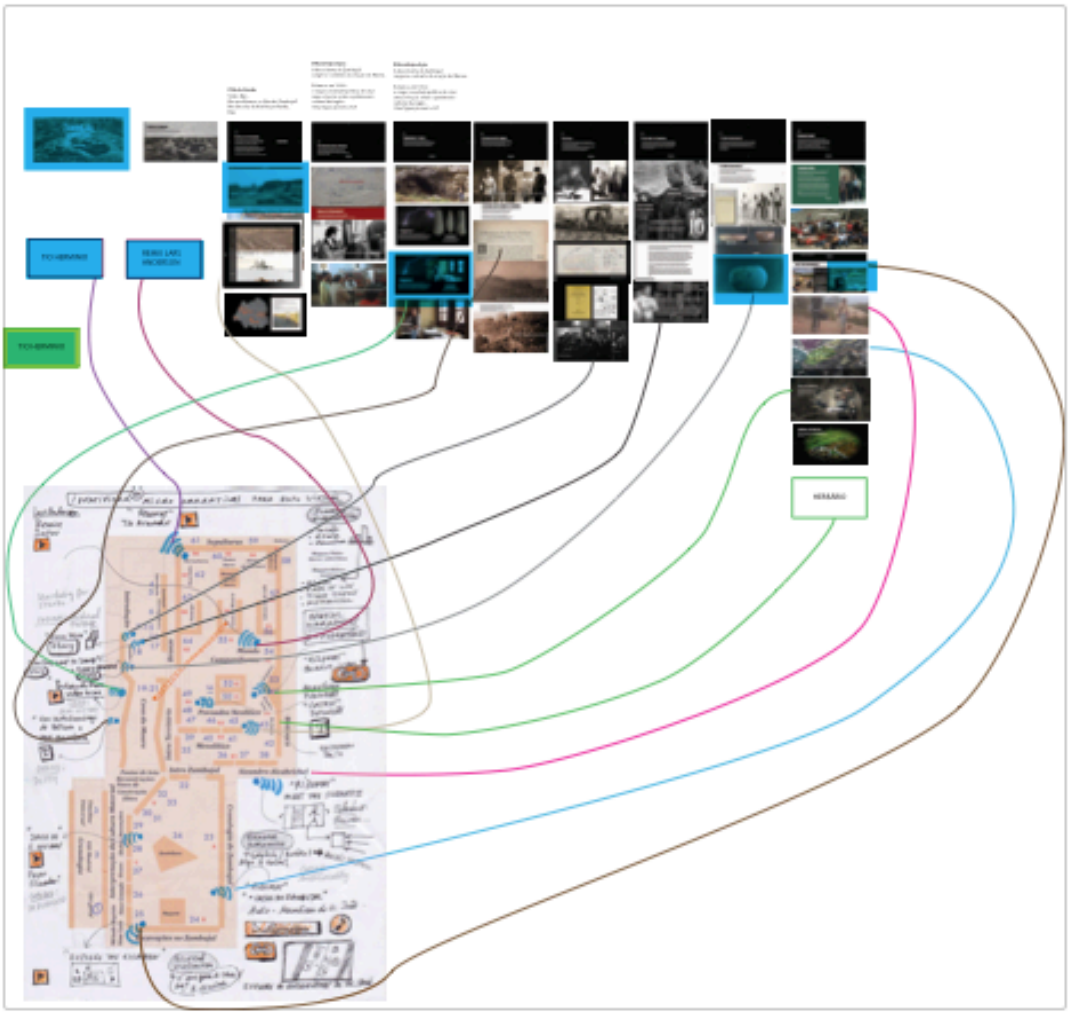


Fig.122) Study for the connection between the virtual and the physical exhibitions © G. Casella

g) Project Testing

Given the available timings for our research we conducted tests with two interaction designers, using think aloud protocol, where we became aware of two fundamental factors. We used *Tumult Hype's* Reflect app[202] that allows one to project what is on the laptop to an iPad. We gave this iPad to two designers and asked them to interact with it and we recorded a think aloud protocol in an informal environment.

[202] Tumult Hype – Reflect : https://itunes.apple.com/us/app/hype-reflect/



Fig. 123) Testing the app in an informal environment

The first insight from the interaction designer was that the idea was good, pleasant, and in general well designed, it had nevertheless too much text. The advice was that what most people expect are the fun facts, and with digital *media* we can relegate extensive text to an archive section through a link.

The second insight from another interaction designer was that the prototype was based too much on clicking in hyperlinks, and this should be replaced by gestures. This tester said that the future of this kind of platform to read interactive publications (tablets or smartphones) relies much more on gesture than on click. The mouse click is something we associate with the desktop experience, while the publication "Stories of Zambujal" is supposed to be read in an iPad.

5.3. Discussion

In this chapter we explored several possibilities of aplying *interactivity* and *multimedia* to archaeological communication. The aim of this fieldwork was to apply Interaction Design (and the principles of digital *storytelling*) in the traditional workflow of communication in Archaeology, including some of the notions and inspired by the good pratices identified in the case studies described in Chapter 4. Because of this premisse, we tested several possibilites that lead us to the final project "Stories of Zambujal" virtual exhibition, each one of the steps led us further into meeting our hypothesis of applying the narrative model of interactive documentary and digital *storytelling* to our field.

One of the experiments (Pilot Study 2 " Interactive Stratigraphy") was concerned with the aplication of *interactivity* to a stratigraphic profile. Archaeologists always need better forms of visualization, and this interactive graphic allowed to visualize circa 20 drawings of an excavation plan, in relation to its stratigraphy in a very intuitive way, a task relatively complex when working solely with drawings. To our knowledge this kind of experiment wasn't made before and can be a contribute to archaeological visualization methods. However, this interactive graphic, although usefull for peer communication was definetly not suitable to public communication of Archaeology.

In order to communicate Zambujal to a broader audience we have experimented with three instances of interactive digital narrative made with the aim of engaging both specialists and non-specialists in our subject. Each iteraction was important, but only the final one met our goal. By working in the iteractive cycle framework (Smith and Dean 2009) we were continuously progressing with our prototype, abandoning the options that didn't meet our goal, but keeping the positive outcomes.

> *"To iterate a process is to repeat it several times (though probably with some variation) before proceeding, setting up a cycle: start-end-start. The creator must choose between the alternative results created by the iteration, focusing on some and leaving others behind (temporarily or permanently)".* (Smith and Dean 2009: 19)

Pilot Study 1 "Once upon a time, a valey" was our first experiment with an interactive interface for public communication. We focus on the development of navigation architecture, content and interface design. Presenting rich visual information and *interactivity*, it conveyed information grouped in four main storylines about the interpretation of Zambujal (architecture, material culture, use of space and environment). However, we observed it lacked a sense of *storytelling* in the sense that there was no plot, no characters, no action. Narrative usually has a plot, characters, and the sequence of events showing tension and emotion, as suggested by several authors (Propp, 1895; McKee, 2002, Lambert, 2009).

Inspired by Propp's *Morphology of the Folktale* (1895) and adopting a Neo Proppian approach (Koenitz, 2015; Ferry, 2015), we had identified in our study of the communication of Zambujal through time (Chapter 3) six types of narrative used to communicate this archaeological site. We hipothesize that applying these six types of narrative in an interactive interface was a successful formula to produce *storytelling* about Zambujal. Proceeding to Pilot Study 4 we collected archival material to *remix*, and divided the interface in four parts, each one leading to a theme: discovery of the site, space, time and stories.

Combining those six types of narrative with *interactivity* led us to create respectively: interactive timelines (chronological narrative); interactive maps (spatial narrative); use zoom in and out of archaeological artefacts, show reconstructions of the site (interpretation narrative); scroll interactive section with the story of discovery of Zambujal (factual narrative).

However, the moment where we identified the emotive dimension of *storytelling* that we aimed to convey, was in the section "stories". Although we just did a rapid prototyping and tested with Interface Design, we soon understood that the power of *storytelling* was successfully evident in the inclusion of characters in our story. But not fictional characters, the characters we aim to include are all the people involved with the site, since its discovery, previously to its disovery even (with folklore local tales), to people that worked in Zambujal, to our idea of further include a section where visitors could contribute with content about what Zambujal means to them[203].

[203] During our research we also did an artistic residence in Torres Vedras Contemporary Art Gallery where we worked with six Senior Clubs in Torres Vedras, adressing the artistic practice of Drawing and Voice and Video recording of their memories connected to the territory of Torres Vedras. In this workshops that in total included near 300 elder people, I asked if they heard about Zambujal, but none of them knew. They did mention however,

From this conclusion, we understood at last the trail we had to pursue, and we worked on the final version of the prototype Stories of Zambujal. The fifht experiment with interactivity applyed to Zambujal's archive was organized as a linear sequence of chapters (avoiding the non-linear interface, although the interactor can explore the chapters randomly, but that is the same case as with a book). The novelty here is that we organized a sequence of chapters, numbered from 1 to 9 (inspired by the examples we studied in Chapter 4), and this chapters had titles that were more than just topics. Instead of "time", "space", "story", we used narrative titles based on the material we presented, for example "My way to Zambujal", "Changing Winds", etc.

In the last version of our prototype we included the 6 narratives indentified in Chapter 3 (see Fig. 13). Finnaly we could focus not so much on the medium and its affordances to display information (ex. Interactive timeline, interactive map) but we dedicated more time and had better results in addressing content, especially in the case of Factual Narratives, Popular Narratives and Grand Narratives.

Our greatest contribute, we believe, was the fact that we noted new voices (the stories of the reaearch, the stories of discovery, the local people's relation to heritage), and tried to include them. We experimented uses of interactivity in all stages of communication proposed by the science communicator scholar Massimo Bucchi (2008) the *Inter-specialist stage*, where we developed the Pilot Study 2 – "Interactive Stratigraphy", the *Pedagogic stage***,** where the Pilot Study 1 – "Once upon a time, a valley" can be used to create simple educative graphics, although with lack of emotional storytelling, and finally, the *Popular stage*, characterized by our interactive documentary "Stories of Zambujal." Our research on the uses of interactive documentary to communicate Archaeology helps to increase the visibility in the way the discipline operates, demystifying the fantastic approaches to Archaeology that have been promulgated in the mass *media*.

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other archaeological sites where they used to go and take wedding photographs near the ruins. The project is archived in this blog https://omeulugar2013.wordpress.com/

	NARRATIVES (6 types)					
CHAPTERS	Spatial (maps)	Chronological (timelines)	Interpretation (Use of Space)	Factual (history of the institution)	Popular (Folklore, legends, myths)	Grand Narratives
Title "Stories of Zambujal"						Focus on smaller stories / on *storytelling*
1.Sizandro's Valley	Aerial video; Interactive Map with all sites	Interactive timeline of changes in Sizandro basin - Universal History timeline		Video of Sr.Hermínio narrating the discovery of Tholos da Borracheira.		
2. A collection of Archaeology				Text, image, historical documents		
3. Thunderstones					Video interview to L.T. Junior	
4. A certain Easter Sunday				Documents		
5. Dona Vera				Documents, text, photo, drawing		
6. My way to Zambujal				Text and photographs – inedited interviews by M.Kunst		
7. A 5000 years breeze	Scientific maps of the excavation	Images: Chronology of Zambujal	Interactive map of the 5 phases of Zambujal		Fun fact: field note by Konrad Spindler	
8. Changing Winds	Interactive Map of the excavation		Models and Reconstructions of Zambujal		Oral History: sound interview of Sr. José	
9. Rizomes				Biography of different people that passed through Zambujal		Focus on the idea of a network – that the archaeological site belongs to many people

Fig. 13) Table that relates content of each chapter of the interactive publication with the 6 narratives.

5.4. Summary

What we conclude from this experience, is that stories have structure, a database is not a story (Manovich 2010), an object is not a story, in making Heritage Interpretation we should create a narrative layer using characters, a plot, and some action in order to make it an object with digital *storytelling*. With this experiment we had in mind that people "*interact with the stories rather than with the authentic site*" as suggested by Bella Dicks (2004) and a privileged way to make people interact with stories today is through digital technology. Although we focused on a specific technology – the interactive documentary – and applied our threefold research design (study of the archive / state of the art / prototype development), we had the opportunity of observe during the years of our research, how Archaeological sites, Institutions, Archaeology Companies, etc. are making increasingly greater use of digital media and reinventing themselves online in an increasingly accessible way. Our framework with "Stories of Zambujal" can be from this starting point, at least, reproduced to other sites.

Conclusion

This thesis, which takes the archaeological site of Zambujal as a case study, aimed at understanding the impact of digital *media* upon archaeological communication, at a time when these *media* are becoming the norm. Archaeology, a science that has its origins in the nineteenth century and roots in the antiquarian tradition dating back to the Renaissance, is now facing a transformation - a condition inherent to culture itself.

In this discipline, one of the issues that has gained considerable importance in the course of the twentieth century was the need to share knowledge produced by archaeologists, both within the scientific community and the general public. In this context, not only has science been professionalized, with the development of methodologies for survey, analysis and production of scientific studies, but also, science communication have all received increasing attention on the part of a more general audience.

The scientific domain of Archaeology, framed by Heritage Management policies, has defined three main areas of actuation: study, protection and communication of archaeological sites. ICOMOS charters that recommend the inclusion of local communities in the protection of heritage sites, highlight the social responsibility of Archaeology.

This encouragement of communication, in conjunction with an increasingly informed public, created the conditions to share the processes and results of archaeological research in novel ways. This new paradigm of the relation between Archaeology and the public results in many positive outcomes: promoting the protection of a common heritage – no one protects what he/she does not know; fostering social education - an informed population stands for values such as cultural diversity, memory, identity, etc., and subsequently attracting funding for research and heritage preservation.

It is well known that the main ‘holders’ of the archaeological knowledge are archaeologists themselves, contributing to the advance of science in its own right. Nevertheless, in present times, the public interest, motivated not only by cultural tourism, but also by the educative and recreational communities, demand the creation

of strategies that facilitate an intelligible access to this knowledge. These strategies include publications, 'musealization' of sites, creation of mediation elements such as information panels, maps, and more recently, digital interactive narratives (websites, videos, documentaries, mobile applications, etc.).

Our prototype *Histórias do Zambujal [Stories of Zambujal]* demonstrates that the interactive digital narrative or interactive documentary format can be used as a medium to disseminate knowledge about an archaeological site on the Internet reaching contemporary audiences' expectations and need for information.

With regard to content, by focusing on telling stories about the archaeologists and the story of the institution itself, helps avoid romanticized interpretations of an archaeological site.

With regard to form, using *multimedia, interactivity and connectivity,* as the main characteristics of the digital medium (Manovich, 2001) confirms our working hypothesis that interactive documentary is a suitable *genre* for public communication of Archaeology on the Internet. It not only remediates older *media* appropriating archival material to deliver it in new ways, in line with an affordance of the "remix" as "*a condition born of the digital era* " suggested by Uricchio (Uricchio, 2017: 194) but it also innovates, successfully engaging audiences with informative content that is presented though interactive design, meeting current cultural conditions of digital literacy.

With our research we have successfully helped the institution to share its stories in a good balance between engaging storylines and deeper explanations of the subject. Through this study we can contribute to future studies that address the question of how digital technology, as the main way of accessing information today, is impacting the tradition of *storytelling* and pictorial representation of the past. It also contributes towards fostering the adoption of digital tools as visual methods in archaeological heritage research and management.

Our prototype, built on the results of our visual content analysis of the corpus and identification of narratives and media, constitute a scalable framework that can be applied to other archaeological sites.

Public approaches to archaeological sites today are characterized by the heterogeneity of groups: archaeologists, local community, scholar community, both national and international, of different ages, levels of literacy and cultural backgrounds, with different motivations. In this sense it was observed that in the case

of Zambujal new visitors have been relating to that space with the intention of carrying out various activities such as: outdoor drawing with groups like the *Urbansketchers*; study visits with school groups; leisure tours with the local community; hiking with groups linked to nature; participation in collective games such as geocaching or even yoga and meditation classes promoted by *New Age* groups.

New audiences, from different cultural backgrounds, approach archaeological sites with curiosity and receptiveness to new learning experiences. The question we need to ask today is how to convey the knowledge that has been so meticulously extracted by archaeologists, and their advanced new research methods, in a way that is meaningful to such a heterogeneous audience without loss of authenticity? In this socio-system, the role of the archaeological communicator is essential for preserving the integrity of the site revealed by the scientific research, and for translating it to the general audience, who can then fully appreciate it and hence contribute towards its preservation.

Digital *media* can be an important ally in engaging people for the apprehension of this knowledge. The role of digital technologies in Archaeology produced unexpected effects with its emancipatory effect (Morgan, 2012). In fact, as digital media theorists (Bruns, 2008; Jenkins, 2008) argue, today we face a generation of *produsers* i.e. people who use digital *media* not only to consume information but also to produce content. In this sense, the heritage field witnesses the confluence of new actors, producers of content themselves - such as blogs, 3D reconstructions, video - although mostly not scientifically validated.

Conscious of the existence of these multiple generators of information, the production of digital *media* content by the archaeological communicator becomes a work of great responsibility, since the transformation of the scientific message has to be the standard. Basically, the communication of Archaeology is no more than an exercise in *rhetoric* where the semantic basis is *traductere et seductere* (translating and seducing), applying the principle of otherness that allows to transmit the message in a clear, involving and eventually disruptive way.

If communication in the twentieth century followed the *one-to-many* approach (there was a reader, a listener, or a viewer), today's digital communication is made from *many-to-many*, where everyone is both producing and consuming information. Increasingly, people seem physically isolated from their surroundings, although they

are closely connected virtually. It is imperative to understand the specificities of the new user, or interactor (as proposed by Murray, 2012) in order to produce content and communications strategies that are successful.

Museums and archaeological sites have to adapt to the new reality without becoming hostage to technology alone. In communication design, it is considered that "form follows content", i.e., that content precedes and dictates the most effective modes of communication. The form of communication should therefore be adapted to the message in order to support it better.

The approach that seemed necessary for us, and which motivated the present research project, was to understand the communication needs in Archaeology and improve our understanding of the *media* that support that communication through time, more than focusing solely upon the new technological changes.

Grounded on the study of the archives of the site of Zambujal, this research was able to identify six types of narratives applied in the last 70 years to the communication of the site: folklore, factual, spatial, chronological, interpretation and grand narratives; and how these were transmitted in different media forms.

Folklore narratives (namely the association of the discovery of Zambujal to legends) were registered, for the first time, in video during our research but were passed on through oral tradition and anecdotes. Factual narratives were presented in numerous articles and exhibits telling the story of research, usually through text and archival photographs. Spatial narratives were transmitted through maps, 3D models and illustrations showing the localization of the archaeological site. Chronological narratives that help to situate the settlement in the Copper Age were told through timelines, or series of reconstructions that show how the settlement evolved through time. Interpretation narratives are the ones that try to explain the morphology and use of space and are usually illustrated with hypothetical reconstructions. Finally, the grand narratives, or the ones that relate the site to a bigger idea, such as war, commerce, environment, class, etc. are conveyed in exhibition themes and titles. These narratives are an attempt to make the site meaningful to contemporary audiences, by addressing universal concepts.

The digital prototype that derived from this research, based on the medium of digital *storytelling,* consisted in the development of a virtual exhibit. It sought to integrate the six types of narratives, incorporating the story of the site under different perspectives, from traditional contextualization narratives of localization, chronology,

and functionality of the site, to memories of local people and their relation to archaeological findings in the region, stories of the discovery of the site, legends and myths, and episodes from the story of the scientific research itself, less known to the public. In other words, the prototype aimed at highlighting the emotional character of the narrative in order to engage the audience with the scientific work that lies behind the creation of archaeological knowledge.

The digital *storytelling* framework as disseminated by the Center for Digital Storytelling of Berkeley is characterized by short digital stories emphasizing the human and the emotional character. We choose this approach as communication strategy to apply to the Zambujal virtual exhibition. The choice of this communication strategy may diverge from the traditional form of communicating Archaeology. Instead of highlighting the *Genius Loci* (describing the place chosen by the old inhabitants because of its defensive characteristics, access to raw materials, etc.) we shifted the argument focus to the site's DNA. And what is the DNA of an archaeological site? In biology, DNA is an organic compound whose molecules contain genetic instructions that coordinate the functioning of each living being, transmitting its characteristics in a hereditary manner. By extrapolation, the DNA of an archaeological site can be its informational legacy; i.e., a group of stories since the moments before its discovery, continuing though the story of an excavation, and all its interactions with the community that relate to the site (archaeologists, visitors, local inhabitants, etc.). In this context, the deep analysis of the documental *corpus* of Zambujal (scientific articles, magazine articles, exhibitions, artist's impressions, scientific illustrations, models, folklore and communitarian and individual expressions) revealed itself to be very useful as a matrix for developing a *storytelling* project applied to digital *media*.

The use of *storytelling* has acquired an important role in communication techniques. In the marketing domain, we can observe several important brands incorporating *storytelling* as a way of connecting to consumers and transmitting the brand identity. It addresses the individual directly and in an empathetic way by favoring a proximity language, where the texts are short and the image acquires an aestheticized plasticity, incorporating graphic design, movement and interaction. Heavily influenced by the communication conventions of the social media, these short chunks of information contain in themselves the condensation of elements that allow its immediate perception in the short seconds of duration of a *scroll* in a news *feed*. To

communicate in this new paradigm one should be aware of these orientations; i.e., to produce content in a way that fits into the contemporary dynamics.

Although the interest for *storytelling* is not new[204], nowadays the digital narratives, added to the previous forms of communication, are more relevant. In this context, the techniques of Heritage Communication should adopt more emotional approaches, adopting new languages and communication codes that catch the attention of the new audiences, disrupting if necessary traditional practices.

The big challenge today is how to choose an informed communication strategy knowing that each *media* has a language of its own. As Léon (2001) suggests, the scientific, literary or journalistic writing, each have their characteristics, and the same applies to different *media* (analogical and digital). For example, we cannot apply in an information panel the same language used in a scientific article. A successful communication happens when the message is well received by the receptor, and most readers / viewers of a museum panel may not understand scientific jargon. That is why it is necessary to know, on the one hand, what are the communication needs in Archaeology (identify narratives) and, on the other hand, what are the means or *media* that better communicate those stories (identify emergent innovations with digital *media*).

With all the potential deviations that may result from the opening of the archaeological sites to the several and heterogeneous readings enabled and produced by the actual socio-system, the role of Archaeology earns an important dimension if it integrates *storytelling* in its communication strategies.

As we suggest in this thesis, Heritage Management should question: *"what does the public want?"* and try to meet the visitors's needs and expectations in their current cultural condition. In the same way that, as we have seen in the short history of archaeological museography, there were several attitudes regarding how collections were organized, presented and appreciated by the public – from the enhancement of the collectors (like in the Renaissance sculpture gardens and loggias), through the exhibition model of the national museums (with its cumulative display of objects that served mainly as reference for other archaeologists), to the educative exhibition regime, using dioramas, models and illustrations, that typify the twentieth

[204] See the role of the literary romance as the dominant way of telling stories in the nineteenth century, or cinema and popular music in the twentieth century, or even the medieval biblical paintings. In fact, the capacity to tell stories is something that distinguished humans from other creatures (Niles, 1999).

century museum; it is necessary to re-think the twenty-first century museum as a space where the visitor besides learning, expects to share, participate, and belong.

Today's visitors take *selfies* inside the galleries or in the archaeological site, publishing their self-representation in social *media* and validating their presence in the world. This phenomenon is becoming a new paradigm. It is important to be aware that these visitors are also producers of contents. Hence it becomes necessary to create a system that combines both the views of the public and the views of the specialist. Perhaps in that way, the visitors, being equaled to the institutional and scientific narratives, can integrate them in their perception and further communication of the site, propagating their acquired knowledge.

It is possible to collaborate in bidirectional learning. On the one hand, the new audiences, who are inevitably content producers, by being integrated in a system, would have contact with the official narrative, on the other hand, heritage managers and archaeology professionals would have access to the views and conditions of culture of the audiences for whom they are entitled to communicate. They would therefore be in a better position to answer the question "*what does the public want, and how can we communicate effectively to this public?"*

One should reflect upon the capacities of this new technological system also regarding the collaboration it promotes, because, in fact, people feel connected not only by a technological network but also a symbolic network. It is for these people of today that we should work. Museums, archaeological sites and interpretation centers create innumerable digital content every day, a field that shows no sign of slowing down. It is therefore necessary to invest in the education of new generations of archaeology professionals, systematizing not only the knowledge about the possibilities of the digital medium, but above all, promoting a critical debate about the social practices that underlie the technological mediation.

Beyond the importance that digital mediation has nowadays, we should preserve a cross temporal view of contemporary practices, considering the narrative line that connects us to the past. We should acknowledge that archaeological communication has very ancient roots. The moment we are today is simply the most recent arrival point and it will too, one day, become another "*comma"* in the text of History.

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