

Real and Virtual Convergences:

The LOCUS project – Playful Connected Rural Territories

Liliana Gonçalves

Lídia Oliveira

Ana Carla Amaro



Real and Virtual Convergences:

**The LOCUS project
– Playful Connected
Rural Territories**

Liliana Gonçalves

Lídia Oliveira

Ana Carla Amaro

Title

Real and Virtual Convergences: the LOCUS Project
- Playful Connected Rural Territories

Authors

Liliana Gonçalves, Lúcia Oliveira and Ana Carla Amaro

Collection

DigiMedia - N°2

Design

Exxa Design Studio

Publisher

UA Editora Universidade de Aveiro Serviços de Biblioteca,
Informação Documental e Museologia
1st Edition - June 2022

ISBN

978-972-789-777-3

DOI

<https://doi.org/10.48528/ee1p-gm62>

The sole responsibility for the content of this publication
lies with the authors. © Authors.

This work is licensed under a Creative Commons
Attribution-NonCommercial-NoDerivatives 4.0.
International License.

Synopsis

Imagine a small rural village in Portugal, composed of places, people, traditions, and collective memories. Amiais is all that. It is located in the district of Aveiro. But without visiting it, we don't know it. Will be? Imagine that Amiais and its cultural heritage go beyond the borders of reality. Imagine that technology allows us to know the places, the people, the traditions, and the collective memories of Amiais, in a virtual, immersive scenario that connects us to the real. Imagine that the edges between the real and the virtual converge in playful experiences, connecting us to the territory, the people, and the cultural heritage of a place and a community. The LOCUS project materialized the imagination and transported the small village of Amiais to the digital world. The use of digital solutions to share and enhance cultural heritage dissemination is the LOCUS project's focus. For four years, the project focused on several technological solutions that allowed real and virtual convergence. This book describes and illustrates that journey and the leading scientific contributions that emerged. Throughout the eight chapters that compose this book, the conceptual dimension of the LOCUS project will be addressed, centered on the concepts of technology and cultural heritage. The methodologies

used in the various phases of the project are presented, especially the participatory methodologies that allowed the inhabitants' engagement in the project and the dissemination of their cultural heritage through the sharing of collective memories. The book also pursues the technological dimension explored to close Amiais to the digital world and present a model for sharing cultural heritage on digital platforms. It ends with a reflection on the future challenges of using digital solutions to share Cultural Heritage.

Content note

Part of the contents that make up the various chapters of this book were edited and adapted from texts previously published within the scope of the LOCUS Project – Playful Connected Territories, appearing in the following academic publications with peer review:

Gonçalves, L., Martins, D., Oliveira L. & Amaro, A. (2022). Amiais in Second Life™: the use of metaverse environments to disseminate Cultural Heritage. *OBS* Journal*, ISSN 1646-5954, Vol. 16 No. 3, pp.101-119, Available at: <https://obs.obercom.pt/index.php/obs/article/view/2215/188188194>

Martins, D., Oliveira, L., & Amaro, A. C. (2022). *The Role of Second Life Games in Promoting Cultural Heritage*. Proceedings of ICITS'2022 – International Conference on Information Technology & Systems, Costa Rica. Springer International Publishing, 499-508, doi: 10.1007/978-3-030-96293-7

Martins, D., Oliveira, L. & Amaro, A.C. (2022). *Life in Second Life through the eyes of residents*, 17ª Conferência Ibérica de Sistemas e Tecnologias de Informação, 22 to 25 June 2022, Madrid Polytechnic University (UPM), Madrid, Spain. *Proceedings of CISTI'2022 – 17th Iberian Conference on Information Systems and Technolo-*

gies (CISTI), IEEE. <https://ieeexplore.ieee.org/document/9819997>, ISBN: 978-989-33-3436-2.

Nobrega, R. & Oliveira, L. (2022). *What features a mobile app focused on cultural tourism and interculturality should have?*, 17ª Conferência Ibérica de Sistemas e Tecnologias de Informação, 22 to 25 June 2022, Madrid Polytechnic University (UPM), Madrid, Spain. *Proceedings of CISTI'2022 – 17th Iberian Conference on Information Systems and Technologies (CISTI)*, IEEE. <https://ieeexplore.ieee.org/document/9820133>, ISBN: 978-989-33-3436-2

Martins, D., Oliveira, L. & Amaro, A.C. (2022). *The Spread of Cultural Heritage in Second Life: Case Study Amiais*, , Proceedings of World Conference on Information Systems and Technologies (WorldCIST'22), Montenegro, 12 a 14 de April de 2022, In: Rocha, A., Adeli, H., Dzemyda, G., Moreira, F. (eds) *Information Systems and Technologies*. WorldCIST 2022. Lecture Notes in Networks and Systems, vol 469. pp 535–542, eBook ISBN – 978-3-031-04819-7 Series E-ISSN – 2367-3389 Springer, Cham. https://doi.org/10.1007/978-3-031-04819-7_51 (https://link.springer.com/chapter/10.1007/978-3-031-04819-7_51#citeas)

Martins, D., Oliveira, L. & Amaro, A.C.

(2022). *From co-design to the construction of a metaverse for the promotion of cultural heritage and tourism: the case of Amiais*, Proceedings of International Conference on Industry Science and Computer Sciences Innovation 2022 | I CODTHT WorkShop – Communication and Digital Technology in Cultural Heritage and Tourism Workshop, Gaia, 9 a 11 de March 2022, Procedia Computer Science, Volume 204, 2022, Pages 261-266, Elsevire, URL: <https://www.sciencedirect.com/science/article/pii/S1877050922007694>

Oliveira, L. (2022). *Sensory and Emotional Smart Cultural Tourism: a conceptual paper*, Proceedings of International Conference on Industry Science and Computer Sciences Innovation 2022 | CODTHT WorkShop – Communication and Digital Technology in Cultural Heritage and Tourism Workshop, Gaia, 9 to 11 de March 2022, Procedia Computer Science, Volume 204, 2022, Pages 283-287, Elsevire, URL: <https://www.sciencedirect.com/science/article/pii/S1877050922007724>,

Martins, D., Oliveira, L. & Amaro, A.C. (2022). *Information and communication technologies and communicational approaches for the dissemination, preservation, understanding, and attractiveness of Cultural Heritage*, ICICT 2022, 7th International Congress on Information and Communication Technology in concurrent with ICT Excellence Awards (ICICT 2022) London, United Kingdom | February 21 – 24 2022. In: Yang, X.S., Sherratt, S., Dey, N., Joshi, A. (eds) Proceedings of Seventh International Congress on Information and Communication Technology. Lecture Notes in Networks and Systems, vol 465, pp.11-18. Springer, Singapore.

https://doi.org/10.1007/978-981-19-2397-5_2

Melro, A., Oliveira, L., Amaro, A. C. & (2021). *Amiais: Territory and Memories Translated from Local Speeches*. In Oliveira, L., Amaro, A. C. & Melro, A. (Eds.) (2020). *Handbook of Research on Cultural Heritage and Its Impact on Territory Innovation and Development*. Hershey, USA: IGI Global. Hershey, PA, pp.298-320., SBN 13: 9781799867012 | ISBN10: 1799867013 | EIS BN13: 9781799867036. DOI: 10.4018/978-1-7998-6701-2. Available at <https://www.igi-global.com/book/handbook-research-cultural-heritage-its/256638>

Rodrigues, R. & Melro, A. (2020). *The challenges in the development of technological research projects in generational gap contexts*. Martins, N. & Brandão, D. (eds.) *Atas dos artigos portugueses e espanhol da 4ª Conferência Internacional de Design e Comunicação Digital, Digicom 2020*, Barcelos, Portugal, pp. 369-381. Retrieved from https://digicom.ipca.pt/docs/DIGICOM2020-Atas_PT-ES.pdf

Pereira, R., Oliveira, L. & Amaro, A. C. (2020). *Enquadrando o Rural – A busca de narrativas na construção de um documentário sobre o lugar dos Amiais, Portugal*. Proceedings AVANCA – Conferência Internacional de Cinema – Arte, Tecnologia, Comunicação, Cap. V, 22-27, ISSN: 2184-4682, <https://doi.org/10.37390/avancacinema.2020>. <https://publication.avanca.org/index.php/avancacinema/article/view/196/381>

Melro, A., Oliveira, L. & Amaro, A. C. (2020). *Digital media usage and the engagement of older people from rural areas in technological projects: co-design sessions*. ESSACHESS – *Journal for Communication Studies*, volume 13, n°

2(26) / 2020, 183-205 eISSN 1775-352X. Ageing and Digital Communication. Retrieved from: <https://www.essachess.com/index.php/jcs/article/view/498>

Amaro, A. C., Rodrigues, R. & Oliveira, L. (2020). Engaging older adults in participatory and intergenerational design teams and processes: a systematic review of the current investigation. *ESSACHESS – Journal for Communication Studies*, volume 13, n° 2(26) / 2020, pp. 157-181 eISSN 1775-352X: Ageing and Digital Communication. Retrieved from: <https://www.essachess.com/index.php/jcs/article/view/493>

Khan, I., Oliveira, L., Amaro, A. C. & Melro, A. (2020). Internet of Things: Evolution and Potential for Preserving and Enjoying Cultural Heritage. In Oliveira, L., Amaro, A. C. & Melro, A. (Eds.) (2020). *Handbook of Research on Cultural Heritage and Its Impact on Territory Innovation and Development*, Hershey, USA: IGI Global. Hershey, PA, pp. 19-43., SBN13: 9781799867012 | ISBN10: 1799867013 | EISBN13: 9781799867036. DOI: 10.4018/978-1-7998-6701-2. Available at <https://www.igi-global.com/book/handbook-research-cultural-heritage-its/256638>

Khan, I., Melro, A., Amaro, A. C. & Oliveira, L. (2020). Internet of Things Prototyping for Cultural Heritage Dissemination. *Journal of Digital Media & Interaction* (special issue on Cultural Heritage and Digital Media, Melro, A., Oliveira, L. & Amaro, A. C. (Eds.)), 3(7), 20-35. Retrieved from <https://proa.ua.pt/index.php/jdmi/article/view/16212/14259>

Khan, I., Oliveira, L., Amaro, A. C. & Melro, A. (2020). Sensing the territory as an opportunity for the promotion of cultural heritage. *Journal*

of Digital Media & Interaction (special issue on Cultural Heritage and Digital Media, Melro, A., Oliveira, L. & Amaro, A. C. (Eds.)), 3(7), 68-91. Retrieved from <https://proa.ua.pt/index.php/jdmi/article/view/16206>

Amaro, A. C. & Oliveira, L. (2019). *IoT for Playful Intergenerational Learning about Cultural Heritage: The LOCUS Approach*. *Proceedings of the 5th International Conference on Information and Communication Technologies for Ageing Well and e-Health (ICT4AWE 2019)*, Heraklion, Crete, Greece, 282-288, DOI: 10.5220/0007747202820288, In *Proceedings of the 5th International Conference on Information and Communication Technologies for Ageing Well and e-Health (ICT4AWE 2019)*, pp. 282-288, ISBN: 978-989-758-368-1. Available at: <https://www.scitepress.org/PublicationsDetail.aspx?ID=IUfyW4A6kxM=&t=1>

Khan, I., Amaro, A. C. & Oliveira, L. (2019). *IoT-based systems for improving older adults' wellbeing: a systematic review*. *Proceedings of CISTI'2019 – 14th Iberian Conference on Information Systems and Technologies*, Coimbra, Portugal, In *Proceedings of 14th Iberian Conference on Information Systems and Technologies (CISTI)*. Electronic ISBN: 978-9-8998-4349-3, Print on Demand (PoD) ISBN: 978-1-7281-1552-8, IEEE. ISSN: 2166-0727. DOI: 10.23919/CISTI.2019.8760866, pp.1-6, DOI: 10.23919/CISTI.2019.8760866, Available at: <https://ieeexplore.ieee.org/abstract/document/8760866>

Amaro, A. C. & Oliveira, L. (2019). *Playful interactions with smart and social objects: supporting intergenerational engagement in learning about Cultural Heritage of rural territories*. *Proceedings of CISTI'2019 – 14th Iberian Conference on Information*

Systems and Technologies, Coimbra, Portugal, 1-6, , In Proceedings of 14th Iberian Conference on Information Systems and Technologies (CISTI). Electronic ISBN: 978-9-8998-4349-3, Print on Demand(PoD) ISBN:978-1-7281-1552-8, IEEE. ISSN: 2166-0727. DOI: 10.23919/CISTI.2019.8760920. Available at: <https://ieeexplore.ieee.org/document/8760920>

Acknowledgments

Part of the contents that make up the various chapters of this book were edited and adapted from texts previously published under the LOCUS Project – Playful Connected Territories. Several researchers who integrated the project at different times contributed to developing these contents. Therefore, the authors of this book are grateful for the valuable contributions of:

Ana Melro

Imran Khan

Dalila Martins

Rui Rodrigues

Rodolfo Pereira

The Locus team and the authors of this book are also deeply grateful to all Amiais residents who warmly received them on their houses and village and shared their stories and memories. This project and this book are also from and for them!

We would also like to thank the Sever do Vouga Municipality, the Couto de Esteves Parish, the Associação Cultural e Social de Couto de Esteves (ACSCE) and the Liga dos Amigos e dos Naturais de Couto de Esteves (LANCE), for their commitment to this project and for their help throughout the research work. Without all of you, Locus would not be possible. Thank you!

The research team also acknowledges FCT - Fundação para a Ciência e a Tecnologia, National Public FEDER/Compete 2020/Portugal 2020 for their financial support to this project [POCI-01-0145-FEDER-029228].

P

Preface

Welcome to LOCUS: a project where real and virtual converge

1

Cultural Heritage and Technology

2

All together, we build science and share culture

3

History, stories and memories: The Cultural Heritage of Amiais

4

From real to virtual: Amiais goes on metaverse

5

Exploring Amiais 2.0

6

LOCUS Model: Sharing Cultural Heritage on digital platforms

L

LOCUS – Playful Connected Rural Territories: what a journey!

R

References

Preface

By Vania Baldi¹

For Marshall McLuhan, the history of the media, and its materialized culture of mediation and representation, corresponds to a process defined by remediation. In *Understanding Media: The Extensions of Man* (1964), the Canadian scholar stated that “the “content” of any medium is always another medium. The content of writing is speech, just as the written word is the content of print, and print is the content of the telegraph”. In this sense, cultural content and its expressive genres are also viewed as objects of remediation: writing is the book’s content, the novel is the film’s content, the film is the videogame’s content, and vice versa. The designers and producers of media technologies’ aim (analog and digital) would be to provide viewers and users with an experience focused on content. This means that the ambition of each medium is to go unnoticed, to reduce to a minimum the perception of the support and technological artifice that allows the mediated content enjoyment or experience. In favor of sensations of immediacy and transparency, the technical and material conditions that provide them must be almost forgotten.

For thinkers Jay David Bolter and Richard Grusin (Bolter & Grusin, 2000), who have taken

up McLuhan’s reflections, the history of the evolution of remediation is based on the constant compensation of the media dysfunction implicit in representational technologies: photography was thought of as the most reliable of painting, cinema more than photography and theater, television more than cinema, interactive technologies more realistic and immersive than analog. The paradox is that sophisticated processes of hypermediacy are developed to achieve the result of immediacy.

However, what happens when technology is not used to disguise or camouflage its nature as a medium, but, on the contrary, to demonstrate its concrete function as the lever of tangible intermediation between alien worlds, allowing to foster an experience of transit between dimensions explicitly different from reality? The book *Real and Virtual Convergences: the LOCUS project – Playful Connected Rural Territories*, in fact, refers us to a set of experiences and reflections that invite us to appreciate, in a separate and hybrid way, the geography and culture of a territory, as well as the creation of a virtual space of interaction and knowledge that digitally retranslates it.

¹ Professor at University of Aveiro, specialized in Ethics and Anthropology.

It is an epistemic and technological challenge to move from knowledge of a context, with its history, topography, demography, and daily life, to its hypermediated transposition. Explore the potential of technological resources and their languages to promote the places and narratives of a territory. Challenge cross paths between the Portuguese village of Amiais and its virtual reinventions.

The LOCUS research project described here in its analytical evolutions, and different stages of development reveal the progressive work of approximation and encounter with the rural location of Amiais carried out by its team. In order to make this reality a ubiquitous space, an intersection of accessible memories and knowledge flow between soils and networks, dwellings and platforms, bodies and avatars.

Without the presumption of dissolving the real by the digital or of viewing the two contexts as equivalent, but with the humility of wanting to challenge the interest in visiting and experiencing both places, this book demonstrates how the creation of a virtual context, full of functionalities and info-communicational layers, can represent a precious work of cultural heritage valorization, rooted in the inexhaustible history and stories of Portugal. In this sense, the digital remediation of this research experience also corresponds to the local heritage enrichment of a technologically increased territory.

Technology is just a means and not an end in itself.



Welcome to LOCUS:
a project where real
and virtual converge

Welcome to LOCUS: a project where real and virtual converge

LOCUS is a multidisciplinary project approved in 2018 and co-funded by FCT – Foundation for Science and Technology and by the European Regional Development Fund. The project's initial goals were to co-design, develop and evaluate an IoT system and understand its potential to support playful intergenerational engagement in creating and exploring cultural contents and learning about the Cultural Heritage of rural territories from the Centre Region of Portugal. To pursue those goals, the project chooses Amiais, a little village in Sever do Vouga, as a pilot territory to implement its findings.

Amiais is a rural space with an aging population that preserves ancient rural traditions, which the few permanent inhabitants still practice. The communal threshing floors, an old gathering point for the farming communities linked to the husking of corn and the ritual of Desfolhada, which are still done today, is an example of those cultural aspects that should be maintained, shared, and promoted with new generations and visitors.

Protecting Cultural Heritage and fostering creativity are crucial to social identity and cohesion and building inclusive and pluralistic societies. On the other hand, promoting social inclusion and economic development in rural areas,

namely through ICT, is one of the six priorities to be addressed by rural development programs of European member states and regions. This prioritization is reflected in the Portuguese national and regional priority domains of smart specialization, and the LOCUS Project is aligned with those.

Cultural Heritage meanings and values emerge from the chains of connectivity linking humans, artifacts, places, and practices, and IoT can bring those connections to matter. Yet, R&D in the role of IoT in preserving the Cultural Heritage of rural territories is globally reduced, and projects in Portugal are unknown. LOCUS contributes to filling this gap by implementing a playful and immersive Cultural Heritage Tourism approach to foster social, cultural, and economic development of Amiais Village and promote intergenerational communication to avoid isolation and contribute to healthy aging.

As was said before, the initial idea to implement the LOCUS Project was to develop an IoT system to explore the cultural heritage of Amiais playfully. The IoT solution initially thought would allow visitors to have immersive gamified experiences. By using a wearable device (bracelet) and their smartphones to interact with everyday things augmented throughout the

village, the visitors would learn collaboratively about the culture of the Amiais and produce and share georeferenced multimedia content. Points of interest and objects around the Amiais village would be tagged using RFID tag/QR code labels and according to playful Cultural Heritage scenarios and narratives. Visitors would be able to interact with the objects by using their smartphones and a bracelet with embedded RFID readers and sensors, which would identify the things and how they are handled. The system would respond by playing sounds, showing augmented reality, requesting the upload or sharing of multimedia content, searching for a new object, etc. Thus, by implementing a playful and immersive approach to Cultural Heritage Tourism, the LOCUS Project would also promote the cultural and socio-economic development of Amiais.

To develop the IoT system and implement it in the territory with appropriate cultural content, the LOCUS research team started the investigation by employing an ethnographically based and agile participatory design approach. Assembling and testing a strategy to integrate Participatory Design and Agile Development methodologies, through which inhabitants,

stakeholders, and visitors will be engaged in the co-design, development, and evaluation of the IoT System.

Considering the initial objective of the LOCUS project, the target audience identified for the project is vast. First, local stakeholders and inhabitants of Amiais and other villages, parish, and county of Sever do Vouga were identified. In addition to this proximity public, the tourist/visitor public was also identified, which, per se, presents itself as variable since it integrates people of different age groups, genders, and cultural profiles. To capitalize on the project's presence in the territory and to disseminate the impact of the work carried out in the region's touristic sector, the LOCUS project developed a set of communication actions, materialized on social media (Facebook, Instagram, and Youtube), on the [website](#) and in the project's logo (registered trademark). Thus, LOCUS intends to create a connection between cultures and generations to promote social and cultural inclusion.

The image below shows the LOCUS logo in its different variants. The LOCUS brand symbolically associates, through the graphic enhancement of the "O" element, the representation of digital connections and an arboreal element, a



characteristic presence of the territory of Amiais. However, in 2020 the world was facing a pandemic that led to a massive lockdown. Portugal was no exception. Since the most vulnerable and affected by the Covid19 disease were the elders, and the Amiais population is mainly composed of older adults, the research team decided there were no conditions to pursue the project's original goal. The IoT system was off the table since it required close contact with the residents, stakeholders, and visitors to develop and test it. Not only represent a health risk to all involved in those dynamics, but it was also forbidden by law to travel between villages or even leave homes for a long time during the project. Therefore, it was necessary to reframe all the project and adjust it to the new conditions provided by the pandemic.

The solution found for the LOCUS project was to virtualize the territory and use digital platforms to enhance, disseminate and promote Cultural Heritage, particularly in metaverse environments. Hence, the LOCUS project recreated Amiais village in the Second Life metaverse. The new goal of the project was to develop and test interactive immersive scenarios, based on co-designed ludic storytelling, to explore cultural contents and learn about the cultural heritage of Amiais. The project also aims to understand the impacts of individual characteristics in immersive practices in metaverses in order to conceptualize virtual ludic experiences to promote cultural heritage and converge it with experiences in the physical territory.

By the beginning of 2020, most data collection was already done. Thus, the co-design sessions with the inhabitants and the literature

review were used to design cultural heritage scenarios and narratives and virtualize Amiais. LOCUS approach included engaging storytelling challenges to employ an immersive playful approach in metaverse contexts. [Amiais spot in Second Life](#) enables immersive gamified experiences for virtual visitors. It is possible to know the virtual village, interact with local characters and participate in cultural experiences through different virtual tours and challenges.

The present book tells a complete story of the LOCUS lifetime. Throughout the various chapters, the reader will travel through the multiple phases of the project. The main theoretical concepts – Cultural Heritage and Technology – that support the practical development of the project and the proximity methodologies used in the different stages of the LOCUS project are presented. It also addresses using metaverses, particularly Second Life, to disseminate knowledge in educational and entertainment contexts. Then the reader will have the opportunity to get to know the village of Amiais in Second Life, the entire narrative developed and tested, and the main results of the convergence between the virtual and the real analysis. The book ends with an original chapter devoted to a theoretical model to converge playful immersive experiences in virtual environments and possible real experiences in the physical territory. Embedded in this last chapter, the LOCUS research team also presents a set of recommendations to implement playful immersive experiences to promote rural territories and cultural heritage in metaverses such as Second Life. These guidelines can be helpful to other rural regions that share cultural heritage aspects with Amiais village, which can bet on the virtual promotion of their territories.



Cultural Heritage and Technology

Cultural Heritage and Technology

From Culture to Cultural Heritage

Culture surrounds us like the air we breathe. The term has been defined as a multifaceted concept, meaning the acquisition of specific elements by community members, including arts, knowledge, beliefs, laws, traditions, morals, and other abilities and lifestyles (Manganaro, 2002).

Cultural heritage characterizes people and territories, distinguishes one region from another, and it is the patrimony that allows people to feel as belonging to somewhere and something. It is part of a personal identity transformed into a cultural identity when shared by a group of people, a community. Thus, Cultural Heritage represents a source of identity and cohesion for groups disrupted by bewildering changes and financial instability (UNESCO, n.d.). Cultural heritage is considered a nation's treasure and identity and a vital source transmitted from one generation to another. Indeed, cultural heritage is the hub of ancient knowledge and history hidden under the magnificent architecture of buildings, locations, and objects. The United Nations Educational, Scientific and Cultural Organization (UNESCO) offers a Cultural Heritage definition containing three dimensions: sites, groups, and monuments (Shepherd,

2006). These are of remarkable worldwide value from an aesthetic, ethnological, and historical point of view (UNESCO, n.d.). The concept is divided into two classes: natural heritage and strictly cultural heritage. Generally, buildings, monuments, landscapes, books, artifacts, and works of art are considered tangible culture and tradition; language knowledge and folklore are considered intangible. In both classes, Cultural Heritage is one of the legacies of ancient people. It includes their memories and experiences (as well as places and monuments) and the information passed to the next generations.

Preservation of cultural heritage and its landscapes' assets are essential for promoting and representing local cultural identity. Cultural components, properties, and landscape is a wealth of ancient human civilization due to their value and uniqueness (Holm et al., 1987). Although Cultural heritage and its components are not vital components of human life that help local development, cultural heritage is evidence of living human memory (Blakely, 2014) (Kalman, 2017). Therefore, cultural heritage proposes significant resources that describe the magnificent monuments and ancient environment and recall ancient time memory (Lowenthal, 2018), which is the primary source

of motivation and inspiration that provides a comprehensive reference to human heritage.

Traditional methods of culture preservation focus on understanding significant events, technological advances, and relevant site constructions (Bogdanovych et al., 2010). Regarding this perspective, Cultural Heritage sites contribute to the countries' economic growth. Still, it is time to have potential cultural heritage site preservation policies. UNESCO's findings indicate more visitors to cultural heritage sites globally. Still, some sites are getting neglected in terms of preservation (Robinson & Picard, 2011). Supervising cultural heritage sites will be the first step in an organized approach, not only to preserve the present cultural heritage sites but also to provide upcoming generations with easy access to their forefathers' traditions, norms, and values.

In this context, Portuguese cultural heritage is no exception. As Jorge Dias states, Portuguese cultural heritage is at risk: "We, Portuguese people, are not on the eve, but amid losing all that wealth from the past. If we do not run quickly to save what remains, we will be bitterly accused by those to come of the inexcusable crime of having lost our traditional heritage, showing signs of absolute neglect and ignorance. If we don't, in two generations we can be a people without character and deeply poor..." (Jorge Dias, cit. in Monteiro, 2001, p. 4). The sentence can be applied today, more than twenty years after it was written, and to all the places, countries, and territories suffering this loss.

Here, technology can help enhance cultural heritage and its maintenance and preservation.

Relation between cultural heritage and technology

As Maksimović and Čosović (2019) indicated, technology has great potential for recognizing, managing, and preserving cultural heritage. It can be the reference to material or immaterial, movable or immovable elements (UNESCO, 1972). Indeed, in this interconnected world, cultural heritage worldwide is now available to whoever wants it, wherever it is situated. Everybody can visit Louvre or the Egypt Pyramids without leaving home. The preservation of cultural heritage can be ensured without being near it (Maksimović & Cosović, 2019).

In breaking boundaries, it is essential to introduce concepts like prototyping or digitalization. These techniques enhance cultural heritage knowledge and bring a new layer to the connection between people and cultural heritage. This new layer can be a playful one, intergenerational, and/or consider the issues related to intellectual property.

Which must make us think: are we part of a technoculture, of a cyberculture? One culture created (among other things) to protect our ancestors and their memories? Borges (2011) considers that "the cyberculture does not imply that everyone will be online, instead, culture is constituted by the growing society digitalization which has implications at all social levels, whether online or offline" (Borges, 2011, p. 115). So, maybe the answer to the previous questions is yes, we are part of a technoculture. We must accept the advantages that this gives us, understand the disadvantages and contribute to their elimination or diminish their adverse effects.

The link between the cultural heritage domain and new technologies has always been dialectical and complex. Often portrayed by pursuing

technologies that can become a deadweight during users' cultural experiences. Technology can reduce the space between cultural sites, such as historical sites or centers, art exhibitions, archaeological parks, and museums. It can become a facilitator of connection and interaction between all involved players: interferences can be appropriate, pleasure can be improved, and tourists can learn more effectively about culture.

Many researchers approach this topic. For example, Hong, Jung, Piccialli, and Chianese (2017) propose an innovative system based on artwork characteristics and user experience to ensure that content and technological crates are adequate for its users. Brancati, Caggianese, Frucci, Gallo, & Neroni (2017) propose interactive wearable Augmented Reality applications to enhance the ecosystem with cultural information since the combination of augmented reality and touches interaction is especially challenging. Siricharoen & Vinh (2017) focused their research on design and visual expression to approach cultural heritage with neat, simple, and beautiful storytelling. Bujari, Ciman, Gaggi, & Palazzi (2017) used gamification to explore the crowdsourcing social network to engage users with cultural heritage along travel itineraries. Another example is the research conducted by Cozzani, Pozzi, Dagnino, Katos, & Katsouli (2017), which focused on the contributions of technology to "intangible Cultural heritage" (ICH) education and preservation.

Thus, academic research shows a deep relation between technology and cultural heritage. These studies demonstrate that technology has truly changed the cultural heritage

field. Currently, cultural relics worldwide are available to researchers and amateurs at a click distance. Museums can be accessed via mobile gadgets and carried in one's pocket. Inaccessible Cultural Heritage sites can now be easily accessed using VR technology. Nowadays, Social Networks and Augmented Reality are technologies at the forefront, leaving aside, over time, multimedia platforms, apps, and interactive websites. With each transformation, i.e., trend, new identities, contexts, and objects are generated. In this way, heritage adapts itself so that future generations can make use of the knowledge, experiences, and traditions of a previous era (Tecnologia e Preservação de Patrimônios Históricos Da Humanidade, 2018). AI (Artificial intelligence) is leading to an energizing future, where developments in cultural heritage research would be possible through modern tools and methods that can manage the massive information and data produced. As technological development is fully supported by cultural heritage academic and non-academic researchers, a truly thrilling future awaits.

Today, society tends to take advantage of technology and digital approaches to engage the community and promote and disseminate cultural heritage values, which are increasingly being considered. Digital technologies can improve means of conservation and preservation, enrich existing archives, enhance participatory experiences, promote communication among stakeholders, and deepen understanding and attachment to culture (Liang et al., 2021).

Over the last years, several technologies have been implemented to involve the community

in Cultural Heritage. Tools like the Internet of Things (IoT), Augmented Reality (AR), Virtual Reality (VR), Digital Mapping, and many others are frequently used to help map and recognize cultural heritage existence. Those digital media are crucial to managing Cultural Heritage. They make it available to the audience and contribute to its maintenance in the present memory and future generations' knowledge of its existence. These technological approaches intend to disseminate the Cultural Heritage, motivate the community to visit places added to the Cultural Heritage, and also raise awareness and extending the value of museums, for example. Technological initiatives restore the cultural identity of a place, bringing the community together and facilitating the dissemination of different cultures. Consequently, it increases tourism and the social and economic development of the region (Tecnologia e Preservação de Patrimônios Históricos Da Humanidade, 2018).

Cultural Heritage and Tourism

The appropriate uses of Information and Communication Technologies (ICT) can change the dynamics of urban and rural territories. This helps to promote cultural heritage sites (Roberts et al., 2017). Therefore, ICT significantly contributes to promoting cultural heritage content through embedded cultural objects, locations, and Augmented Reality (AR). Thus, ICT makes it possible to change the old way of analyzing cultural heritage content (Alivizatou-barakou et al., 2017).

Improvements in new emerging technological tools, especially in virtual reality, AR, and smart sensors, make sense of the cultural heritage

territory possible. Moreover, these technologies promote cultural heritage, as well as cultural properties, and increase the curiosity of the visitors about the cultural product.

Tourists generally seek to learn the history of cultural heritage hidden under the mist of time. The learning from heritage sites is informal education; few people have access to this kind of education from academic institutes. Consequently, learning AR's method initiates a process in which cultural heritage depends on intrinsic motivation that helps to promote cultural heritage and make it enjoyable and playful for visitors (Camilo et al., 2020).

In recent years, several investigations have focused on improving the cultural heritage tourism experience, at different scales, by exploring the opportunities of using information and communication technologies (Graziano & Privitera, 2020). According to Bolchini et al. (2007), using information and communication technologies has dramatically changed how Cultural Heritage is displayed. If, on the one hand, tourists used to see the information presented statically with a large amount of "cultural signs", on the other, the new services are being personalized since the visitors' interests are considered, along with context information (Amato et al., 2017).

"The digital revolution is leading to new and innovative forms of artistic creation while making culture and heritage more accessible and opening up new ways of enjoying cultural content. Making our cultural heritage widely available in the digital era is vital" (R. Di Giulio et al., 2021). Today, digital transformation is one of the most common and critical phenomena.

In parallel, the increasing attention to cultural heritage as a fundamental driving force for social cohesion, economic growth, and sustainability has encouraged the development of knowledge, dissemination, reuse, protection, and knowledge enhancement of cross-border cultural heritage [7].

According to the conclusions practiced by the Council of Europe in 2014, European policies have propitiated Cultural Heritage as “a strategic resource for a sustainable Europe.” (“Conclusions on Cultural Heritage as a Strategic Resource for a Sustainable Europe,” 2014). Therefore, the European Union encourages research, development, and promotion of all means necessary to provide economic growth, social cohesion, and a sustainable environment for intangible and tangible cultural heritage. This led to the European Union initiative highlighting the role of the development of new digital technologies and the process of digitization. Digital heritage is needed to register and protect European heritage, increase its visibility and accessibility, involve local communities, and support the impact on cross-cutting areas such as education, tourism, and creative and cultural industries (R. Di Giulio et al., 2021).

Therefore, more and more attention has recently been paid to the participatory approach to culture and heritage management (Li et al., 2020). Internationally qualified people have paid more attention to the variety of cultural expressions, agreeing that the assimilation of cultural diversity is the focus of ensuring an efficient and sustainable connection between a society and its heritage (Brunner, 2007).

It is important to emphasize that something

becomes heritage when the population propagates certain values. Thus, accessibility becomes crucial for a place to become heritage (Sørmoen, 2009), and ensuring public access to Cultural Heritage sites should be a prerequisite for any site that wishes to be recognized as Cultural Heritage. One way to ensure this accessibility is through information and communication technologies, making information easily accessible. In this way, accessibility becomes a concept to be considered since the accessibility of all interested parties to a particular site is essential for Cultural Heritage (Paladini et al., 2019).

Digital Approaches for Cultural Heritage Collaboration

Since ICT and communicational approaches have encouraged this connection to society and co-collaboration in urban planning and heritage conservation, cases such as co-production, e-education, digital archiving, or location-based games have been studied (Kleinhans et al., 2015) but little empirically validated knowledge in this emerging field of study. We outline key developments and pay attention to larger societal and political trends. The aim of this special issue is: 1.

User experience can also be a way to collaborate with cultural heritage. It can be used on travel equipment to create a digital system that provides valuable services and information from different sources, from text descriptions to images and videos. It allows users to enjoy real-time multimedia stories (Amato et al., 2017).

The availability of innovative tools based on 3D models, such as Virtual Reality (VR),

Mixed Reality (MR), and Augmented Reality (AR), opens innovative scenarios for Cultural Heritage. 3D models can be used for documentation and control, digital applications such as virtual tours, virtual tourism, digital reconstructions, etc.), and for diagnosis, conservation, and management measures (Roberto Di Giulio et al., 2021).

Social media also contribute significantly to the community's collective memory (Psomadaki et al., 2019). The eagerness to get important information at the moment and participation in planning inspires people and, consequently, leads to a great potential for involvement in both the media use and the connection to Cultural Heritage (Deng et al., 2015).

Gamification

In the modern world, gamification and its innovative methods have become one of the primary tools for advanced communication and socialization with users in various sectors (finance, marketing, business training, and entertainment) (Kapoor et al., 2018). Studying the skills of the game link shows that game plays a powerful and productive role in improving the key skills and competencies required for success in education, real life, and professional realization (Pellegrino & Hilton, 2012). Comprising the historical-cultural heritage in gaming cultural heritage training might be one of the most promising learning approaches for visitors of all ages.

Gamification is the process of introducing game strategies and components into some scenarios and situations that are not a game (Robson et

al., 2015). Gamification can be considered the meaning to engage people in tasks (Nicholson, 2015), promote relationships (Caporarello et al., 2017), or improve motivation (Sailer et al., 2017). Khaled, Deterding, Dixon, and Nack (Deterding et al., 2011) suggested a definition of gamification as "the use of game design elements in a non-game context."

Due to specific elements, gamification can be useful for teaching and learning activities because it can promote student engagement. The difficulties educators face related to student interest and engagement in their classroom are no new. In the past, educators have attempted to use a variety of inventions, including the use of motivational tactics. However, the impact of the intervention lasted for only a short period. Due to its playful and natural characteristics, gamification can be a great solution to help solve student engagement and participation in learning activities (Kim et al., 2018). The primary function of Serious Games is to help the player achieve a learning target via an enjoyable experience (Anastasiadis et al., 2018).

In this way, it seems essential to understand how the gamification environment can be developed and how it promotes cultural heritage sites and activities so that visitors can gain knowledge and entrainment.

The growth of games in non-leisure contexts is transforming daily lives and, most importantly, introducing more fun in everyday life (Arnab & Clarke, 2017). It is the power of games to motivate, engage and immerse (Alsawaier, 2017). The competencies of games to facilitate and foster cognitive gain, behavioral and consciousness change have encouraged more games of

this nature to be installed in a real-life setting. Most of these games are bespoke and do not help the reusability

Over the past few years, there has been a massive development in entertainment technology, i.e., today's games are exponentially more sophisticated, smart and responsive than just a few years ago (Boomsma & Hafner, 2018). This, in turn, intakes lead to remarkably high customers expectation. Modern real-time computer graphics can accomplish near virtual games and photorealism. Worlds are generally populated with massive high-value content producing a richer experience. The project "The main project: Discovering the territory of Old Peucetia" (Cesaria, Ferdinando, 2019) describes the usage of a tangible consumer interface game and how he/she understands cultural heritage, particularly considering the castle Caracciolo in Sammichle di Bari in Apulia, Italy. The main objective of this project is to promote the local heritage of old Pecucetia in Apulia among primary school students. This project provides a network of activities and educational workshops arranged in the historical buildings of towns of old Pecucetia to allow primary school students to learn the area's history and environment of the area by gamification method. Offered workshops rely on interactive tools and multimedia installations designed, developed, and installed. Via events and simulation, familiar visitors and students of the exhibitions can engage themselves in ancient times and uncover the history of their area.

Another study offers the possibility of underwater exploration of cultural heritage sites through AR gamification. The title of this

study is "A hybrid augmented reality guide for underwater cultural heritage sites", conducted by Čejka, Zsíros, & Liarokapis (Čejka et al., 2020). This study offers a very innovative Augmented Reality model for the underwaters divers to introduce ancient, abandoned buildings at underwaters archaeological locations. The study provides a prototype that runs on smart devices (smartphones), which are sealed in a waterproof casing and uses a hybrid method to pinpoint the location of divers—the prototype of this study experiment is based at In Baiae, Italy. Ten professional divers participated in this study. Their gamification experience level showed that underwater AR substantially improves the user experience and entertainment level.

The review studies described that gamification does not only offer entertainment platforms but also offers tourists to enhance their knowledge level by planning Serious Games. Conclusively, gamification plays an essential role in effectively promoting cultural heritage and knowledge.

Metaverses

Thanks to the advancement of technology, it is possible to evolve methods of preserving and learning about ancient cultures. Bogdanovych et al. (2010) introduced the notion of "virtual culture" as a combination of cultural knowledge, the environment, and objects preserved in a 3D virtual world (Bogdanovych et al., 2010). 3D visualization allows cultural heritage to be simulated (Bogdanovych et al., 2010), resulting in an experience that, although not entirely the same as a visit to a particular place, enables

learning and entertainment on the part of the beholder.

Nowadays, 3D technology can support cultural heritage for visual and documentary presentation, communication, and educational purposes (Mortara & Catalano, 2018). Understanding cultural-historical heritage in the environment of 3D games emerges as one of the most promising ways of learning for players and visitors of all ages. This approach spans various disciplines, such as history, art, and languages. It includes tangible and intangible content such as myths, beliefs, and social values (Mortara & Catalano, 2018).

The expansion of three-dimensional virtual worlds, such as *Second Life*, has enabled varied formative experiences (Páscoa, 2016). According to Mattar (2008), the game *Second Life*, although not developed as a virtual learning environment, can perform similar functions since it is composed of micro-environments that allow the audience to engage (Páscoa, 2016). This kind of educational feature is a factor to be considered when dealing with cultural heritage and heritage since it is essential that the player, besides having a playful experience, can absorb knowledge. According to Harrison (2009), creating content in metaverses such as *Second Life* that relates to the cultural heritage of real communities can lead to sharing processes and familiarity. However, it can also exclude those who do not share the same values (Freitas, 2011). These types of events occur because the game stands out for its realism, and it is possible to do almost anything one would do in the real world. However, there is still much to be discovered regarding the

potential of environments such as *Second Life*, particularly in disseminating cultural heritage in three-dimensional virtual worlds.

Traditional methods of cultural preservation focus on understanding significant events, technological advances, and relevant site constructions (Bogdanovych et al., 2010). Thanks to the improvements in new emerging technology tools, it becomes possible to perceive the cultural heritage territory on a macro level. Also, it allows the preservation of the cultural elements related to the life and behaviors of ordinary culture bearers, including their rituals, customs, and social norms, which are often left aside (Bogdanovych et al., 2010). It is pointed out that through modern, real-time computer graphics, it is possible to observe the existence of games, in which photorealism and virtual worlds are usually populated with a massive amount of content of high cultural value, producing a richer experience. According to Addison (2000), the use of 3D virtual environments to reconstruct lost sites of high historical and cultural significance has become very popular (Bogdanovych et al., 2010). According to Smolin & Borisov (2013); Smolin (2014), and Nemtinov et al. (2014), new technologies help not only to preserve the current image of historical objects for future generations but also enable the display of the various phases of their existence (Nemtinov et al., 2018).

One of the main focuses of most 3D virtual games is on the macro level, i.e., on the reconstruction of ancient buildings, objects, and cities that may be partially or destroyed at the moment (Bogdanovych et al., 2010). Therefore, these technologies promote cultural heritage as

well as cultural assets, increasing visitors' curiosity about the cultural product. Following this, Bogdanovych et al. (2010) applied the concept of "virtual heritage" as the act of incorporating some of the aspects of knowledge using avatars. Avatars, i.e., graphical representations of users (Páscoa, 2016), are defined as the population of a culturally valuable place in the virtual environment, resembling virtual agents that behave similarly to the former citizens who used to occupy a given heritage site, bringing cultural heritage to a new level. Thus, using artificial intelligence (AI), virtual agents can absorb relevant knowledge and become carriers and transmitters of knowledge (Bogdanovych et al., 2010).

Smart Cultural Heritage Tourism

Nowadays, usually, each person has a smartphone in hand. This fact creates vast opportunities for communication and interaction, which has a high potential for tourism, particularly cultural tourism. Thus, the possibility of using locative technologies is created. The Internet of Things (IoT) and the Social Internet of Things (SIoT), complemented by geolocation technologies (GeoT) and mobile augmented reality (mAR), expand the potential for design and content development. This increases interactive experiences of material and immaterial cultural heritage, transforming the territory into a hypermedia structure. By recognizing the tourist's presence and profile, it proposes experiences to explore and enjoy the region. This territory expanded by digital mediation will provide an experience of hospitality.

Research and understanding of Sensory and

Emotional Smart Cultural Tourism involve:

1. understanding the uses, perceptions, and emotions triggered by the use of mobile applications already implemented within the scope of the territory intelligence;
2. co-design of digitally enhanced tourist experience scenarios, using objects and territory sense, to generate a holistic environment in which historical and scientific information, life stories of the local population converge, traditions, legends, crafts, how to use plants, gastronomic traditions, etc. (formal and informal knowledge, sensations and emotions);
3. prototyping and evaluating the scenarios that arose from the co-design work engaging the local population (valuing the participation of several generations, from the elderly to the young), stakeholders, and tourists.

The term "smart tourism" is commonly used to designate the use of digital technologies in tourism (M. I. Ribeiro et al., 2020; Zamyatina et al., 2021), and the term "IoT-Enabled Smart Tourism" is the use of IoT in tourism (Sharma et al., 2021) i.e., Internet of Things continues to be in its pre-stage and is supposed to transform the Travel and Tourism Industry. It reforms the end processes of the accommodation, airlines, and alternative travel firms by linking smart devices, methods, and course of actions. By taking advantage of the IoT technology, travel business will realize better functioning competence and a lot of custom-made visitor experience. In the present time, IoT becomes the heart of smart tourism technology but ubiquitous Wi-Fi, Near-Field Communication (NFC).

Here, the use of digital technologies (IoT / SIoT, etc.) amplifies the use of the various senses and promotes the sensory experience of the places, for example: Hearing (music – cultural heritage; Nature: river, birds, etc.); Smell (perfumes and cosmetics; gastronomy and herbs, gardens, etc.); Sight (architectural and natural beauty / landscape, etc.); Touch (nature, crafts, traditional music instruments, etc.); Taste (gastronomy and wines).

The idea is to add value to places, local people, and tourists in a circular transformation to promote well-being within a creative, playful, and intergenerational experience focused on sensoriality and emotion. To this end, co-design strategies aim to create scenarios for valuing cultural heritage [Tangible (Immovable Heritage: buildings, monuments, gardens, etc.) + (Movable Heritage: books, paintings, pottery, etc.) and Intangible Heritage (local traditions, music, dance, crafts, religious ceremonies, language, theater, literature, etc.)] where digital technologies are at the service of cultural tourism (Gössling, 2021). The innovation is to value emotion and sensoriality in the tourist experience, not just the cognitive dimension. The objective is to promote an experience of convergence between cognition, emotion (Sanagustín-Fons et al., 2020; Volo, 2017) and sensoriality, enhanced by the satisfying relationship with the territory in a holistic sense: people, places, and heritage.

Considering that playfulness scenarios foster good emotions (well-being, joy, happiness, etc.), designing communication scenarios with digital mediation (SIoT) will be convenient. Tourists visit places to get to know them better and have an emotional and sensory experience

rewarding. Thus, the playful scenarios should focus on the emotional dimension besides the cognitive one.

The idea of sensory and emotional smart cultural tourism aims to engage local people, tourists, and the sites in their complexity (natural, socio-cultural, and patrimony), which leads to a 3P convergent scenario: People, Places, Patrimony (Katsoni et al., 2017; Uysal et al., 2012). Hence, the 3P model is a triple helix of the sustainability of cultural tourism and the promotion of social well-being linked to identity and ties between generations and territories.

Therefore, the development of initiatives based on the concept of sensory and emotional smart cultural tourism implies:

1. to develop a sensory and emotional smart cultural tourism experience assessment scale that considers inhabitants and stakeholders in addition to the tourist to contribute to a sustainable smart cultural tourism model relevant to the development of mobile digital applications;
2. to use a research methodology focused on co-design with the engagement of local people of different generations and stakeholders, to promote intergenerational dialogue and empowerment of local people, who are part of the wealth and intelligence of the material/ immaterial cultural heritage and natural;
3. to design and develop communication systems/platforms/apps based on IoT/SIoT and mixed reality (augmented and/or virtual, geolocation) to promote tourist interaction with the natural and cultural heritage, focusing on sensations and emotions.

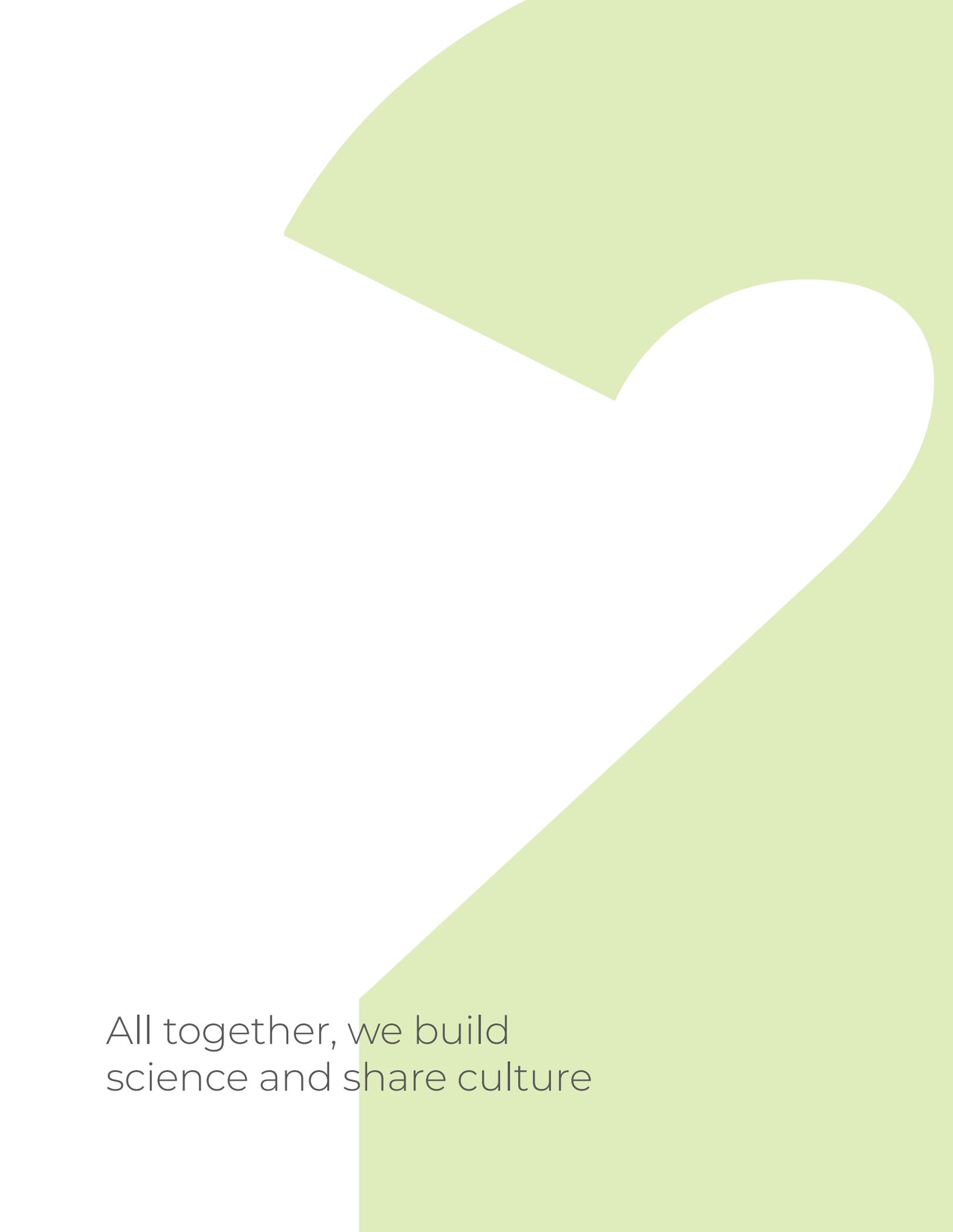
Inheritance is the ballast from which to build and innovate. Here, inheritance is the fundamental capital for the generation of identity processes and the valorization of territories. Local populations must be considered fundamental in developing a sustainable cultural tourism approach (Dekhili & Hallem, 2020).

The development of research projects that involve, on the one hand, the use of technology (tools or knowledge to use them) and, on the other hand, the cultural heritage of depopulated rural areas is always a challenge. These two (or three) dimensions inevitably unfold into many more and more varied, such as population aging, territorial availability, and personal technological skills. Thus, it must be considered that the initial challenge will be related to how the population appropriates the technology. This includes their initial acceptance, as well as the ease with which they later become involved in the project, the technology, and its objectives (Almeida, Alves, & Delicado, 2011; Carroll & Reich, 2017; European Commission, 2006; Mahardika, Thomas, Ewing, & Japutra, 2019).

All these factors – aged population, rurality, and depopulation – are increasingly important

in projects with a high technological dimension. They may influence how the tasks are developed and how the population participates in them (more actively or passively). Thus, it is concluded that these challenges should be perceived more as opportunities. In other words, they are challenges that will promote the implementation of more interactive and participative co-design techniques, with more moments of joint sharing. This way of carrying out the planned tasks is an excellent contribution to the possibility of the project's team to get closer to the population, therefore, to their cultural heritage and knowledge. Additionally, it is a way for the people to feel closer to the projects and contribute more actively to their development.

As heirs of cultural dynamics, local people must be considered in the research-development methodology of new digital services / applications in a co-design strategy. This way, the locals feel recognized, engaged, and not invaded by tourists. In addition, the older people know the traditions, for example, the use of plants, fantastic narratives, crafts, etc., which are also part of the cultural heritage. In this sense, the methodological proposal should be based on co-design processes to promote people's participation from different generations.

The image features a minimalist design with a light green background. A large, white, abstract shape resembling a stylized heart or a drop with a curved top and a pointed bottom is positioned in the upper right quadrant. The text is located in the lower left area, set against the green background.

All together, we build
science and share culture

All together, we build science and share culture

The LOCUS Project has many interrelated layers that contribute to the project as a whole. The methodological layer relates to the different ways to collect and analyze data. The technical layer focus on the technological and functional features of the metaverse. The anthropological/ethnographic layer is related to the Cultural Heritage elements. Finally, the project has an Intergenerational Communication layer, which addresses the characteristics of this communication and the essential elements for its promotion.

open conversations become a way of knowing their life stories, motivations, and desires; and understand how playful interactions with objects and with other people are established. These goals were reached simultaneously as the culture, rituals, habits, and stories of Amiais and its inhabitants were revealed.

The project's development went through 5 fundamental stages: Ethnographic Research, Reflection & Creativity, Participatory Design & Agile Development, User Testing, and Sustainability & Migrability models.



Figure 2 – five stages of project development

The purposes of the LOCUS project's ethnographic research are multiple and aim to encompass different dimensions: gain access to Amiais residents, the main action agents, and visitors; observing people in their daily lives, watching and listening to what people say and do, and engage with them so that the

Ethnographic research

Participant observation, interviews, and focus groups are the principal methodologies for gathering data. By direct contact and observation, researchers uncovered the rituals, habits, motivations, and stories of Amiais and its inhabitants, visitors, and stakeholders. Also,

researchers unveiled what they find playful by engaging people in conversations and activities and how they might establish playful interactions with others and objects.

This first phase was intended to establish synergies with stakeholders (government entities, cultural and recreational associations). The goal was to get to know the inhabitants, their daily life, life stories, motivations, and wishes and earn their trust.

Semistructured interviews with the main stakeholders (the Mayor, the President of the Parish Council, and the Presidents of two local Cultural associations) were applied. In those moments, the project was presented, and partnerships were established to gain an understanding of the socio-economic and cultural contexts.

As suggested by (Müller et al., 2015), these contacts allowed us to identify someone who could act as a door opener. Even though the first contact with the inhabitants took place as part of informal visits to the village, the President of the Parish Council played a key role in bringing the team closer to the people.

The workshops performed with the local community addressed the barrier of low ICT skills and the difficulties envisioning new technologies or engaging in creative thinking around abstract and intangible issues that older adults have, as reported by Duh et al., Lindsay et al., and Rogers et al., (Duh et al., 2016; Lindsay et al., 2012; Rogers et al., 2014). For that purpose, mobile devices and applications were gradually introduced and used in the workshops to access diverse multimedia content prompted by physical tags or objects.

It is worth noting that, following (Lindsay et al., 2012) recommendations and (Rogers et al., 2014) approach, older adults were engaged from the beginning and throughout the participatory design process. Also, as recommended by many studies (Hornung et al., 2017; Jelen et al., 2019; Kopeć et al., 2017; Müller et al., 2015; Orso et al., 2015), workshops were always inter-generational. Participants included younger researchers, older adults, their children, and grandchildren. In the upcoming co-design phases, older adults were paired with young researchers, designers, and developers, and suitable ways of cooperation were found. Finally, considering the lack of self-confidence of older adults acknowledged by (Kopeć et al., 2017), the LOCUS team endeavored to make them feel empowered by being indispensable elements of the project team, as it was stressed out often during workshops.

Informal conversations, participant observation and interviews

As an action-research project, what matters the most is the people and the connection that the research team can establish with them. The first strategy was to set some travels to Amiais to facilitate the site recognition and get to know the inhabitants and the frequent visitors (tourists).

Every travel to the site was seen as an opportunity to just walk around the village and talk with those on the streets. Many people were always working, enjoying time in the sun, or visiting. During those travels, it was possible to have informal conversations regarding the use of technology, the main traditions in

several aspects (familial, labor, school, commercial transactions, ways of living, etc.), and playful activities among children and adults. When talking with visitors, the focus was to know what leads them to Amiais.

Another important technique was participant observation. This data collection tool is quite important. As (Quivy & Campenhoudt, 1995) already claimed, “[participant observation] is the only social research method that captures the behaviors in the exact moment they are produced and exactly as they are, without the mediation of a document or a testimony.”

(Quivy & Campenhoudt, 1995). In fact, the former informal conversations and the visits make participant observation more meaningful. As Punch (1994) states, “[Participant observation] implies that the investigator engages in a close, if not intimate, relationship with those he or she observes. Crucial to that relationship is access and acceptance [...]” (Punch, 1994). The research team noticed that many activities and gathering moments were specifically organized in Amiais to contribute to the project development. And this was a great sign of trust and engagement with LOCUS’ goals.

Formal interviews with stakeholders were conducted almost simultaneously with the previous data collection techniques. These interviews had several goals:

1. present LOCUS, its objectives, and the team;
2. understand how the territory was open to this kind of research projects and which open and closed doors it will encounter; if there are any closed doors, understand how it was possible to open them;
3. getting to know the territory, its economic challenges, the technological advancements (if any), and the changes that occurred in the last years;
4. getting to know the people and any resistance that the team should know of;
5. understand the dimension of collaboration the team should expect from those stakeholders.

Four interviews were conducted: with the Mayor of Sever do Vouga; the President of the Couto de Esteves Parish Council; the President of the Association League of Friends and Naturals of Couto de Esteves (LANCE), and the President of the Cultural and Social Association of Couto de Esteves (ACSCE). They are undoubtedly stakeholders, but they assume a much more critical role in the territory. They are agents of change. They actively contribute to the territory’s development and to life’s people changing. They care about them, their security, and their well-being. And if collaborating with LOCUS would mean improvements for the territory and people, they were completely open to collaborating. And that was what happened.

The interviews and informal conversations made it possible to assemble a set of playful activities, connecting them to a labor/school, religious and/or familial dimension, or understanding the playful dimension by itself. It was possible to realize that some of these categories intersect. For example, families reunite during Easter, but it is also a religious party. And a lot of playful activities took place during labor activities.

As already claimed, it was also possible to understand the inhabitants’ technological

literacy. There weren't many technological tools inhabitants used; some had tablets and smartphones, but the majority only had access to television, radio, and telephone. Another significant result taken from the application of these techniques was the technological infrastructure availability. Namely, network quality and availability in the village (were there any wi-fi devices, and how was the maintenance provided). It was pretty quickly understood that there is no 3G available. Still, worst than that is the mobile phone network, which is inexistent in some places.

However, people were available to collaborate with LOCUS. And one can conclude that from all the informal conversations, but, most importantly, from the co-design sessions, in which the inhabitants were invited to participate, and numerous groups showed up.

Reflection & creativity

This stage comprises the analysis, interpretation, discussion, and consolidation of all the information gathered and knowledge acquired during ethnographic immersion. Also, creative sessions with the inhabitants, stakeholders, and visitors are fostered to brainstorm and envision scenarios and narratives for the metaverse experiences in Amiais village in Second Life.

With the progression to the project's second stage, the activities with people became progressively more structured, assuming the form of workshops with defined objectives and strategies to which people were formally invited. The ultimate goal is to co-design playful and immersive scenarios and narratives to

be implemented, first into the IoT system, then into the metaverse experience.

Following the strategy proposed by Hornung et al. (Hornung et al., 2017) and Müller et al. (Müller et al., 2015), the workshop sessions started by being cake, coffee (in fact, tea!), and talk-type sessions. Older adults taught us about the multiplicity of aspects of their cultural heritage in the two sessions that took place until the COVID-19 pandemic started, through paper-based activities and by enacting situations and playful activities. During these workshops, we found it sometimes difficult to keep participants focused on the discussion topics, as reported by some studies. As such, we tried to find some balance between flexibility and guidance, as Lindsay et al. (Lindsay et al., 2012) suggested.

Co-design sessions

The previously described techniques were instruments and a way that allowed the LOCUS team to organize and conduct co-design sessions. Co-design is defined by Sanders & Stappers (2008) as the process of "creativity of designers and people not trained in design working together in the design development process." (Sanders & Stappers, 2008, p. 6). And because of this, "users are the principal instrument in co-design, and it is necessary to understand and interpret their needs." (Sánchez de la Guía, Puyuelo Cazorla, & de-Miguel-Molina, 2017, p. S4547) in an iterative way.

The concept of co-design means collaborative design (Burkett, 2012). Its prefix "co" characterizes its collaborative and collective nature with the development pact. Thus, this concept

is defined as gathering people who want to design and create things they are interested in, thus creating a better future (Zamenopoulos, Theodore; Alexiou, 2018), resulting from collective creativity (Avram et al., 2020). It is important to emphasize that in co-design, there is a predisposition of all elements, whether at the level of knowledge, resources, and skills, so it is possible to perform the tasks (Zamenopoulos, Theodore; Alexiou, 2018). This methodology becomes a practice in which unity and collaboration are essential for research projects to go well.

Co-design has been playing a fundamental role in the face of complex issues in many different areas, such as social, environmental, technological, and educational, as well as social and political. People need to be involved and share their skills, knowledge, and experiences to change complex and entrenched issues (Burkett, 2012) that are debated daily. A different approach is thus needed so that stakeholders can participate and control their lives and environment since no one has the individual knowledge and skills to understand a certain problem and solve it individually (Zamenopoulos, Theodore; Alexiou, 2018). Co-design focuses on building shared knowledge in which all voices are included, not just consulting people in the early stages or end-users.

This methodology intends the space for interaction between teams to be overpowering to nurture the ideation process. Consequently, co-design effectively depends on factors such as sustained participation, the initiators and beneficiaries of involvement, and the control provided to the participants. It should be noted

that verbal communication is the privileged mode for collaboration between people. Thus, co-design also focuses on questions, on knowing what they think, on interviews and surveys (Burkett, 2012).

Also the personal and organizational motivations of all those involved are an influential factor concerning what is being studied. Thus, in co-design, everyone must act openly so that this tactic is effectively a means of change (Díaz et al., 2016).

Stakeholder participation usually presupposes three goals: sharing control (this way, participants have the freedom to participate 100% in the conception of ideas that have direct consequences); sharing expert knowledge (by sharing this kind of knowledge, users can reciprocate with tactical knowledge as well as other types of knowledge relevant to problems and solutions in play); finally, inspiring change (this way it will be possible to explore and adapt futures and solutions through them) (Díaz et al., 2016).

Much of the co-design process starts from understanding user needs and then develops measures that are tested quickly, simplistically, and at a low cost before they are actually improved. However, Bowen et al. (2014) suggest five phases for this process, these being: “understanding and sharing experiences, (ii) exploring blue-sky ideas, (iii) selecting and developing blue-sky concepts, (iv) converging to practical proposals, and (v) prototyping and evaluating”. Boyd et al. (2010), on the other hand, propose six phases for this methodology, namely, “(i) engagement, (ii) planning, (iii) exploring, (iv) developing, (v) deciding, and (vi) changing”

(Thabrew et al., 2018) defined as collective creativity across the entire design process, can lead to the development of interventions that are more engaging, satisfying, and useful to potential users. However, using this methodology within the research arena requires a shift from traditional practice. Co-design of eHealth interventions with children and young people has additional challenges. This review summarizes the applied core principles of co-design and recommends techniques for undertaking co-design with children and young people. Three examples of co-design during the development of eHealth interventions (Starship Rescue, a computer game for treating anxiety in children with long-term physical conditions, a self-monitoring app for use during treatment of depression in young people, and HABITS, the development of an emotional health and substance use app, and eHealth platform for young people. The co-design processes of the authors mentioned have in common user engagement by sharing knowledge, discussing and exploring the problem, and developing a solution that is a turning point for effective change. In terms of benefits, co-design entails advantages for projects, users, and services. Thanks to different ideas, projects can understand the users' needs and reduce costs and development time. For users, there is improved intervention and learning for future interventions. Finally, services benefit from knowing and focusing on the users' needs, thus increasing the support and success of their decisions (Thabrew et al., 2018) defined as collective creativity across the entire design process, can lead to the development of interventions that are more engaging, satisfying, and useful to potential users. However,

using this methodology within the research arena requires a shift from traditional practice. Co-design of eHealth interventions with children and young people has additional challenges. This review summarizes the applied core principles of co-design and recommends techniques for undertaking co-design with children and young people. Three examples of co-design during the development of eHealth interventions (Starship Rescue, a computer game for treating anxiety in children with long-term physical conditions, a self-monitoring app for use during treatment of depression in young people, and HABITS, the development of an emotional health and substance use app, and eHealth platform for young people.

Participatory design

Stage three will begin with the recreation of Amiais village in the Second Life metaverse previously drafted. The development of elements, characters, and objects allows for the implementation of immersive playful narratives. Programming the different levels, layers, and types of interaction will allow those immersive playful experiences to explore Amiais' cultural heritage. A strategy to combine Participatory Design and Agile Development methodologies was assembled and tested. Meanwhile, the design and development team selected the testers to participate in the immersive experiences in Second Life.

The Participatory Design concept has been evolving since its appearance in the '70s with some Scandinavian projects (Simonsen & Robertson, 2013). The focal point in Participatory Design research becomes the development of design

processes where participation must be negotiated and equalized as an integral part of democratic practices to engage people. Working with and learning from them in actual settings and thus giving rise to engaging Participatory Design tools, techniques, and conceptual frameworks (Loos et al., 2019; Kensing & Greenbaum, 2013; Schiau et al., 2018). Thus, Participatory Design is an approach to creating and designing tools. When applied to develop technology, they are processes that allow going, in a closer way, to meet the users' actual needs since they are carried out with their active intervention and collaboration. Participatory Design is about the direct engagement of people in the co-design of ICT they use and how design processes can be adjusted to embrace that involvement, namely by using design-by-doing techniques (Simonsen & Robertson, 2013).

Similarly to LOCUS, some research projects that contribute to the maintenance and sustainability of cultural heritage appeared in the literature review mentioning Participatory Design processes (Andrade & Dias, 2020; Pereira, P., & Martins, 2018; Petrelli, 2019). Even projects with other scientific interests and/or from other areas applied the same Participatory Design methodology (Cozza et al., 2016; Gomes et al., 2018; Östlund et al., 2020). Thus, since people have an active role in Participatory Design, this methodology impacts people and the territory where they are implemented.

Applying Participatory Design in ICT projects can vary in depth. From small sessions (e.g., Focus Group) to the inclusion of Participatory Design in all stages of the project, it is important to understand how this participation can be useful and enriching to these projects, either

in a specific context or during the entire development. In this context, user engagement in the whole design process is even more relevant when it involves older adults, especially in ICT projects. For many years, including older adults was not considered suitable because they were supposedly resistant to the use of technology or did not trust their ICT-related skills (Cozza et al., 2016; Kopeć et al., 2017; Lindsay et al., 2012). However, this has been changing thanks to the increasing people's life expectancy and the importance that this kind of project can have in older adults' health and well-being.

Therefore, the engagement of older adults in Participatory Design teams and processes can be beneficial. Several studies have shown that older adults seem motivated to contribute with their life experiences. They feel more engaged in contributing to the project in which they are included and know that these technologies can be helpful for them (Kopeć et al., 2017; Lindsay et al., 2012). At the same time, older adults are a group that feels apprehension about participating in technological tasks. However, this effect "can be mitigated by positive social intergenerational contact and the feeling of working for a greater good." (Kopeć et al., 2017). Therefore, it is essential to create a co-design approach adapted to older adults, focusing on technology use and providing intergenerational engagement and social inclusion. In that way, the older people feel integrated with the team and the whole design process.

Co-design and Participatory Design approach in LOCUS

The LOCUS project held two co-design sessions

in Amiais with local inhabitants. It is important to emphasize that co-design allowed participative proximity research of ethnographic nature, in which the local inhabitants are promoted to members of the research team. The opinion and life experiences of these inhabitants were valued and respected, and their contribution was crucial to the systematization of the material and immaterial traditions that make up the cultural heritage. Afterward, the information collected was worked so that the village of Amiais took shape in the Second Life metaverse.

The main goals of these sessions were to discuss and reinforce the informal conversations, participant observations, and interview results. Also, the sessions were intended to promote brainstormings to define and characterize scenarios and narratives for playful metaverse experiences.

It was only possible to organize two co-design sessions. The first one took place on November 23rd, 2019, in Amiais. The team used the chappel with the previous authorizations from the President of Couto de Esteves Parish and the Priest. This is an important place since it is familiar to the inhabitants, and it was crucial for them to feel comfortable. The team prepared and invited the inhabitants and stakeholders for a traditional season feast called Magusto. It is a feast where people eat

chestnuts and drink jeropiga, an alcoholic traditional drink similar to port wine.

Eleven inhabitants joined LOCUS' first co-design session, plus the President of the Couto de Esteves Parish and a representative from LANCE, a local social and cultural association. In this session, the focus was mainly on Amiais' traditions and customs as dimensions of cultural heritage. The participants are their keepers' par excellence, particularly the playful dimension. After a brief formal presentation of LOCUS goals, a video started to play, showing several photos and videos that had already been captured in some previous moments. Then, the participants were engaged in brainstorming to share information. For this purpose, a scenario paper with previously written statements was posted on a wall and filled with the participants' comments.

The paper was entitled: Traditions of Amiais,



Figure 3 – co-design session

Stories, Songs and Jokes. For each category, the participants linked to words that were familiar and related to the category. For example, for the category “At Work”, the participants included the terms: flax/ rye/maize, wine, milk, animals, wood, new crops, and tools/ tools. For the category “In the Family,” the inhabitants proposed the following words: werewolf and sheep stories, corn as an offering to the priest, recitation of the supper, and finally, Easter (holy water and folar).



Figure 4 – Shared record in co-design session

The second session occurred on December 7th, 2019, in the same place. In this session, it was also possible to have many participants, but no stakeholders were present. Here, a conversation with the participants was initiated to consolidate the activities collected in the visits carried out in the previous session. Three documents listing the different activities were used, divided by topics: play, work, family/neighbors, and religion. This document continued the scenario paper used in the previous session. Once again, the session format was brainstorming. The columns considered the following questions: what the activity goal was; who played/participated in the activity; in which moments the activity took place; which objects were necessary for

the activity; if the activity was in a group or individually.

Most games and playful activities were played by girls, and it was very difficult for boys and girls to mix in playful activities. Additionally, the games or the resources they used resulted from nature or even tools that no longer had any other use. Regarding work activities, they were, above all, family tasks, in which even children were obliged to get involved. So, before school, they had to take care of animals; the same hap-

pened when they returned from school. Religion was (and still is) very important in the villages, not significantly different in Amiais and Couto de Esteves. It often being moments of family reunion where food was scarce. Still, extending the invitation to close friends was always possible and enjoyable.

Additionally, it was intended to gather information about the importance of some specific spaces in Amiais. Thus, a village map was used, where the inhabitants identified the places they spent time during youth and adulthood for playful and/or work purposes. Also, some residences were identified. The map activity was very interesting, with children and older people working together to identify the places and houses. For past memories, the elderly assumed an important role; for present memories, the children helped complement the information in a truly intergenerational activity.

The third co-design session aimed to consolidate the use of technology by residents (after

applying the door-to-door questionnaire). Additionally, it was intended to understand the importance attributed to using technology to make Amiais and its cultural heritage known. This session could not be carried out due to the Covid-19 pandemic. Considering the aging population was a great risk, the third co-design session was canceled.



Figure 5 – Researcher making shared records in the co-design session

Challenges in integrating older adults and strategies to overcoming them

Older adults are a “very heterogeneous group, especially regarding technology experience and adoption” (Sengpiel et al., 2019, p. 11; Stone et al., 2016). Researchers generally describe older adults as non-tech-savvy people, reporting challenges related to the lack of ICT skills, such as inexistent knowledge about modern technology, difficulties in understanding basic ICT concepts and the impact that technologies can have on their lives, and also in articulating their

needs regarding technology (Kopeć et al., 2017; Müller et al., 2015; Pedell et al., 2017). Hence, these issues can limit older adults’ inputs into the design process.

Another reported challenge that, in part, relates to the previous one concerns older adults’ difficulties envisioning new technologies and/or engaging in creative thinking around abstract

and intangible issues (Duh et al., 2016; Lindsay et al., 2012; Rogers et al., 2014). As such, older adults can struggle with concept design activities, such as narratives and scenarios, that require them to imagine how a prototype might look or behave (Orso et al., 2015).

Researchers often find it difficult to keep older adults focused on tasks or discussions topics during design sessions, especially in long sessions involving deep exploration of issues, management of dense information, or attention to materials or speeches

(Duh et al., 2016; Lindsay et al., 2012; Orso et al., 2015). As Orso et al. (Orso et al., 2015) point out, these tasks can be excessively demanding for older adults due to the decline of working memory, the ability to inhibit irrelevant information, and pay attention to peripheral stimuli in the visual field. (Kopeć et al., 2017) mention two other problems that may impact older adults’ engagement in Participatory Design teams and processes, namely older adults’ lack of self-confidence and limited social involvement, which often fuels a feeling of alienation from the

highly digital society, and low criticism levels, making them eager to accept the solutions proposed by others with low questioning.

Besides, as Orso et al. (Orso et al., 2015) point out, methods, techniques, and instruments used to engage older adults as co-designers need adaptation to the cognitive and physical changes that aging naturally brings. Problems and barriers, however, are not always on the side of older adults. Ageism brings age-related stereotypes among technology designers and developers concerning older adults' activities, interests, and mental capacities, being a significant contributor to neglecting their experiences, needs, and desires and hence integrating them into Participatory Design teams and processes (Kopeć et al., 2017; Lindsay et al., 2012).

Addressing the ageism problem seems a priority as far as strategies to overcome all these challenges are considered. Research demonstrates that older people do not conform to ageist stereotypes that many technology designers and developers hold (Lindsay et al., 2012). Users, regardless of age, have particularities that must be considered and respected. Hence, reported strategies revolve around the need to sensitize designers more to this reality by promoting intergenerational interaction.

Rogers, et al. (Rogers et al., 2014) suggests that "pairing design students with older people can open their eyes to seeing the world of aging differently". Kopeć, Nielek, et al. (Kopeć et al., 2017), in their turn, included an entire step in the SPIRAL method dedicated to intergenerational interaction. In this step, which grounds contact theory, a miniature of the whole design process is put into action by involving people of different ages in

hackathon teams. According to the authors, "the intention of this step is to provide an opportunity for immersion of older adults in the development process and facing stereotypes from both sides of the process." (Kopeć et al., 2017).

Bringing this intergenerational interaction to less formal and structured situations of cake, coffee, and talk type is the strategy proposed by Hornung et al. and Müller et al. (Hornung et al., 2017; Müller et al., 2015): "we brought cake and made coffee, sat together with the participants and talked to them about their problems, fears, and wishes to learn more about their everyday lives." (Hornung et al., 2017). These sessions are intended not only to sensitize the team to each one's interests, needs, and limitations but also to develop trust and promote the active engagement of older adults in the Participatory Design process.

Some strategies to address the lack of ICT skills found in the analyzed studies concern teaching older adults about technology in more or less formal ways. The SPIRAL method, for example, comprises a step devoted to lowering the technology barrier by using some formal educational techniques, such as traditional computer courses and workshops, and by introducing basic ICT notions and tools, like email or social media (Kopeć et al., 2017). Raju (2018) also describes a set of educational sessions intended to teach older adults how to use tablets and shopping apps. In Orso et al. (Orso et al., 2015), older adults were instructed on the characteristics of the application to evaluate via practical tutorials with an expert.

In a much less formal format, Hornung et al. and Müller et al. (Hornung et al., 2017; Müller et al., 2015) slowly introduced into the cake, coffee, and

talk meetings mobile devices and apps, such as interactive maps, email, instant messaging and web browsing, which could support older adults in their daily lives. These strategies, though, can raise problems in handling expectations of people with different ICT skills, as more tech-savvy participants may become bored by repeating basic topics, as was the case in the study by Müller et al. (Müller et al., 2015). Being cost-effective, quick, requiring no technical skills, and, at the same time, helping older adults envision future technologies and overcoming the abstract and intangible nature of some technical and design issues, the use of low-tech and paper-based artifacts and prototypes are proposed as engaging strategies by Bergvall-Kåreborn et al. (2010), Ferati et al. (2018), Jelen et al. (Jelen et al., 2019), Lindsay et al. (Lindsay et al., 2012), Orso et al. (Orso et al., 2015), Pedell et al., (Pedell et al., 2017), Rice & Carmichael (2013) and Rogers et al. (Rogers et al., 2014). These strategies can materialize in different instruments, such as physical models, life-sized paper-based mock-ups, storyboards for animated scenarios, paper-based prototypes, and illustrated cards.

User testing

LOCUS will use engaging storytelling challenges to employ an immersive playful approach in metaverse contexts.

Case studies with different users were conducted to test and evaluate the developed Immersive Playful Experiences in Second Life, namely by accessing the social interactions around the narratives and gameplay. According to the results of this phase, the narrative plots, architecture, functionalities, interaction design, content, etc., of the Second Life immersive experiences was tuned.

The data collected through this stage allows for developing insight on:

1. how individual characteristics – such as age, background, culture, digital literacy, goals, roles, etc. – may impact the way people interact in/ with an immersive playful experience in a metaverse;
2. what is the potential of playful immersive experiences in metaverses to explore cultural contents cooperatively and intergenerationally.

Based on these scenarios and narratives, the immersive experience in the metaverse Second Life was drawn. The technical specifications for its implementation (required avatars, notecards, and other interactive structures to pursue different immersive challenges) were identified. The functional and technical requirements to recreate Amiais village in the Second Life metaverse (specific sims and grids, 3D territory modulation, and others) were also defined.

Agile development

Agile is an iterative time-boxed methodology involving design, development, and testing sprints or iterations, which imply a continuous incremental improvement of what is being developed, significantly reducing costs and time to market (Cockton et al., 2016; Meyer, 2014).

Thanks to the information gathered through the co-design sessions, it was then possible to design and implement Amiais in a metaverse, in this case, Second Life. All the work previously developed through the visits and the creative co-design sessions with the inhabitants and stakeholders was channeled to developing scenarios and ludic

narratives that frame a gamified and immersive experience in Amiais Second Life, thus allowing the learning about the cultural heritage of Amiais.

Regarding the construction of the village of Amiais in Second Life, this task encompassed modeling since the context is inserted in a virtual world. Thus, its development has been based on altimetric data extracted from various public and unique sources. It was possible to populate the virtual territory with models of typical vegetation, roads, walls, fences, rivers, and other small details, visibly approximating the region's landscape's general appearance.

In terms of transposing the knowledge and customs of the inhabitants to the metaverse, interactivity was implemented in the space so that the visitor/user could explore the place through a game. The narrative formulated for this game resembles a geocaching game within the environment. Visitors can interact with NPCs (Non-Player Characters) to find clues about the path to follow and which missions they must complete, thus encouraging the exploration of the place virtually.

It is important to highlight that the constructed narrative is based on information about the heritage and cultural heritage of Amiais. Thus, the narrative focuses on the ludic, affective, religious, and craft dimensions. Those dimensions were investigated and discussed during the co-design sessions. For example, in the game's narrative, a werewolf was added so that myths and legends would continue to have an impact in Amiais, in a convergence between the imaginary of the material and the immaterial territories. Also, the use of milk as a source of work and income, referred to by the inhabitants, will be recreated in the metaverse, being one of the game's missions – milking a cow.

Besides these two examples, more information acquired in the sessions was used in the game narrative and to support the architectural construction of Amiais in Second Life. The intention is also to develop a rich narrative, a virtual place as similar as possible to reality.

This transposition of the material and immaterial heritage of Amiais enabled global and international visibility of Amiais since it is present in an online metaverse, open to any user. In this way, Amiais' cultural heritage will be immortal, enhancing the attractiveness of Amiais as a place to be visited by tourists.

Sustainability & migrability models

Based on the previous stages' results, LOCUS's final phase included developing a fully functional version of Amiais' sim. This step allows the incorporation of immersive playful experiences. From here, it was possible to present recommendations from the case studies and re-test to evaluate new features.

This last stage also comprises developing a theoretical model to converge playful immersive experiences in virtual environments and possible real experiences in the physical territory (see chapter 6).

To ensure the project's sustainability, LOCUS also presents a set of recommendations to implement playful immersive experiences in metaverses such as Second Life specifically to promote rural territories and cultural heritage in metaverses. These guidelines can be useful to other rural regions that share cultural heritage aspects with Amiais village, which can bet on the virtual promotion of their territories.

The background features abstract, layered geometric shapes in a light green color. A large white shape, resembling a stylized 'L' or a corner cutout, is positioned in the upper right and middle sections. The text is placed on a green area in the lower left.

History, stories and
memories: The Cultural
Heritage of Amiais

History, stories and memories: The Cultural Heritage of Amiais

Amiais is in the district of Aveiro, municipality of Sever do Vouga, in the parish of Couto de Esteves. Amiais is a place that is about 10km from Sever do Vouga, about 2km from Couto de Esteves, almost 4km, and approximately 10km from the neighboring villages of Vilarinho and Ribeiradio. Vilarinho is so close to Amiais that their inhabitants shared the organization of the festivities in honor of São Francisco de Assis and Nossa Senhora do Amparo. Children from both villages accompanied each other on foot to the school in Couto de Esteves; corn was shared on the community floor of Amiais, where the residents of Vilarinho also appeared for the same work. Ribeiradio, today apparently more distant from Amiais due to the accumulated water (the result of the construction of the Ribeiradio dam), was once so close that the party in honor of São Francisco started there, moving by boat to Amiais side; but also, because many marriages were celebrated between residents in the two villages. Therefore, it seems clear that characterizing Amiais must include getting to know Vilarinho, Ribeiradio, and Couto de Esteves.

A relevant feature is the border and geographical transition area in which Couto de Esteves is located and, consequently, Amiais, Amiais,

Vilarinho, and Couto de Esteves still belong to the district of Aveiro, unlike Ribeiradio, which already belongs to the district of Viseu. This has geographical, commercial, economic, and financial consequences (for example, in applying for and obtaining European funding).

As the President of the Parish Council explains:

“We are the last parish in the municipality of Sever do Vouga, the last in the district of Aveiro. On the other side of the river is another parish, another municipality, another district, and another province. Here is Beira Litoral. On the other side is Beira Interior. [...] But, at the same time, [Couto de Esteves] is part of the Dão-Lafões Demarcated Region, which also starts from here to the Interior. In addition to being connected to the coast, we are also very connected to the interior, gastronomically, architecturally, agriculturally...”

Sérgio Soares da Silva (President of the Couto de Esteves Parish).

Accessing statistical data specifically about Amiais is a complex task due to its small dimension. In this way, information about the parish seat (Couto de Esteves) or the county (Sever do Vouga) is used, from which data about Amiais is extrapolated. As a point of comparison, one has the total number

Amiais Surroundings

- Vilarinho
- Ribeiradio
- Amiais
- Sever do Vouga
- Couto de Esteves

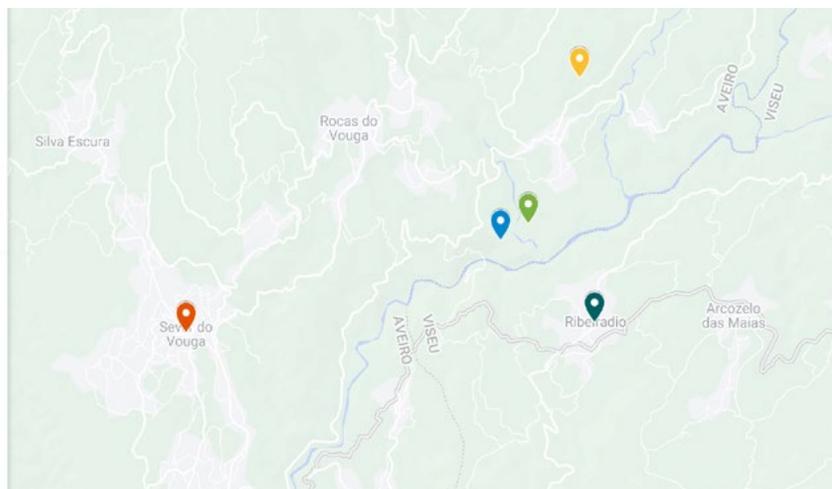


Figure 6 – Geography of Amiais surrounds

of Amiais' inhabitants confirmed by the President of the Couto de Esteves Parish Council:

“The village has 15 inhabitants, and then there are these three or four specific situations with a second home. We still have a couple who live in Sever do Vouga, who come there [to Amiais] every day, have their land there and cultivate their land.”

Sérgio Soares da Silva (President of the Couto de Esteves Parish).

Couto de Esteves has approximately 890 inhabitants². On average, the population of Sever do Vouga municipality has decreased by 100 individuals per year since 2011. Specifically, in the parish of Couto de Esteves, four babies were born in 2018, a number that has remained unchanged since 2014 (except 2017, a year in which the registration of live births was zero). In 2011, 348 families lived in Couto de Esteves, with 567 households that same year.

² www.cm-sever.pt, visited on May 10th, 2019

³ Relationship between the elderly population and the young population, usually defined as the quotient between the number of people aged 65 or over and the number of people aged between 0 and 14 years old (www.ine.pt).

In 2017, Sever do Vouga's aging index³ stood at 242.4, which increased from 207.3 in 2014. This figure is inevitably reflected in Amiais, which, as stated by the President of the Couto de Esteves Parish:

“In Amiais live essentially elderly people. [...] There are some younger ones, who stayed, and the rest are older.”

Sérgio Soares da Silva (President of the Couto de Esteves Parish).

Of the inhabitants who stayed and the dwellings that remained, many situations are the result of commuting between city-village or country-country (emigrants) for professional reasons or the search for a resting space at specific times, such as weekends or longer rest periods (holidays):

“[...] We have a gentleman who leaves in the morning and returns in the evening

[...]. Then we have three specific situations: a French man, who is retired, who wanted to change his life, came from France, found a house there, and lives there [in Amiais]. Second punctual situation: a weekend house, a man from Aveiro, who also comes here once or twice a month, has a holiday home. The third situation: we have holiday homes, emigrants who have holiday homes here, and people who live in Aveiro, Viseu and who also come here from time to time.”

Sérgio Soares da Silva (President of the Couto de Esteves Parish).

Due to the political, social, and economic repercussions that this brings to the management of the territory, another aspect also relevant for Amiais is that, at the beginning of the 20th century, Couto de Esteves ceased to be the county seat. In addition to all these facts, Couto de Esteves has always been a commercial point of great importance. The country's first milk cooperative was located there. The commercial movement promoted the sale of local agricultural products, thus enhancing the development of agriculture. Also, Couto de Esteves was the county seat where many inhabitants went to do their shopping and look for social spaces and leisure. For example, the community television of the Couto de Esteves cafe was the meeting point of the population from Couto de Esteves, Amiais, and Vilarinho, leading to several fun moments on the weekends afternoons.

Over the years, these realities have changed: the population has been decreasing and aging; agriculture has been losing prominence as regards economic development; leisure time and activities are currently different, and the role that

religion had, although it has not disappeared completely, has undergone a significant change, which is reflected in the way the population lives traditions.

However, the transformation of Amiais has contributed to increasing attention to being classified as a village of Portugal by the ATA – Village Tourism Association. This is a local action group that promotes the development and promotion of rural territories (*Aldeias D Portugal. Aldeias de Portugal: Um Espaço Coletivo de Construção*, n.d.).

Thus, the dimensions that stand out by their importance for the inhabitants, the way they have undergone mutations, and the question of the maintenance and sustainability of cultural heritage and understanding of the territory are playfulness, labor, affective bonds/families, local architecture, and religion.

Playful dimension

Playfulness is one of the most important dimensions of any culture. Through this aspect, ways of doing and being are learned, and knowledge and traditions are transmitted. The game is played through interaction with the Other (Vygotsky, 2008 [1934]), which provides learning, transmission, and transformation. As Ribeiro (2011) points out, “The playful environment is par excellence an environment that promotes interaction, commitment, and spontaneity, resulting in a fruitful exchange of affective, visual, tactile and psychological stimuli, thus supporting the relationship between the participants (child/child; parents/children; grandparents/grandchildren). Promoting the relationship between generations



Figure 7 – Desfolhada (Recreation of the leafless tradition)

facilitates the sharing of knowledge and values, and the cultural identity of a family, a region, or even a country is reinforced and perpetuated.” (2011, p. 11).

In Amiais, through informal conversations with local inhabitants and semi-structured interviews, it was possible to collect information on some of the leading traditional leisure activities. Among these are, for example, the playing associated with working out the corn, in which one has to find the king corn, a special corn whose outside thread is red, standing out from the others. Whoever participated in a leaf removal often looked for that king corn. Whoever found the king corn could

hug the other participants. Even in other villages, mostly men would keep it secretly and then pretend to see it to have the opportunity to embrace women. It was a game associated with a job that could have preparation time.

Another game often referred to was the nail. In this case, it was a question of throwing a nail into a hole made in the land. The player whose nail stood upright would win the game. Similar, but more played by females, was the button, which also had to be thrown into a hole made in the land, winning whoever hit the spot. The game called “little scarf” was also mostly a girl game. In this game, children were seated in a

circle, one of them singing a spiel and circling the circle with a handkerchief in her hands. Then, the cloth would be dropped on the back of one child, and they all had to guess where the handkerchief had fallen. Whoever got it right won and could then do this process.

In the *patela* game, squares were drawn on the floor to make a circuit. A stone (the *patela*) was thrown at the first square, and all the remaining squares were made by jumping on one foot. One cannot touch the other squares or even step on the lines. This process was done from the first to the eighth square. The winner was whoever reached the last square (C) without stepping the risk at all or falling to the other squares. Anyone who lost would start all over again. Finally, the *pião*: after placing the rope around the *pião*, each player launches it in turn, keeping the rope in hand. The *pião* that runs the longest was the winner.

Music was an always present element in all these moments and many others, such as labor or even when no other activity was associated. Several residents of Amiais and Vilarinho mentioned the Sunday afternoons spent playing mouth harmonica with two singers singing verses or even with other musical instruments. Music bands also played during the afternoon at parties in honor of São Francisco de Assis, and Nossa Senhora do Amparo. Music was still present at work times, for example, when corn or rye was worked, when washing clothes in community places, among others.

Playfulness assumes great importance in interactions, as already mentioned, but also in growth, with the change in games occurring as age advances, but without ever disappearing. When the intention is to carry out a historical reconstruction or to recognize cultural heritage, for Mortaraa, *et al.* (2014, p. 319), “Games in this category have history as the primary educational goal and focus on the faithful reconstruction of a specific historical period, event or process which happened in the past; notions of archaeology, art, sociology and politics are also involved.”. Thus, if games have always been important for civilizational development, whether at a particular level (of

the player himself) or at a general level (of the history of a place), this importance has repercussions for the future through the reconstruction of what the gameplay practices are, interfering later in all the sociological, artistic, archaeological development of that same place.

Playfulness is relevant in the reconstruction of Amiais’ memories, not only because the individuals have frequently referred to it but also because it has been recognized, since the beginning of the LOCUS project, as a dimension to study, know and, later, implement in the technological development phase.

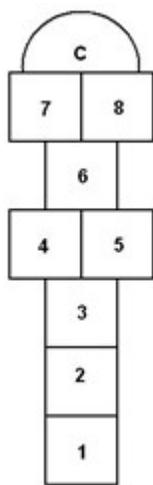


Figure 8 – Patela game.
Source: <https://bit.ly/39T39t6>, visited on June 17th, 2019.



Figure 9 – Pião.
Source: <https://bit.ly/34ib8z8>, visited on June 17th, 2019.



Figure 10 – Traditional musical entertainment during the Defolhada



Figure 11 – Intergenerational relations during the Defolhada

Labor dimension

Another of the dimensions that stood out from the interviews and conversations was related to labor. In a predominantly rural environment such as Amiais, the laborers were closely related to this economic activity, either by growing food or producing animals. This dimension intervened not only in the subsistence of families, being, in most cases, the only way of obtaining economic means, but also in how the community organized, communicated, and interacted. The main developed activities at Amiais were American wine, wood and milk production, corn, rye, flax cultivation, and gorse collection to heat the ovens. These were products that, for the most part, were sold at the parish seat (Couto de Esteves) but also in neighboring towns, such as Ribeiradio, to which local producers traveled on foot purposely to transact the products.

Mário Silva highlights this aspect:

“In these decades of 20/30/40/50, as there were many people and everything was concentrated here in the village, in Couto de Esteves, this came to have much commerce, from shoe shops, shoe factories, post offices, cafes, many cafes. Also, the number of people who came here to bring the milk, because the seat of the cooperative was here, so imagine, people sold the milk here and then where did they spend the money? Here, at Couto de Esteves. This brought tremendous economic life to the place here.”

Mário Silva (President of the Cultural and Social Association of Couto de Esteves (ACSCE)).

As Pêgo (1999) mentions, the improvement of

instruments is a reality that comes together with the need for cultivation. In the specific case, the *argau*, a tool used in producing wine in cellars, was mentioned, so crucial that it gives its name today to a sparkling wine produced in the region of Sever do Vouga. Currently, agriculture continues to have a substantial weight in economic development, although now related to new products, for example, the production of blueberry, which has even resulted in new variants of its use, such as in the production of the spiritous drink, gin.

Despite the diversity of products, corn cultivation has gained prominence for several years, particularly throughout the county, but specifically in Amiais. Starting with the Couto de Esteves parish, as the President of the Parish explains:

“The heraldic symbol of our parish in Couto de Esteves is the canastro [the place used to keep the corn after being harvested], the river, and the palms. The canastro is symbolic and is part of our socio-cultural history. Because the entire parish, which is made up of about ten villages, almost all the villages have a community threshing floor and granaries. For several centuries the parish has lived around corn, starting right in the geographical relief, the hillside, which is a sign of growing corn, maize, and wine. Maize to feed the animals, the cows, to produce milk, which has been the main livelihood for the past 100 years.”

Sérgio Soares da Silva (President of the Couto de Esteves Parish).

Corn is thus an essential part of the story and is represented a little everywhere. In Amiais, the *canastros* (granaries) representing the



Figure 12 – Community threshing floor on the day of the Desfolhada

region have recently been rebuilt and recovered. This symbology was associated with the labors, as already mentioned, but equally with the organization of the place. Often, families managed maize cultivation in a shared way related to the existence of a community threshing floor in Amiais, to which the inhabitants of Vilarinho also traveled. The same was true of the mills.

“This is a community threshing floor, and each canastro belongs to a family [...] the threshing floor is communal and belongs to the family owners of the canastros. What is the threshing floor for? To make maize. At these community threshing floors, each parcel had access from one to the other. Then each family also had a small stand. This probably

is not recorded, but each family knows what belongs to whom.”

Sérgio Soares da Silva (President of the Couto de Esteves Parish).

“The mills were shared, not communitarian, but shared, and then each one had their own hours, 10 hours, 20 hours a week, and we knew it started at a specific hour.”

Finally, the existence of mining is highlighted. The mines also made a solid socio-economic contribution to the region, especially regarding the professional occupation of men.

“We were a municipality with great development in terms of mines. We had mines



Figure 13 – Socializing during the Desfolhada

in operation until 1958. It was the great occupant of people, of men mainly. Now, in the final years, before closing, galena was extracted, which was lead ore. Therefore, it had its peak between wars because it provided material for... lead was used in cannons and bullets."

António Coutinho (President of the Sever do Vouga City Hall).

Meanwhile, geography has undergone mutations. As already mentioned, the construction of the Ribeiradio dam (which started operating in 2015) brought significant changes to local architecture and agricultural production. Much of what used to be cultivated fields were flooded after 2015. Before that, this change in agriculture was due to political and commercial

reasons, namely, with the entry of Portugal into the current European Union:

"In the last 25 years, with the entry of Portugal into the European Community, there were cuts in milk quotas, and the land started to be abandoned. It was not so profitable to cultivate the land, people stopped having cows, producing the fields, and these stone houses and corrals are now abandoned, as are most of these canastros."

Sérgio Soares da Silva (President of the Couto de Esteves Parish).

Amiais is a population center with a rich cultural heritage. This is also retrieved from its variety of agricultural products. The distance between each village, when there was no means of transport, dictated their development. In Vilarinho,

the corn was worked in shared spaces, while in Ribeiradio and Couto de Esteves, the products were traded. The locations' proximity defined their capacity and organization, a characteristic that is transversal to several dimensions under analysis. However, it assumes particular relevance in what concerns labor due to the socio-economic implications it later had for the families and the territory's development.

Affective bonds / Families' dimension

As in the previous dimensions, the importance of proximity between population centers was also evident in the case of affective and family bonds. Over the years, with the construction of road infrastructures and easier access to means of transportation (whether public transport or own vehicles), affective connections have changed. In this dimension, economic and social development's influence is also evident.

When displacements between settlements were made on foot, they took place in closer locations, so affective relationships (which sometimes resulted in weddings and family formation) were established between these places, such as Ribeiradio or Vilarinho. Thus, through ethnographic research, it was noticed that the proximity between areas encouraged affective connections and several marriages. As one inhabitant of Vilarinho explains:

"When it was on foot, we went to Amiais, there was a man who had a boat, charged some money and we crossed the river to the other side, then we went up, up, up. I even know four children of my grandfather who got married there since it was such proximity."

M., 40 years old

This reality shaped the cultural heritage of Amiais since these affective connections allowed the continuity of generations and, consequently, the transmission of knowledge and culture. In the family environment, new relationships were defined (sometimes, with whom the children could or could not marry); work, leisure and social hours and the future of younger generations (in the past, almost inevitably, linked to agriculture).

Thus, boys used to go to different villages in search of girls to date, but this was not an easy matter, as family control was always present. An Amiais inhabitant reports one of these stories:

"They [Men] came from Ribeiradio to Amiais searching for girls. And dating was at a distance, and it was close to home. You could only talk near the door, and when many hours passed, 'oh girl, it's time to moo the cow!'"

F., 87 years old

As time passes, this dimension has also changed. Over the years, the distances traveled in search of marriage have increased due to the more access to transportation and the consequent proximity created between places, once very distant. Thus, over the years, affective relationships started to take place between more distant geographies, such as the municipality of Sever do Vouga.

"The further we go back in time, the more they married among neighbors and within the village. I saw it through my family tree. My parents were the last. They were both from the village of Couto de Baixo. My grandparents were from the parish, then they were already married between places, they were all married very close."



Figure 14 – Religious festival as a meeting point

Sérgio Soares da Silva (President of the Couto de Esteves Parish).

The familiar and affective dimension (of friendship) is of high relevance due to the way it defines and shapes the future of all people. In the specific case of Amiais, it is no exception. Several friendships have been maintained over the years between inhabitants of Amiais and Vilarinho, who attended the same school in Couto de Esteves. Despite the possibility of some distance nowadays (as a result of (e)

migratory movements)), when they meet again at specific moments, everything happens as if they had never been apart.

An example mentioned above is what was possible to observe at the festivals in honor of São Francisco de Assis and Nossa Senhora do Amparo. This is the time of year when Amiais population doubles (from 15 inhabitants to 30 visitors): several people return for the celebration, either because they feel a special connection to the place or (simultaneously) because they still have family members there.

Participant observation allowed to witness how long-standing friendships almost remain unchanged, despite time, with the sharing of news as a circumstance of great emotional importance.

Affective relationships are essential for how a population develops by sharing common values. This process allows the cultural heritage to last over time (Lisboa et al., 2007; Singly, 2009), but it also undergoes mutations. The departure of new generations in search of other places, with further opportunities and characteristics at various levels, also influences cultural heritage and its evolution. The ease of movement transforms the place, either because it is open to other people, or the people born there bring

new experiences and introduce them into the context of their past.

Local architecture dimension

Architecture is always an aspect that characterizes the places. The way houses were built in the past, for example, was often determined by needs related to agriculture: spacious basements at the bottom of houses to keep the animals, large terraces to dry products, etc. In addition, the type of buildings was also influenced by the materials most easily accessed in each geographic location: granite, and marble, among others. Amiais is no exception. In most houses, marble is the primary material in the construction, but the granaries (*canastros*) found all over the village are built in granite with a wooden roof.

Over the years, this dimension has also changed, either because natural conditions have changed over time or because there was a vast human intervention in the territory. After the construction of the Ribeiradio dam, natural and landscape architecture underwent significant changes. Currently, it is possible to view a water mirror that did not exist and contributed to changing access to places. In the past, and on days of greater drought (especially in the Summer), Amiais and Ribeiradio could be reached on foot, crossing what today is this vast water mirror. Today access is made by road crossing a bridge built in that dam. Some buildings, especially *canastros*, were even submerged and what were once vast fields of cultivation ceased to exist.

Notwithstanding all the mutations, the water

mirror formed is a strong tourist attraction, but also for the establishment of a second residence, having brought new people to Amiais. Emigrants are rebuilding houses that were previously abandoned; people who, having no connection to Amiais, decide to buy and restore housing for holidays and weekends, given a new look, combining modern and traditional architecture.

Thus, historical changes contributed to architectural changes. Since agriculture is no longer relevant, for example, corn production, this brought a need to transform the existing *canastros* into tourist attractions. The structure rehabilitation happened with public and private investment. Natural or built, architecture defines a location, especially if considered over time. Architecture often makes it possible to understand how long a place has existed, the intentions of the building, the effects of the time passage, people's needs, and the way these needs have been changing. Amiais' architecture is full of history, making it possible to know the place and its people through, for example, the existence of a community threshing floor, the cross square, or the *Alminhas* (a religious reference that will be explained in the next dimension).

Religious dimension

Religion is a dimension in every corner of the parish of Couto de Esteves and, specifically, of Amiais (Rubio, 2018). Throughout the ethnographic research, it was possible to collect various testimonies and information on how religious celebrations influenced the coexistence between neighboring villages, how they contributed to families' formation, or even how



Figure 15 – Amiais Streets



Figure 16 – Canastros / Espigueiros



Figure 17 – Chapel of Amiais



Figure 18 – Views of the river in Amiais



Figure 19 – Restored houses in Amiais (traditional architecture)

family members returned to Amiais always at the same time of the year.

Every year in Amiais, the festival in honor of São Francisco de Assis and Nossa Senhora do Amparo is held, on the Sunday after Easter (*Pascoela*). This is a party organized together with Vilarinho and has been changing its structure over the years. It started in Ribeiradio, where processions walked down the slope to the riverside and crossed the river in a boat to Amiais. Years later, the procession left Amiais and went to Couto de Esteves. And if before the profane part of the party had evident importance, with two musical groups playing in different points of Amiais, today it does not exist. Currently, the party is also changing from year to year. The procession with the

two saints leaves the Amiais chapel, makes the journey to the cross square, goes around there, and goes again to the chapel. This procession usually takes place on Sunday, around 11 am, after a mass celebrated in the chapel of São Francisco.

But the most important celebration in the parish and to which all inhabitants and family members of the villages attended (and still attend) is the Feast of Lord (or *Santíssimo*). Active participation in the organization of the party was customary, as one resident in Vilarinho says:

“The Amiais festival was a small one, I was a butler for a few years, and I was a butler for the Feast of Lord, at least three years. And once I sold a bull to get money to make the



Figure 20-21 – Religious Procession of St. Francis and Sr.^a do Amparo

party, the party was expensive, it cost between 11 or 12 escudos [55€ or 60€] at that time, for each butler, see, six butlers, it was about 70 escudos [140€], it wasn't easy."

A., 93 years old

The Feast of Lord takes place in Couto de Esteves every year on the second Sunday of July and still brings together many people from the villages belonging to the parish. It is already a larger party, with events over three days (12th, 13th, and 14th July 2019) that include the performance of musical groups, the opening of exhibitions, and religious celebrations.

In terms of monuments, it is worth mentioning the *Alminhas*, existing throughout the county, symbolizing places of worship (figure 16). They have a remarkable history due to the

importance they assume for the entire Sever do Vouga municipality population. Thus, they marked places to stop and pray when there was a funeral procession; they served to calm passengers down in darker places or even pay homage to people who had already died. As Natália Braga and António Coutinho explain:

"Many of them [Alminhas] were built of devotion, thanks or faith, in places where someone died or was mugged. Because they continue to build Alminhas, they build an Alminha to signal the place if there is an accident. And in the past, there were many night robberies, and people felt more relieved when they passed by the Alminhas because there were fears, night fears, and no lighting."

António Coutinho (President of the Sever do Vouga City Hall).



Figure 22 – Religious Procession in Couto de Esteve



Figure 23 – Alminha

“The Alminhas were a cult monument. There are still people who put flowers, others have the crucifix. [...] When people died, on the way to the cemetery, they always stopped to rest in front of the Alminhas. The Alminhas are always in places where funeral processions pass. In the past, there were no mortuary houses, and forms of transport were by hand. People rested next to the Alminhas, prayed, and continued the journey until they reached the Church, the parish of Couto. It was a place of worship, always having images of saints or purgatory, the path of souls.”

Natália Braga (President of the Association League of Friends and Naturals of Couto de Esteves (LANCE)).

Faith and religion are essential throughout the Portuguese territory, namely, in rural areas. There are many festivals in honor of saints, especially in the Summer, but they happen a little throughout all months and places. To the religious celebration (masses and processions), it is customary to join the profane celebration,

with festivals, fireworks, and music, which still manage to gather many people who return to the lands they have left for years. This is a dimension of the history of Amiais, but which could be replicated throughout the country, which gains greater relevance in this specific case due to the way it is still experienced today, considering the reduction suffered by the population in that village.

The importance of cultural records for the preservation of cultural heritage

The United Nations Educational, Scientific and Cultural Organization Convention for the Protection of the World Cultural and Natural Heritage, signed in 1972, includes Cultural Heritage and Natural Heritage. The monuments, sets (groups of isolated or assembled buildings), and places of interest are included in cultural heritage. The geological and physiographic formations and the zones that constitute habitat for threatened animal and plant species and the natural areas of interest are included in the natural heritage (Organização das Nações Unidas para a Educação, 1972).

From 1972 to the present, the concepts of cultural and natural heritage have evolved. They included the physical and tangible aspects (as perceived in the 1972 definition) and the intangible aspects of culture (ways of doing, language, immaterial specificities related to interactions between people and between people and objects, whether singing, games, or other phenomena). The same is said by Ferretti,

Bottero, and Mondini (2014): “This initial definition has been enlarged and nowadays in the characterization of cultural heritage it is possible to include also territorial systems, landscapes, itineraries, and intangible heritage.” (2014, p. 645).

Both tangible and intangible characters have an economic value for people, as mentioned by the authors above, but also a non-economic value related to various dimensions contained in the concept, above all, cultural heritage (Mazzanti, 2002). Thus,

“Firstly, cultural heritage is a multidimensional issue, because it belongs to the economic categories of public and mixed goods. Secondly, cultural heritage is a multi-attribute problem considering that the heterogeneous flow of services and functions characterizes cultural markets. Thirdly, cultural heritage is a multi-value problem because it concerns a wide spectrum of personal and inter-personal value benefits.” (Ferretti, Bottero e Mondini, 2014, p. 645).

Relating the perception of cultural heritage, in its various aspects, with the objectives of the LOCUS project and with the dimensions analyzed in the previous sections of this chapter (playfulness; labor; affective bonds/families; local architecture and religion), it is considered urgent not only to survey the cultural heritage – in the specific case of Amiais – but to contribute, in some way, to its continuity and maintenance. This urgency is in line with what Jorge Dias says:

We, Portuguese people, are not on the eve, but amid losing all that wealth from the past. If we do not run quickly to save what remains, we will be bitterly accused by those to come of the inexcusable crime of having lost our traditional heritage, showing signs

of absolute neglect and ignorance. If we don't, in two generations, we can be a people without character and deeply poor... (Jorge Dias, cit. in Monteiro, 2001, p. 4).

Thus, not only because one recognizes the value of tangible and intangible cultural heritage, a value that can be economical, but which is considered here in its most comprehensive dimension: the awareness of a people and a country, it is easily understood the importance of documentary, digital, museological records, among many others, of cultural heritage. These records have the ultimate purpose of guaranteeing the survival of the past, also contributing for future generations to access what their history was and to feed it with new layers (new information, technology, etc.) and past generations to continue the legacy through knowledge sharing.

Records guarantee subsistence over time and the maintenance of culture, that is, the continuity of cultural heritage and intergenerational transmission and can be done in several ways: using different formats (video, audio, photography, writing...); diversified technologies (virtual means of recording and/or sharing information, such as the web, Augmented Reality, the Internet of Things; physical means, such as books, artifacts, objects); starting from different methods of collecting information, such as observation, participation in a real context, interviews...; and involving different interlocutors: current and past residents of a given territory, agents of change, visitors, family members, among others.

Belhi, Bouras, and Foufou (2017) evidence the relevance of cultural heritage, as follows: “Cultural heritage assets [...] is the only tool

that can trace the lifecycle of civilization and thus transfer knowledge and education through the time. Conserving these assets is a top priority for all nations” (2017, p. 1). The authors evidence the importance of registration and archiving of cultural heritage. They reflect on the concept of digital inheritance since there are more and more possibilities offered by digital technologies to guarantee the maintenance of cultural heritage. It also allows their access to be generalized without being put at risk.

With the increasing performance of digital technologies, heritage organizations around the world are considering adopting these technologies to cultural heritage promotion. Museums are digitizing their collections not only for cultural heritage preservation, but also to value and promote their collections and make their inventory accessible for a larger audience in an attractive way [...] Digital preservation is very far from taking a backup of some files. Digital preservation is a set of packages and well-established architecture that is adopted by the archivist to ensure that the information is there when we need it, and more importantly, to ensure its usability and interpretability. (Belhi, Bouras e Foufou, 2017, pp. 1-2).

Maintaining and guaranteeing cultural heritage survival is so essential that Blundoa *et al.* (2018) suggest a specific cultural heritage life cycle management protocol, divided into three fundamental phases: decision-making, execution, and management. Each phase is divided into sub-phases related to the life cycle of cultural heritage, always in a logic of stakeholder engagement (2018, p. 223).

Contributing to the maintenance, management, and survival of Amiais’ cultural heritage is one of the objectives of the LOCUS project. This

mission started when the research team contacted the territory and the people who live there through semi-structured interviews and informal conversations, but also with the participant observation of the moments that the Amiais population has been promoting over the years and the ones that inhabitants still give importance to today.

As Paasovaara, Lucero, & Olsson (2016) state, “While there are various social norms, cultural practices and privacy concerns that hinder interaction with strangers, ignoring the other people can be even more detrimental in the long term (e.g., leading to a low sense of community and missed opportunities)” (2016, p. 1). This was the first challenge for LOCUS project.

Despite the importance of people for the continuity of cultural heritage, currently, contributing to the cultural heritage promotion and continuance is an easier task using technological means that allow not only to register its existence but to be an extension of it.

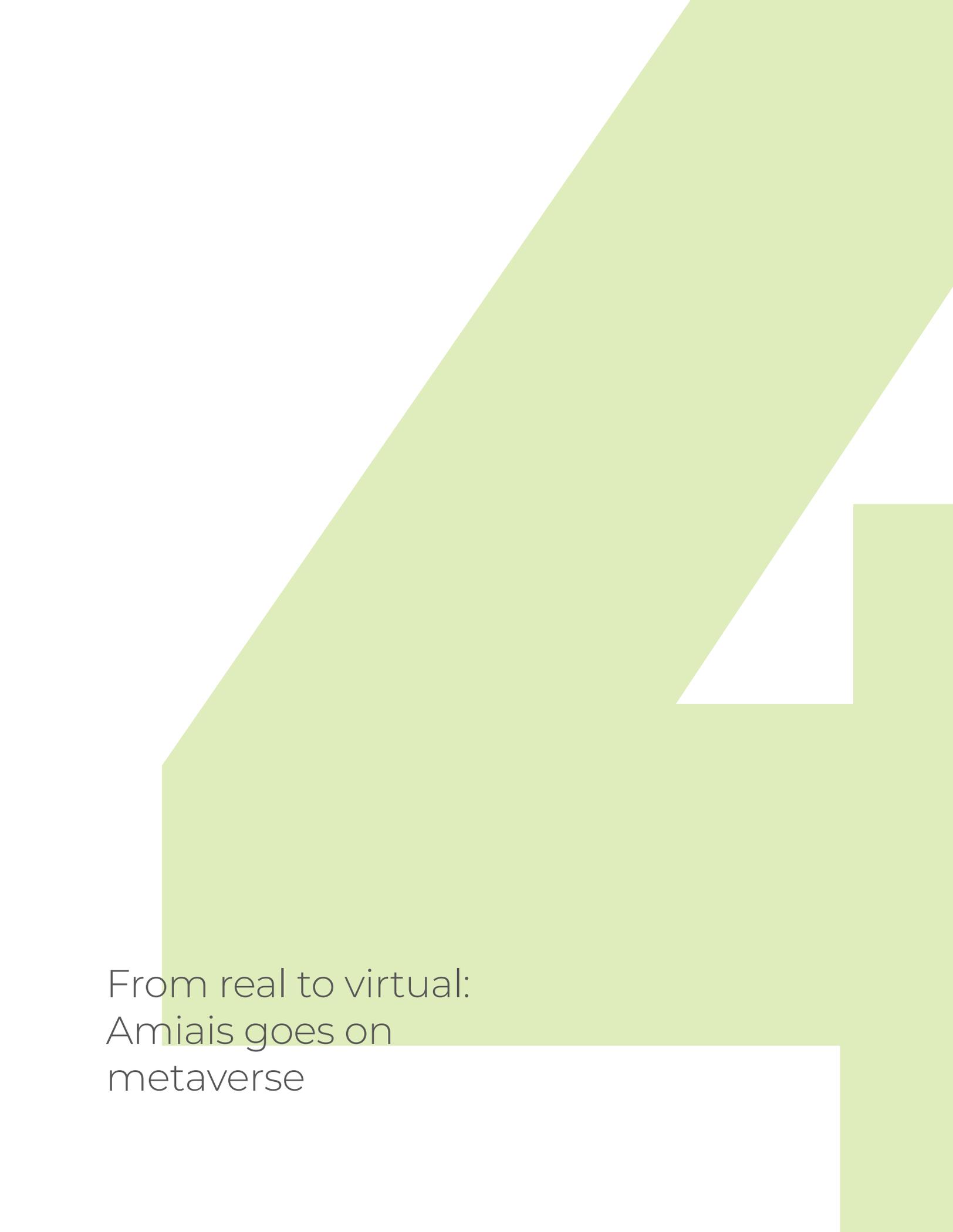
When faced with a project with a solid technological base, a second challenge is related to technological development. Even when thinking of a co-design logic, as is the case of the LOCUS project, it runs the risk of focusing attention on technology, forgetting what is, in fact, essential for the people who intervene in the process.

Thus, the LOCUS project made an effort to include residents, visitors, and stakeholders in all the phases of the project development. Although it is vital to consider the individuals’ engagement in their own cultural heritage processes, it is also crucial to not compromise the project development but, more importantly,

the work that was intended to be done with the cultural heritage, namely, its projection for the future, the contribution to its maintenance.

In this regard, the following chapters will focus on a different approach adopted by the LOCUS project in the face of the circumstances of the Covid19 pandemic that occurred during the

project time. The goal of preserving and disseminating the cultural heritage of Amiais through digital technologies remained. However, it was necessary to search for sustainable solutions for the project, the territory, and its cultural heritage.



From real to virtual:
Amiais goes on
metaverse

From real to virtual: Amiais goes on metaverse

The project's territory of development and implementation – a small village (Amiais) in the interior of the district of Aveiro – has a resident population of 15 people, essentially elderly people, with quite advanced age. These seniors are fundamental elements of the development of LOCUS, being considered team members due to the nature of the project's methodologies. The inhabitants of Amiais collaborated on the project in work sessions in the small chapel of Amiais. For the project to continue in its original version, they would have to collaborate actively and presently until its end. However, the pandemic situation caused by Covid19 that the world faced from 2020 brought some challenges to the LOCUS project.

Almost all of the LOCUS tasks were based on a very close, face-to-face relationship between researchers, inhabitants of Amiais, and stakeholders. The very nature of the methods and techniques that the project aimed to implement demanded face-to-face engagement of the subjects. However, the shallow literacy levels, academic qualifications, technological-digital literacy, and the lack of internet and other technology access, besides television or telephone, made face-to-face interactions and online meetings unfeasible. Furthermore, the

project's feasibility would also depend on the continued travel to the territory to ensure the implementation of the technical and technological infrastructure. In this sense, for health reasons (of the transmissibility of COVID-19) and for ethical reasons (of moral and social responsibility to protect the population), there were no conditions to continue the project in the way it was initially conceptualized.

All the creative sessions of participatory design of scenarios and narratives for playful and intergenerational IoT-based experiences were not possible, as they provided active participation of seniors living in Amiais. Likewise, the IoT system prototyping and testing sessions, which rely on the participation of inhabitants and stakeholders, also became unfeasible. Some prototypes were developed to work with seniors in these participatory design sessions, specifically to demonstrate ways to digitally enhance everyday objects, adding different layers of interaction/information/communication. However, these sessions were no longer held, and the pandemic compromised the entire co-design process.

Thus, the solution for the LOCUS project continuity necessarily involved virtualization of the

territory. The project's development started to be carried out in a virtual environment, using the Second Life™ platform.

Second Life is a metaverse, a three-dimensional socialization platform that simulates the real world. Second Life was created and operated by Philip Rosedale's Linden Lab (Winkelmann et al., 2017) in 2003 (Quintin et al., 2017). It is a free, online 3D virtual metaverse in a multi-user environment (Chen, 2016a; Quintin et al., 2017), characterized by being shared, interactive, immersive, and collaborative (Caulfield, 2021). This metaverse evolved rapidly and peaked in the late 2000s (Gent, 2021); however, recent statistics show that in 2018 only about 500,000 users were monthly active, a number that has dropped significantly compared to previous years (Buscemi, 2020).

In this type of platform, structures are built in a virtual territory composed of regions, and it is possible to make just about anything that can be imagined. In this metaverse, users exist and move as avatars, entirely digital graphical entities that embody the player. Interactivity with places and objects is developed using a specific Second Life programming language – Linden Scripting Language (LSL) (Linden, n.d.). The Second Life metaverse is not a game. There are no goals, levels, or central goals for its development (Robbins & Bell, 2011). Instead, users create a representation of themselves through an avatar that assumes a different concept upon entry into the metaverse and are called residents (Berger et al., 2016). Residents are three-dimensional forms that can be customized with varied visual aspects: anthropomorphic, zoological, fantasy, or

everyday objects (Abdullah, 2016). In this way, users or residents can explore the world, meet other users, participate in activities, and create and build 3D objects or their digital content once they enter the metaverse. They can also trade goods and services through the currency created for the metaverse, the Linden dollar (Chen, 2016a; Gent, 2021). In this context, residents have freedom and flexibility to live their “second lives” (Chen, 2016a), making it possible to make mistakes or make bad decisions without fear of consequences, as these do not exist, contrary to what happens in real Life (Quintin et al., 2017).

Although Second Life does not include missions or objectives, the LOCUS project uses interactivity as a source of gameplay in the medium, as a core element, and as the central strategy of Amiais in Second Life. Thus, a gamified experience is provided. These interactive logics are based on information gathered from the inhabitants of Amiais in which they shared aspects related to the playfulness of their traditions. Hence, the gameplay present in the virtual world of Amiais aims to enable the user/visitor to explore the territory through missions and interactions between NPCs in a playful way. Gaining virtual existence, Amiais can potentially be visited by some 900,000 Second Life users (Schneider, 2020). All the work previously developed through visits and creative sessions with inhabitants and stakeholders was channeled to developing scenarios and ludic narratives that frame immersive gamified experiences, allowing collaborative learning about the cultural heritage of Amiais.

Second Life: a virtual place where interactivity enhances cultural heritage

Developed by Linden Lab, Second Life is defined as a metaverse which means one or more 3D virtual worlds that are shared, interactive, immersive, and collaborative (Caulfield, 2021). Second Life is free, online, and allows users to socialize, connect, and create using free voice and text chat. Users can interact with others through avatars, also known as residents. This world is based on the archipelago metaphor, in which islands are interconnected. The islands are inhabited by “residents”, represented by avatars, which can be customized (Mendes, 2011). Residents can explore the world, meet other residents, socialize, and participate in activities. These connections can be made through teleports that simulate bridges and roads. In addition, this metaverse allows you to simulate real-world routines and use scripting functions to create and build 3D objects to trade virtual goods and services with each other (Chen, 2016b).

Thus, the constructions performed are reflected as a metaverse and computer-generated immersive environment that mirrors the residents’ real world, creativity, and imagination. As a result, residents can perform activities like those that exist. Therefore, players have complete freedom and flexibility to live their own “second lives” and create their personas (Chen, 2016b) in their likeness or customize them in any way they prefer. In this sense, what differentiates Second Life from other MMORPG games and makes it attractive to research in this area is the creations ownership by the residents, and the possibility of doing whatever they want, which serves as motivation for the user.

Unlike most games, Second Life has no clear and defined goals, no levels, or quests necessary for the game to unfold. Thus, interactivity is not one of the core concepts for the average Second Life player. Therefore, this is the way out found by the creators to ensure a growing and healthy economy in which players have the same property rights as in real life (Soares et al., 2015).

Interactivity can be understood through the concept of communication, which means conferring, sharing, associating, and exchanging opinions. This implies participation, interaction, and exchange of messages (Rabaça & Barbosa, 2002). Second Life offers the freedom to program the interactivity of objects, one of the examples in which it is possible to verify this application refers to the virtual museums present in Second Life, in which visitors can interact with cultural artifacts and obtain information about them (Vosinakis & Tsakonas, 2016).

Another form of interaction in Second Life is the possibility of residents communicating with each other. These interactive possibilities present themselves at the language level, i.e., text-based chat, instant messaging (IM), voice over IP, note cards, action scripts, billboards, road signs, etc., and avatar-based possibilities, i.e., movements and gestures, such as dancing, yawning and laughing; teleporting or flying to different locations (Chen, 2016b). Residents can also hear and see streaming audio and video in Second Life through a surface texture that they designate as a multimedia surface. However, one form of interactivity is spoken communication which is rarely employed in Second Life between avatars and NPCs. As a rule, NPCs only provide information to users, creating a one-way communication.

Thus, spoken communication is mainly used among residents, i.e., human users (Griol et al., 2019).

According to Dawley (2014) & Kluge & Riley (2008), the constructions reflect a metaverse and immersive computer-generated environment that mirrors the residents' real world, creativity, and imagination. Thus, in the first instance, the game is characterized by creating an imaginary space in which the game takes place, whereby the players agree to "suspend" reality (Goutx et al., 2021). This freedom makes it possible to create anything that can be imagined just like real cities that existed thousands of years ago.

As Mendes (2011) mentions, this medium allows you to know cultures and civilizations, not in an empirical way, but through exploring the place, living in the territory, and its culture and society, as is the case of Sparta and ancient Rome (Mendes, 2011). Also, since Second Life is a large environment, Darken and Sibert (1996) concluded that it is necessary to develop a structure to navigate them effectively. An example of this is the organization of the islands in Second Life. There is a distribution of smaller and distinct parts of the world, thus making it easier to organize them. At the same time, the resident often is provided with directional clues and maps. The same authors emphasize using directional indicators such as landmarks, maps, and paths to improve the search for places (Lerner, 2016).

According to (Mattar, 2008), Second Life, besides being characterized as a promising virtual learning environment, also has the potential to present a "macro" environment composed of infinite "micro-environments", with interactive features such as scripts, images, texts, and sounds, among

others. As a learning space, it allows the creation of playful and rich places as a tool of information in several dimensions. In addition, it is also used as a source of study for education research (Zimmer & Vezzani, 2017). Playfulness is one of the most important dimensions of any culture. This aspect teaches ways of doing and being, and knowledge and traditions are transmitted. According to Vygotsky (2008), play is done through interaction with others (Oliveira et al., 2020), promoting learning, transmission, and transformation. In this way, this game-level concept becomes a force that unites the participants or players in an animating moment of the simulation they are "inhabiting" (Goutx et al., 2021).

Second Life as a learning tool

The concept of "heritage" in a virtual environment like Second Life, in which there is a control of time and age, can lead to the idea that the symbolism of the elements and the objects built should be carriers of a recent history base. However, according to Harrison (2009), the image that Second Life mirrors is about the old and grand, highlighting what is "official" and not so much as the "vernacular" (Freitas, 2011). According to Ferguson et al. (2014), Second Life residents not only develop their own distinctive heritage but also recreate and reshape real-world heritage sites within this virtual environment (Ferguson, Rebecca; Rodney and Weinbren, 2014). In this way, Second Life becomes a game possessing features that allow the dissemination of cultural heritage.

According to Choi *et al.* (2010), the Second Life platform brings advantages regarding the

preservation of intangible cultural heritage within a virtual world:

1. Contextualization: The environment is rich, so it supports not only the construction of 3D structures but also audiovisual and motion assets for the preservation of intangible cultural material;
2. Multi-view: The Second Life environment allows the user to observe performing arts from any direction/orientation;
3. Recreation: The flexibility of the platform allows creators to easily redesign and reuse a performance art from a common database;
4. Accessibility: Second Life's client system requirements are moderate and can be run through an Internet connection;
5. Multi-participation: Second Life is a massive multi-system that allows the presence of the user, avatar or resident, in participating in various roles, whether these are the audience or a performance avatar.

Places created on the platform that somehow present a heritage's existence tend to be focused on building a sense of rootedness and developing a public memory in the virtual settlement (Freitas, 2011). Through replicas of historical sites, students learn about their ancestors through site exploration (Winkelmann et al., 2017). An example of this is the prototype that simulates the culture of the ancient city of Uruk in 3000 BC in the Second Life environment (Bogdanovych et al., 2010). Based on various written sources that address the type of culture and heritage of the place, Uruk's environment was built in the metaverse. The creators transposed what existed: a large flat desert area with few trees, the animals that were part of the place, a river

with a wide variety of fish, the main historical points, and the appearance and behavior of the virtual inhabitants. To illustrate the local culture, the team created four NPCs with distinct social roles, representing members of two fishing families from ancient Mesopotamia. They can move around the world, perform animated behaviors on objects in the environment, and interact with users. In addition to focusing on replicating the place, the project creates a 3D virtual world that provides an environment for viewing cultures using interaction, in which NPCs are carriers and disseminators of knowledge. Bogdanovych et al. (2010) highlight their goals for effectively conveying the cultural heritage of the site, these being 1) to specify the role of virtual agents as an important element in preserving virtual cultures; 2) to produce a formal model of a virtual culture that facilitates the preservation and learning of that culture by visitors and provides a foundation for the computational enactment of culture; 3) to develop a computational framework that helps preserve and simulate virtual cultures and 4) to test and demonstrate the developed model and framework through a case study (Bogdanovych et al., 2010).

Similar to the Uruk case study, the City and Spectacle project: a pre-earthquake Lisbon view, relating to the recreation of Lisbon in 1755, is also an example that allows the user to learn through the Second Life metaverse. The project's objective is to recreate and understand, historically, a reality that disappeared with the earthquake in the city of Lisbon at an urban, architectural, and social level (Câmara et al., 2009). Also, the project intended to explore the ability of the Second Life and OpenSim platforms to make information available, as well as to expose immediately

recognizable forms to a non-expert audience, such as the “interpretive center”, the “screen”, and the “i” used to signal that information is available (*Cidade e Espectáculo: Uma Visão Da Lisboa Pré-Terramoto*, n.d.). In this way, the information can be disseminated to any public, contributing to the learning and understanding of Portugal’s cultural heritage.

Medical and health education are other case studies that exemplify the use of Second Life to promote learning. Researchers at the Ohio University VITAL Laboratory created “The Nutrition Game” in Second Life to demonstrate fast food’s short – and long-term side effects. The objective of the game is the player’s healthy choices, which guarantee a high score in the game and, at the same time, the awareness of their health (Boulos et al., 2007; Team, n.d.). In the same area of study, the “Gene Pool” was conceived by Texas Wesleyan University. The Gene Pool is an explanatory and interactive laboratory that promotes learning in genetics. Users can simulate laboratory experiments, make tutorials and watch videos. In addition, the space allows playing the game “Mating Game” (Boulos et al., 2007). Also, language learning can be improved through Second Life. Sarc developed an investigation to understand to what extent the Second Life metaverse could be a promising tool for improving language skills, in this case, at the English language level. According to the data collected, the main advantage of Second Life is that the user can adapt according to his needs. The environment is also an effective tool for sharing materials and improving the autonomy of students and teachers. This research shows that all participants from different universities in Turkey concluded that the skills enhanced by the metaverse are speaking and listening (Sarac, 2014).

The effort that educational institutions make to use technology and communication for collaboration and learning is notorious. In this sense, Linden Lab intends to use Second Life to provide an improvement in world education. According to the company, “virtual worlds solve many challenges educational institutions face”. The Second Life metaverse allows students to collaborate synchronously, individually, or as a team. It also appears that the learning space is constantly available, whether for groups regularly in the physical world or geographically dispersed groups. There is also scope for flexible hours or to work asynchronously if necessary (Education, 2011). In addition to the benefits for education, it is essential to highlight the role of the metaverse in cultural learning. Virtual worlds such as Second Life can reconstruct material and immaterial places and objects close to cultural heritage (Freitas, 2011), as the two previously named studies regarding Uruk and the 1755 earthquake. LOCUS project uses the potential of the Second Life metaverse to promote learning about the cultural heritage of the village of Amiais.

Virtualizing the Amiais territory in Second Life

Virtual and material space involvement is intended to trigger people to visit Amiais as a physical territory. The interconnection of virtual and material space creates expectations in people so that they become curious and feel attracted by the discovery of the material space, thus contributing to the socio-cultural development of the village. In this way, besides having the goal of architecturally transposing the Amiais site into a virtual environment, the

project intends to use interactivity and playability as a central focus. Gameplay and interactivity will be key factors for the visitor to get to know and explore the environment, considering the missions and the proposed objective. This way, Amiais in Second Life will be a means to get to know the most important cultural heritage approaches, traditions, crafts, affective connections, local architecture, and ludic environment.

The idea of playfulness enables imaginary structures to materialize, transposing the playful environment of the inhabitants of Amiais. Interactivity is thus transformed into a dimension that is also playful, and these are the most significant vectors that Second Life allows to be incorporated into the dynamics of Amiais in Second Life. In this way, objects, and other entities, in this case, NPCs, can assume a relevant role in a ludic logic, making known not only the village but also the habits of the inhabitants in detail.

Cultural Heritage is a determinant part of the heritage of a society, considering its protection to preserve the history, the values, and the specific contributions of that society to the globalized world. It comprises places and people who carry stories and histories that are the foundation of their experiences and existence. Bear in mind that cultural heritage characterizes a village, a parish, a city, or a country, it is important to contribute to its preservation. Through technological resources, it is increasingly easier to record and extend the existence of cultural heritage. This means contributing to disseminating heritage and cultural heritage (Oliveira et al., 2020). In this follow-up, technological advances have become a turning point for developing methods and learning about ancient cultures. 3D visualization is thus one of the media that provides an opportunity to simulate cultural heritage (Bogdanovych et al., 2010), resulting in an experience that, although not entirely the same as a physical visit to a particular place, allows for



Figure 24 – Desfolhada in Amiais in the metaverse

visitor learning and entertainment. This educational particularity is relevant for cultural heritage since it is essential that the resident/visitor has a playful experience and, simultaneously, can absorb knowledge (Páscoa, 2016). In this way, the amplification of three-dimensional virtual worlds and 3D MUVES (multi-user virtual environments), as in the case of Second Life, were conceived as innovative and immersive technologies that can be transformed, being able to translate into varied educational experiences (Chen, 2016b; Páscoa, 2016). Although it was not created as a virtual environment for learning, the Second Life metaverse can perform similar functions since its microenvironments allow public engagement (Mattar, 2008).

Thus, the challenge of the LOCUS project was to transpose and recreate the space of Amiais in Second Life. The project reformulation implied the recreation of the physical space of Amiais modeling the territory's characteristics in 3D. The village of Amiais in Second Life was built using modeling and programming as it is presented in a virtual world. Its development was based on altimetric data extracted from several public and singular sources, populating the virtual territory with typical vegetation, roads, walls, fences, rivers, and other small details, approaching visibly from the general appearance of the landscape of the region. In this regard, the replicas are as faithful as possible so that the user can fully experience their presence in the village.

In addition to altimetric data, representations from public sources such as aerial landscapes were also used to determine where buildings were located accurately. Thus, the territory of Amiais in Second Life is composed of about 30

houses within the village, as well as the granaries located near the threshing floor and elsewhere; the chapel of Nossa Senhora do Refúgio and São Francisco de Assis (with surrounding buildings); as well as streets and paths between these buildings. It is noteworthy that around the Amiais village area, there are some small landmarks of particular local importance, such as water mills, stone crosses, small shrines (alminhas), and similar elements. These were modeled based on photographs taken as part of the project. Thanks to the detailed photos, these buildings are represented so that they are immediately recognizable.

A complete recreation of Amiais in a virtual territory also involved integrating its dynamics of playfulness, linking the territory's tradition to the virtual space of Second Life through interactivity. In this way, this environment is a medium to preserve and disseminate the cultural heritage of Amiais, giving the possibility to visit it remotely.

Interactivity with places and objects is developed using a specific Second Life programming language – Linden Scripting Language (LSL) – and, eventually, using elements hosted on servers outside the metaverse, programmed in other programming languages. Thus, in terms of interactivity, it was possible to develop different levels/layers/types of interaction in Amiais' virtual environment. For example, the existence of information panels. When touched by visitors, it provides them with information about the area or point of interest through a notecard or via chat. Those are small files containing text and/or images that can be transferred between the system and the avatars, either in a private channel or in public chat.

Interactivity can trigger responses from the



Figure 25 – Real image of Amiais village took in 2019 by the Locus Project researchers



Figure 26 – Image of the virtual Amiais village in Second Life

system, such as playing a sound, displaying multimedia content, and requesting new actions from the visitor, among others, and is manifested through:

1. objects that provide an Internet address for the visitor to click on, allowing them to access a Web page;
2. objects that show multimedia content, such as videos or animations, whose display can either be automatic and activated by the proximity of the visitor or can be triggered by any action of the visitor;
3. the visitor's action, for example, when arriving at a specific location (detection of avatars' presence through proximity sensors) or crossing a particular area (which can be transparent and invisible to the visitor).

It was also possible to include interactive chatbots that can represent the inhabitants of Amiais or, for example, some of the characters from the traditional magical stories of the region (the

werewolf, the goat, etc.), providing clues for exploring the village or completing challenges.

These interactive logics are common in, for example, role-playing games (known as RPG), in which players, who assume certain roles (characters), interact with the so-called Non-Player Characters (NPCs), that is, characters with for the unfolding of the narrative, but who are not players.

Through previous visits and creative co-design sessions with inhabitants and stakeholders (before the pandemic started), people were encouraged to share aspects related to their culture: "stories about the place, ways of doing things, traditions, games, crafts, the importance of religion, the main festivals, [...], among many others" (Oliveira et al., 2020). Thus, all the work developed during the previous project's phases was channeled into developing playful scenarios and narratives that frame immersive gamified experiences allowing collaborative learning about the cultural heritage of Amiais.

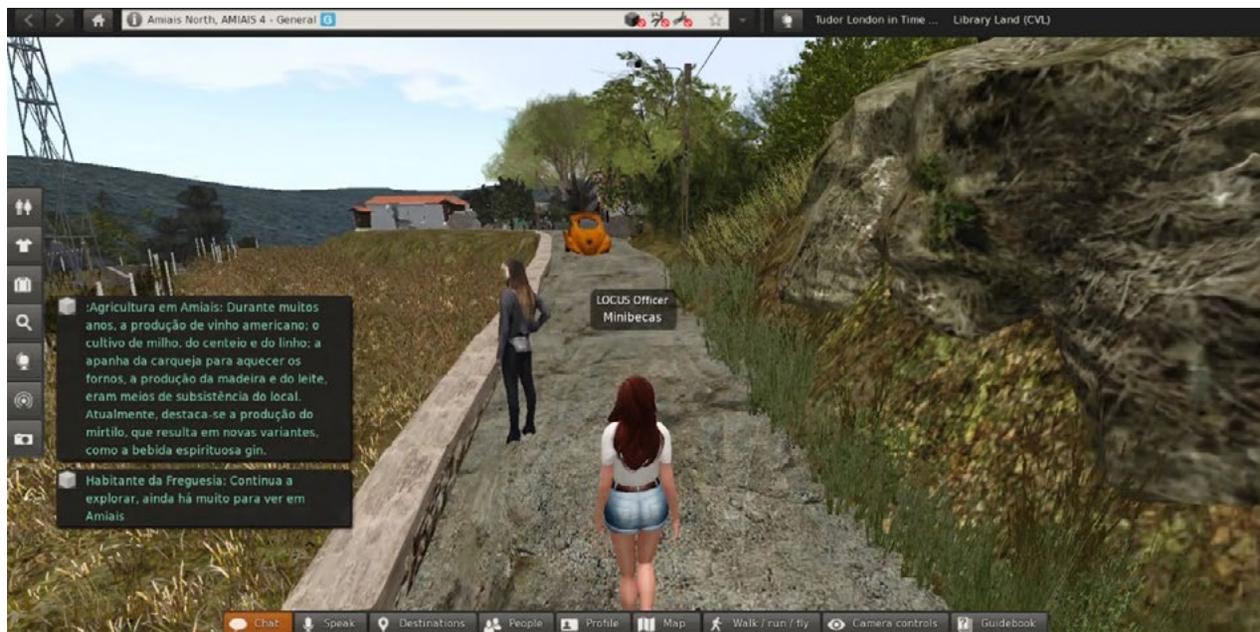


Figure 27 – Walk in Amiais village in Second Life



Figure 28 – Information panel in Amiais village in Second Life



Figure 29 – Werewolf in Amiais village in Second Life



Figure 30 – Visitor discovering Amiais village in Second Life

Thus, the planned participatory design activities could not be operationalized due to the pandemic situation that made direct contact with the inhabitants and stakeholders impossible. In this sense, although based on user-centered design and development methodologies, the project's technological process exclusively implicated virtual visitors, who integrated the process as narrative testers at specific moments.

In this way, the essence of LOCUS in its original proposal could be maintained and promoted, changing the technology media (which allows moving from physical to virtual). Thus gaining virtual existence, Amiais can potentially be visited by around half a million Second Life users, a number that has been increasing since 2020.



Exploring Amiais 2.0

Exploring Amiais 2.0

Building Amiais in Second Life

The construction of the village of Amiais in Second Life encompasses modeling since the context is embedded in a virtual world. Its development has been based on altimetric data extracted from various public and singular sources, making it possible to populate the virtual territory with models of typical vegetation, roads, walls, fences, rivers, and other small details. This approximates the general appearance of the region's landscape.

In terms of existing infrastructure, the replicas are as faithful as possible. To make this modeling likely, representations from public sources, such as aerial views, have been used to determine where buildings are located more precisely. Thus, the territory of Amiais in Second Life consists of about 30 houses within the village, as well as the granaries situated near the threshing floor and other locations; the chapel of Nossa Senhora do Refúgio and São Francisco de Assis (with surrounding buildings); as well as streets and paths between these buildings. Also, it should be noted that around the village area of Amiais, there are several small landmarks of local importance, such as water mills, stone crosses, small shrines (alminhas), and

similar elements. These were modeled based on photographs taken as part of the project. Thanks to the detailed photos, these buildings are represented so that they are immediately recognizable.

Amiais gets interactive

Interactive screens will be implemented to provide location information regarding the interactive level. These will be no different from real-world information panels and signage. The difference is that they can display information in different ways, the equivalent of information brochures (known in the Second Life environment as note cards). In addition, information panels will also be implemented in the Amiais territory. These will resemble real-life information panels (such as those existing in the region). Also, several characters (animals and people) are displayed in the Amiais virtual territory, whose function is simultaneously decorative and informative, allowing visitors' avatars to click on them and receive a notecard or some additional information through online text chat.

The LOCUS project also implemented videos to disseminate information about Amiais.



Figure 31-32 – Overview of Amiais village in Second Life



Figure 33-34 – Architecture view of Amiais village in Second Life



Figure 35 – Informative panel in Amiais village in Second Life

Through panels, the resident can click and view videos about Amiais. In this case, there are two videos: one presents the village to the sound of a small dialogue of an inhabitant, and the other, has a musical performance of the local event Desfolhada. There are other panels where aerial images of the plantations and the Desfolhada festival can be observed.

Additionally, visitors can access web pages/

films through panels. Location and motion-sensitive information panels are also developed. Such devices are sensitive to the proximity of an avatar or activated when an avatar crosses a certain threshold. When activated, they generate a specific action or effect, such as playing a sound or video or requesting some additional interaction from the user.

Also at the level of interactivity, the narrative was formulated as a kind of geocaching game within the environment, where visitors can interact with NPCs to find clues about where to go next, thus encouraging exploration. Therefore, the interactive items used for this task were programmed to be integrated into the narrative, serving as “waypoints” (detecting visitors’ presence at each point, activating text chat, giving objects/letters, playing sounds). It is important to point out that the narrative built is based on information about the cultural heritage of Amiais, so the story focuses on the ludic, craft, affective, and religious dimensions.



Figure 36-37 – Visiting Amiais village in Second Life

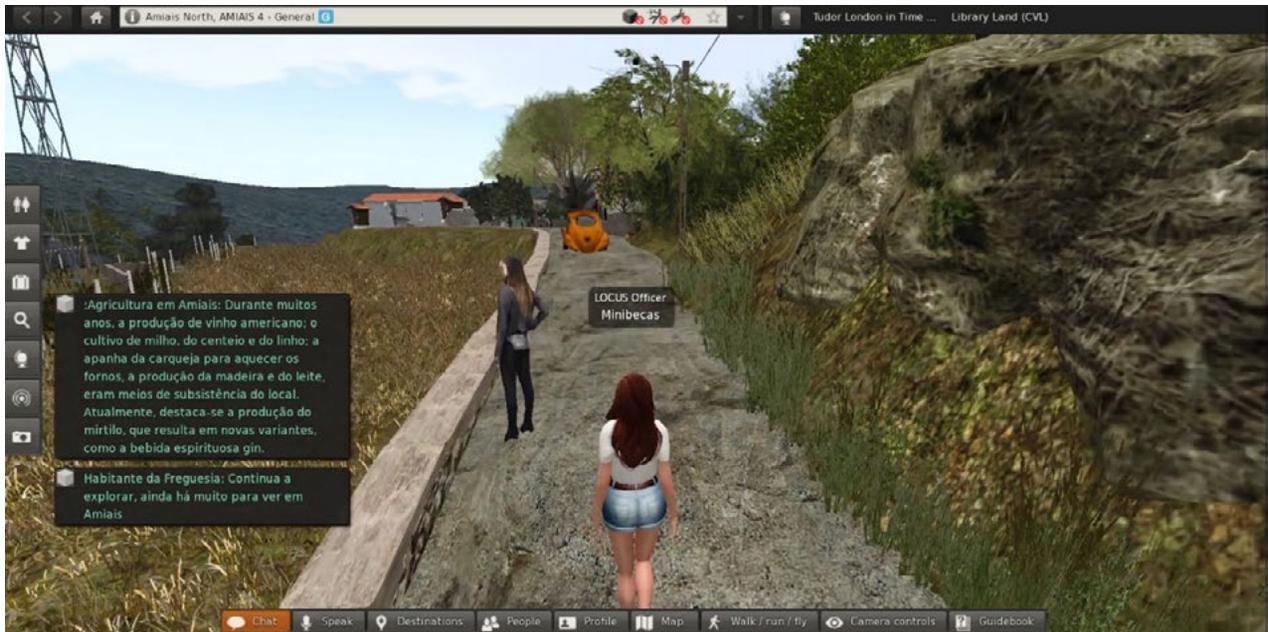


Figure 38 – Discovering Amiais village in Second Life

Learning about the Cultural Heritage of Amiais

It is important to point out that following the narrative built for the exploration of Amiais, human NPCs were also created that symbolize the village's inhabitants; various domestic animals (cats, chickens, cows, etc.) and mythical creatures (werewolf). These characters give information about Amiais and encourage the user to explore the territory through clue sharing. Thus, they are a critical interactive medium for the dissemination of information about the culture of the village.

The narrative was formulated similarly to a geocaching game. Clues were created to allow the visitor/user to explore, interact, and learn. Although Second Life does not include missions or goals (Robbins & Bell, 2011), the LOCUS project used interactivity as the central resource to construct the narrative and transmit knowledge regarding the village. Interactivity can be understood through the

concept of communication, that is, checking, sharing, associating, and exchanging opinions. This implies participation, interaction, and message exchange (Rabaça & Barbosa, 2001).

Referring to the case of Amiais linguistic communication, it will focus on the reception of text messages and note cards by NPCs, objects, and animals. In terms of communication through the avatar, the resident/visitor is free to do everything except fly. In this way, the user will be motivated to walk or run in the village, see the environment details and acquire knowledge throughout the exploration.

In sum, the interactivity present in the virtual world of Amiais aims to allow the user/resident to explore the territory through small missions and interactions between NPCs in a playful way. The projection of Amiais in Second Life aims to provide a gamified experience engaging the user who visits the place to learn about the cultural heritage of Amiais, motivating them to visit the place physically.



Characters:

Ms. Rosa – an elderly lady with a shawl on her back who lives in Amiais.

Mr. Vitor – the oldest gentleman of Amiais.

Marco – a young fisherman who has a discreet relationship with Maria.

Maria – a young girl and cook who has a discreet relationship with Marco.

Ms. Celeste – an elderly lady and Maria's mother, she is curious and devout and has been helping at the party since she was young.

Mr. José – a farmer who lives near the church.

Pedro - son of Mr. José.

Musicians – a band composed of two musicians with violas and two musicians with accordions

Ms. Emília – an elderly lady who dedicated her whole life to agriculture. She still sells its wines and gins at local parties and festivities.

Ms. Ana – a candy seller at parties. She has a red apron.

Werewolf – Mystical creature that dwells among the trees in Amiais. It appears (at night) on the way to church

Cats, Sheepdog and other characters without an active role in the narrative – They are in space as a prop and give information about Amiais.

Figure 39 – Characters of Amiais village in Second Life

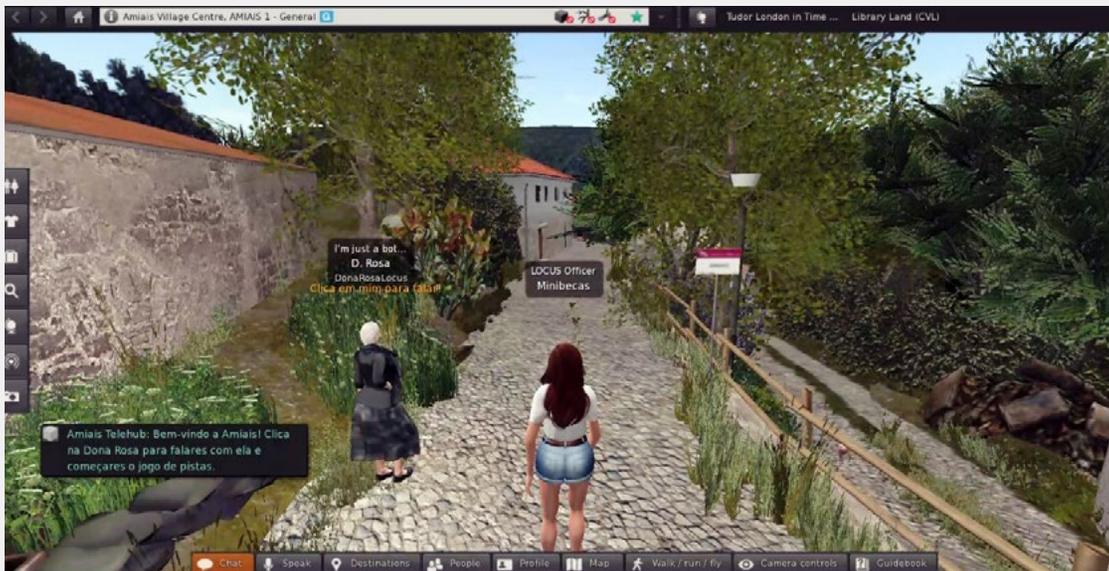
Let's Explore Amiais in Second Life!

Within the storytelling of Amiais in Second Life, the visitor has to help the inhabitants of Amiais to organize the annual Desfolhada party while they visit/explore the village. Through interaction with objects and NPCs, the visitor will enjoy a simulated experience of the village by knowing the affective, religious, and playful dimensions of Amiais. The narrative created calls for interaction

with the digital territory/scenario and the characters. The narrative includes 14 moments requiring the completion of small tasks and/or interactions with the NPCs. The first moment concerns the starting point. All users started from the same point. Arriving at the “region” of Amiais in Second Life at the exact location, users received a welcome message with instructions to start the game/narrative.

Moment 1

The visitor appears in the initial space where s/he can see Amiais and a lady around them – Ms. Rosa. A signal induces the visitor to click to talk to her: “Welcome to Amiais. Amiais is a village in Sever do Vouga with about 15 inhabitants. If you want you can help us while exploring the village, our inhabitants are already quite old, so an element like you will be very important. We hope you enjoy this experience, and we count on you in physical Amiais in September. Before starting this adventure, you can see a panel with a short video about our knowledge. Follow the path that has chickens. See you at Desfolhada!”



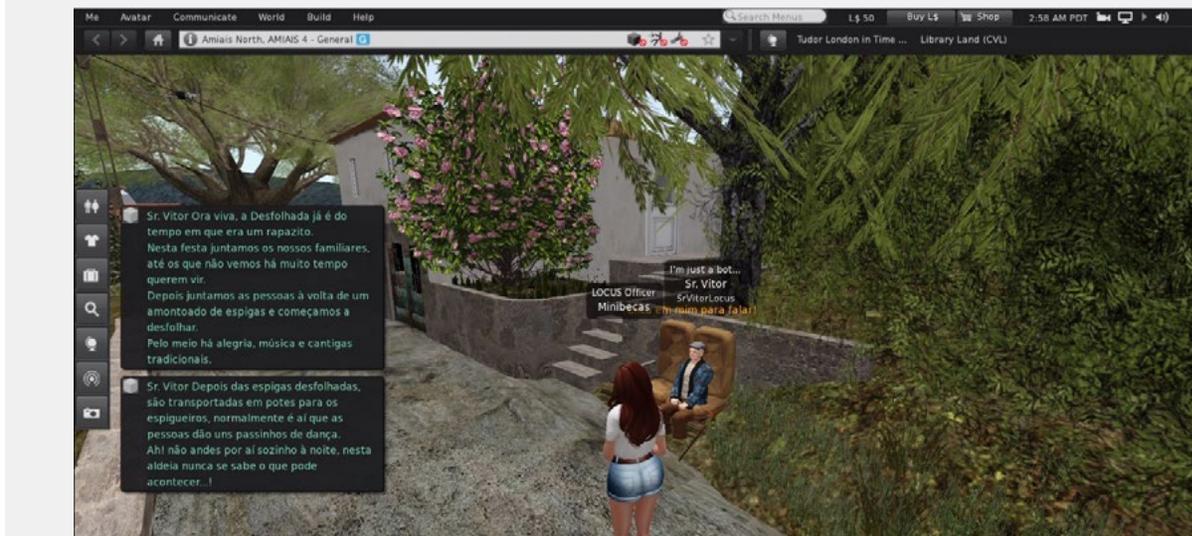
Moment 2

The visitor goes to the place indicated by Ms. Rosa and sees a panel and a sign. The sign indicates that the player must see the video and suggests that s/he goes to find Mr. Vitor. “Check out the short video about Amiais to better get to know the village. If you want to know more about the Desfolhada, go to Mr. Vítor, owner of the yellow car, who is sitting on a 2-seater bench. Just follow the path with plantations.”



Moment 3

The visitor goes looking for Mr. Vítor and when he finds him, he receives a message explaining what Desfolhada is: “Come on, Desfolhada dates back to when he was a little boy. At this party we gather our family members, even those we haven’t seen for a long time want to come. Then we gathered people around a cob pile and defoliated the corn. In between, there is joy, music, and traditional songs. After defoliation, cobs are transported in pots to the granaries, where people usually take a few dance steps. If you want to know more facts about the party, follow the river flow and talk to Marco, he will be fishing. Oh! don’t walk around alone at night, in this village you never know what might happen.”



Moment 4

The visitor goes down to the river and finds Marco fishing: “Mr. Vítor is one of the oldest inhabitants of the village. He knows everything about the Desfolhada. I don’t know if you know, but every year we look forward to getting the king corn. Tradition says that whenever someone finds an ear of red corn, called Milho Rei, they will have to hug the party participants. But since you’re here, you’ll help me! My girlfriend Maria is waiting for a love letter; as you are new in Amiais, no one will suspect that the letter is mine. Along the way, please read. When you bring her the letter, remember that she will be on the street with a sign saying Amiais and Dona Rosa.”

Marco hands (automatically) a Notecard to the visitor. The visitor keeps the notecard with the following message: “From the first moment my eyes met yours, I felt the dawn of a new life and affection, whose roots would deepen as the days and months went by. Therefore, remember what I told you yesterday: I love you from here to the immensity of the sky that shines like your eyes. Code: rice pudding”.



Moment 5

The visitor interacts with Maria, hands her Marco's letter and she asks the question regarding the code: "What is the secret recipe?" The player has three response options:

1. "rice pudding"
2. "Noodles"
3. "bread of God"

If the visitor gets it right, Dona Celeste says: "Since you seem to be my daughter's friend, remember that the Alminhas and the church also need to be decorated for the Desfolhada!"

If the player gets the answer wrong, automatic feedback is activated: "Remember that the Alminhas and the church also need to be decorated for the Desfolhada!"



Moment 6

The visitor can place a flower in the Alminhas.



Moment 7

The visitor makes his way to the church alone and is surprised by a werewolf. Which says, "Well, well, what do we have here!? A new visitor to Amiais? Has anyone ever told you not to walk around Amiais alone at night? They think old people are crazy, but no... each one of them already knows me and knows what I'm capable of."

"Out of my forest!"

"I told you to get going!"

"Are you still here? It's time for my dinner...!"



Moment 8

The visitor reaches the chapel of S. Francisco de Assis and N. S. do Amparo. In the church, the saint sends a message: “From the seed the bud is born, from the bud the flower is born, from a great friendship, love can be born. Have you nothing for us?”

When the visitor clicks on the saint, he places flowers in the vases, decorating the church. After the church is decorated, Mr. José and his son, Pedro, appear. These ask for help with the dances and music of the Desfoliada party. Mr. José says: “Dear young man, we need your help. The party is almost here and we still haven’t found the musicians, can you look for them? There are two boys and two girls and they always carry their instruments close by. Speaking of music, have you trained a few dance steps for the party? You have plenty of space in Eira, where the stalls are already located!”



Moment 9

The visitor can dance. S/he must click on the dance ball.



Moment 10

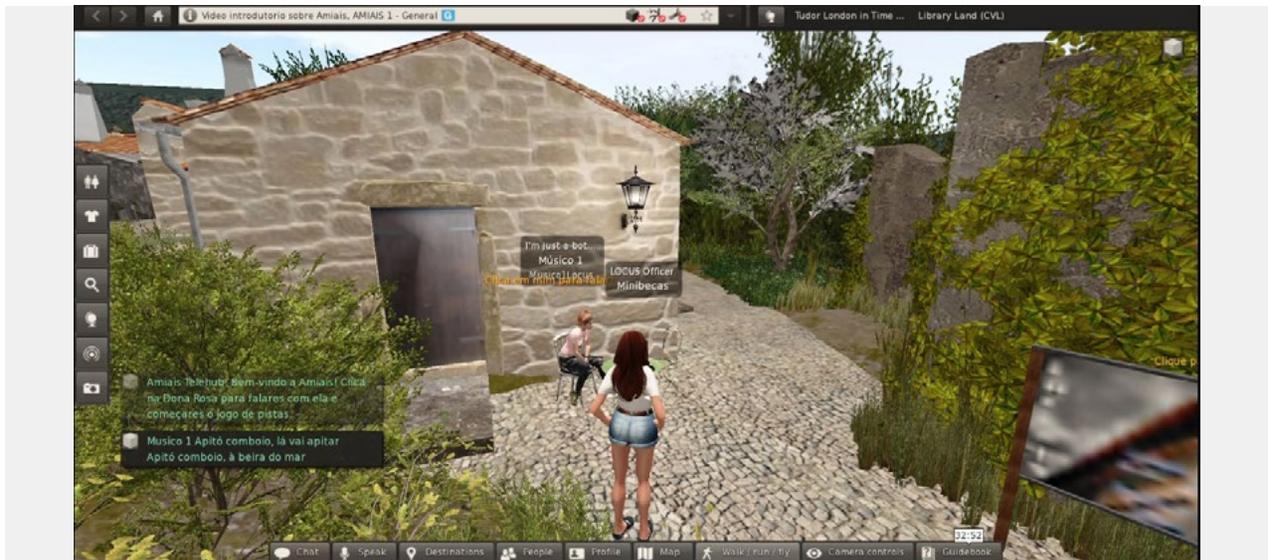
Musicians can be found in various spaces (behind a house, sitting on stairs, inside a windmill and next to a tractor). The instruments associated with the musicians are two accordions and two violas. Each musician says part of a Portuguese popular song:

“Apitó comboio, lá vai apitar | Apitó comboio, à beira do mar | À beira do mar, mesmo à beirinha | Apitó comboio, no centro da linha”

“Milho verde, milho verde | Milho verde maçaroca | À sombra do milho verde | Namorei uma cachopa”

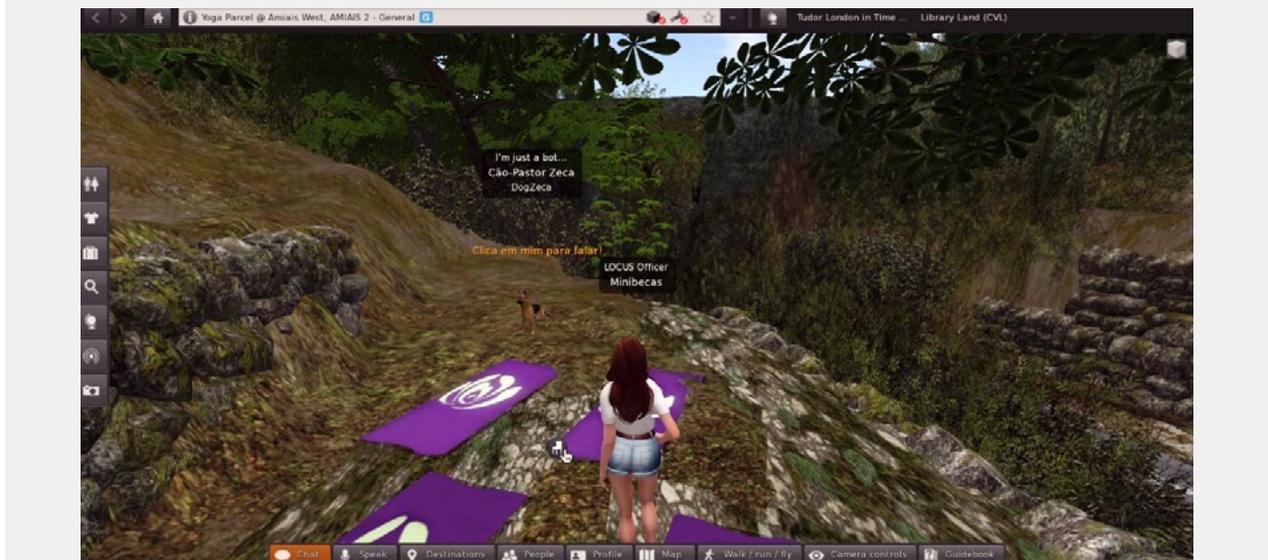
“Numa casa portuguesa fica bem | Pão e vinho sobre a mesa | E se à porta humildemente bate alguém | Senta-se à mesa com a gente”

“Mãe querida, mãe querida | O melhor que a gente tem | Não há outro amor na vida | Igual ao amor de mãe”



Moment 11

Visitors can do yoga on the mats by the river. Next to the rugs is the dog that gives the visitor a tip about Ms. Emília's whereabouts: "Go look for Ms. Emília over there by the plantations, to the north of here."



Moment 12

The visitor finds Ms. Emília near the plantations. She asks for help to collect the corn for the event and the grapes and blueberries to be sold at the party stalls. “The Desfolhada is soon. Can you help me? We need to harvest corn to have cobs to defoliate and grapes and blueberries for the drinks we will sell in the stalls”.

The visitor must pick ten corn ears, five grape bunches, and five blueberries.

Close to Ms. Emília, there are also two cows. The visitor can milk the Mimosa cow. Once the milking is over, s/he should click on the pot to deliver the milk to Dona Ana.



Moment 13

The visitor finds Ms. Ana on the threshing floor. When interacting with her, she asks to find the cornbreads to sell at the party: “So you are the famous visitor helping the population! Thank you. I need cornbread to sell at the party, but I don’t make them. You can find them in houses that have a cage with canaries. Pay attention to the singing of the birds.”

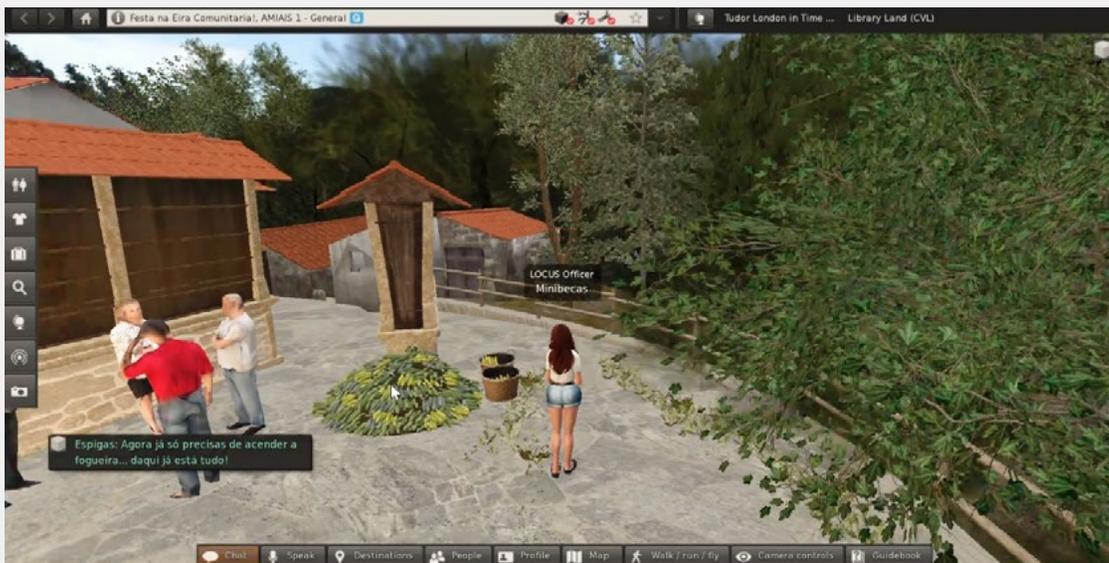
The visitor collects the five cornbreads, simply touching them.



Moment 14

After collecting the cornbreads and returning to the threshing floor, the player clicks on the empty baskets, fill them with corn, and lights the fire, receiving the following final message: “Everything is ready! If you want, you can continue exploring the village. Thanks for your help!

We look forward to seeing you in September for the real Defolhada party in Amiais!”



Testing the narrative

To understand if the narrative was adequate to engage the visitor to fully explore Amiais in Second Life, the LOCUS team has tested it. An evaluation model was designed to observe the heuristics of exploration, allowing the narrative and user experience evaluation. According to Pinelle et al. (2008), heuristic evaluation is an effective method used to identify usability flaws in the game development process (Barcelos et al., 2011). The narrative gameplay tests were based on the 14 moments when the user should interact with the digital environment. The evaluation was carried out through direct

observation of the exploration of the territory, the narrative, and the user behavior. Then, the user’s perception regarding the convergence of the physical region and the virtual scenario and the cultural heritage transmitted through the narrative was tested through a questionnaire. The questionnaire has 21 questions: multiple choice (19), agreement scale (1) and open answer (1). The tests lasted 30 minutes, followed by 10 minutes to answer the questionnaire. To analyze the concepts of Immersion and Interaction, the following indicators were observed: interaction with NPCs; the understanding and interaction of the narrative; the

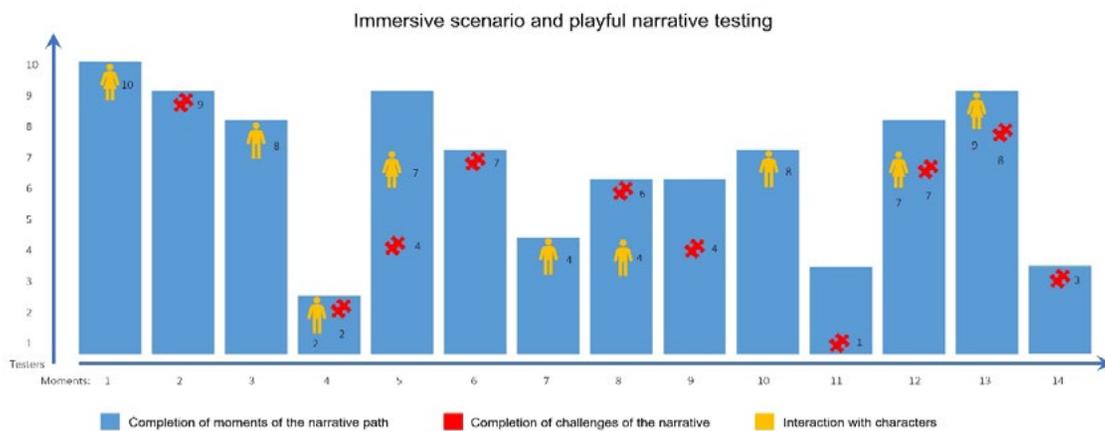
understanding of the contents of the cultural heritage of Amiais. A quantitative methodology was used to analyze the questionnaires using the descriptive analysis of the quantitative data.

Amiais' exploratory narrative in Second Life was voluntarily tested by 10 participants, seven males and three females between the ages of 20 and 60. Only one of them already knew Amiais. Most have experienced life in rural sites like Amiais or have been exposed to nearby realities through family members, including participating in small communities similar to those depicted by Amiais in Second Life's narrative cultural traditions and festivals. Three metrics were analyzed regarding the scene and narrative immersion: the number of moments in the narrative path the user completed within 30 minutes, the number of challenges completed, and interactions with characters in the narrative (see graphic 1).

All players initially interact with Ms. Rosa. From here, the rest of the moments were done by most players. There were only four narrative moments that most users did not complete: moments 4, 7, and 11. In all three cases,

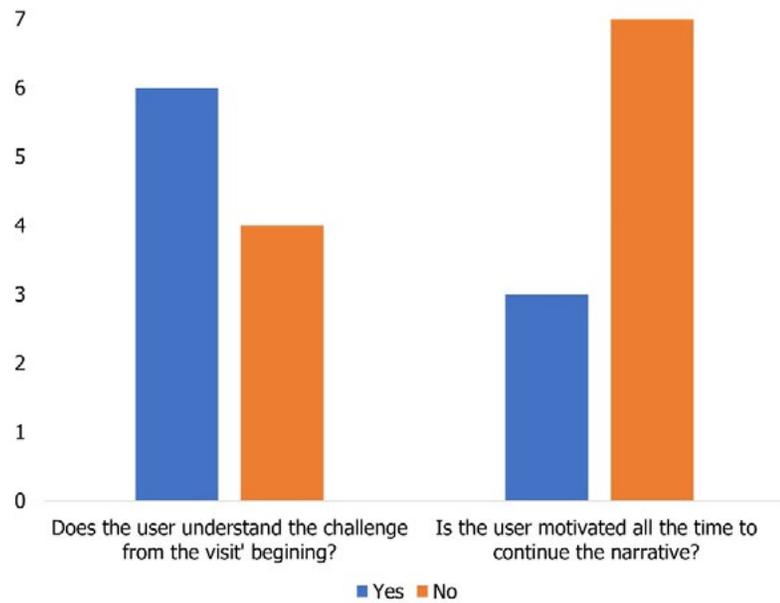
the instructions to reach the areas of the scene far from the central location of Amiais via clues in the narrative were not straightforward and always implied that the user was willing to explore the stage independently. At the last moment (14), although they are in the central village area, many users have passed through this area but did not complete it due to lack of time. As a result, most users cannot complete 14 moments in 30 minutes, needing more time to fully explore the narrative and scenarios.

In terms of interactions with characters, it could be observed that most users interacted with almost every character they found throughout the path. There are also several NPCs with human and animal forms (cats, goats, cows, chickens...). While not playing an active role in the narrative, they delivered messages about Amiais traditions, stories, and way of life. Therefore, the purpose of these NPCs was to stimulate the user to interact with scene elements while integrating layers of information about Amiais into the virtual environment, complemented by several information panels with videos and photos of real Amiais. Participants initially understood this type of



interaction when they touched the cat in the first moments of the narrative. From there, all participants interacted with the NCPs in the scenario, receiving information about Amiais. Thus, the high level of interaction with characters and the content information sharing about the Amiais' traditions and cultural heritage confirms the literature trends about the potential that three-dimensional virtual environments can have in educational, recreational, and cultural experiences such as the present one.

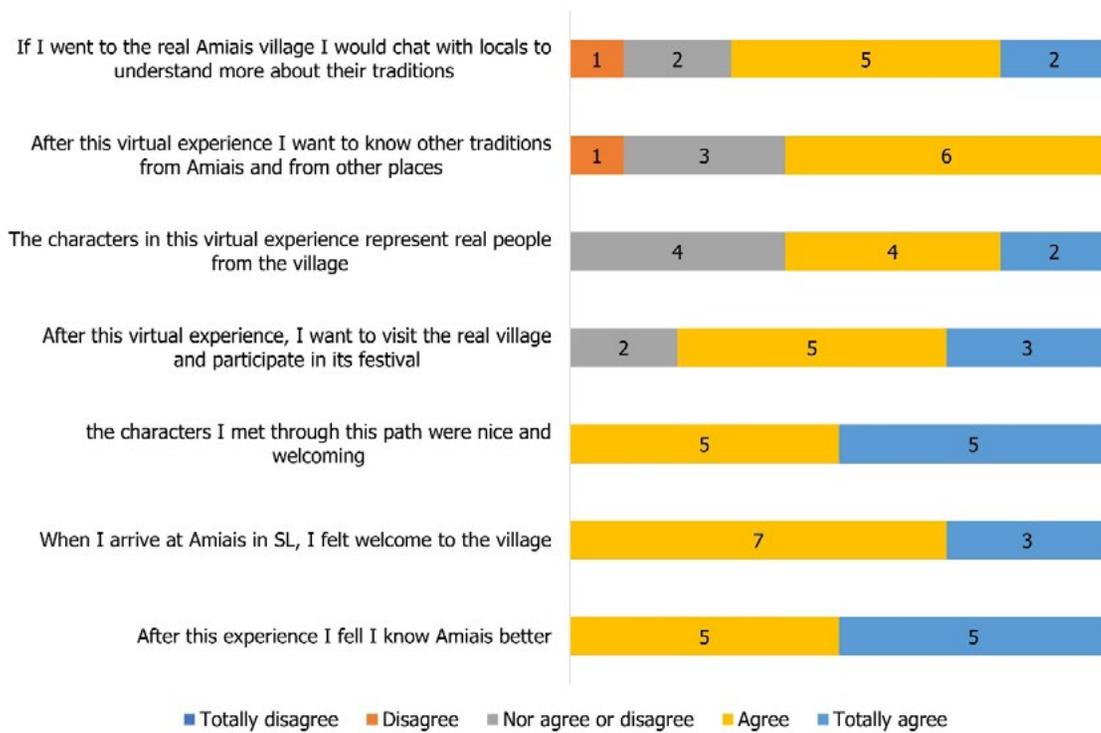
Regarding the narrative and challenges' understanding (see graphic 2), the test observation showed that it was clear from the beginning what the purpose of the narrative was for most users. From the moment users read the NPC's instructions in the chat, they did not make any comments with doubts about the steps to be taken and started exploring following the instructions at the beginning of the game. The users' motivation throughout the narrative decreased as the game progressed and/or users faced difficulties throughout the play. For example, difficulty completing challenges, being lost in space, "handling" the Second Life controls, accessing information due to the technical unavailability of the system, etc. However, most users broke the slump whenever they performed a challenge and were given the proper reward, for example, seeing panels, picking up cornbreads, dancing, or interacting with characters.



Graphic 2: Narrative Comprehension and Motivation

It should be noted that several users felt lost after the beginning of the narrative. In several tests, it was found that users decided to freely explore the scenario and interact with the elements and characters, even if they did not follow the path previously established in the narrative. This did not imply a negative test evaluation since it was always told to users that the narrative served only as a guideline for the virtual Amiais exploration. Though not on the pre-established trajectory, the moments, interactions, and challenges were categorized as complete whenever the user concluded them.

The narrative proposed for exploring Amiais in Second Life was intended to meet several goals: 1) to lead the user to explore the space and receive information about Amiais and its cultural traditions; 2) to enhance the user's immersion in the scenario without imposing strict rules on the use of space; 3) to engage the user in one of Amiais traditions. Thus, the narrative adapts to users with a greater tendency



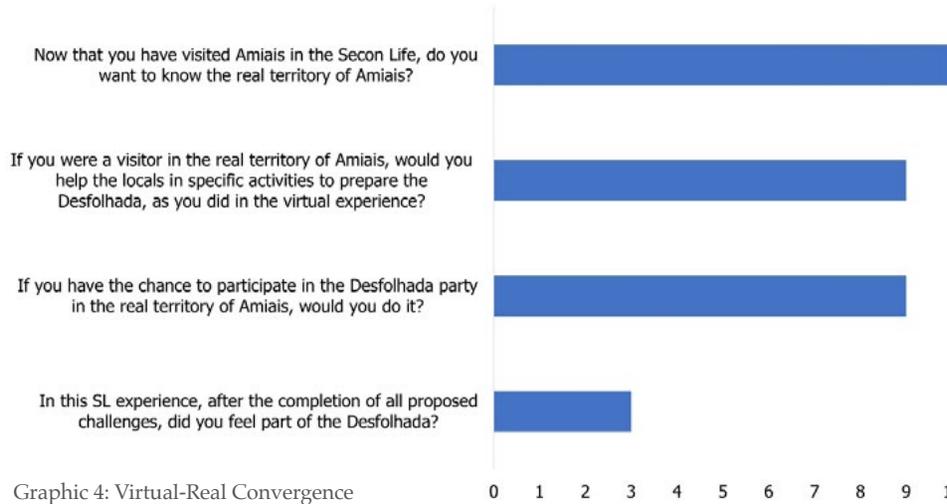
Graphic 3: Perception about real territory and virtual experience of Amiais

toward gamification processes, which are stimulated by the challenges, and to users with a more free user profile, who feel more motivated by exploring the digital scenario itself and not so much for the gameplay challenges of the narrative. In this sense, the narrative did not present a linear path and structure, having been designed precisely to allow the exploration of the virtual village of Amiais more freely or with the orientation of the proposed challenges. Hence, the challenges were dispersed in space, and the path was not structured, leading several testers to feel lost in the virtual space and the narrative itself. Given these data, the research project intends to keep the narrative open enough to allow both types of exploration. However, it is possible to integrate new mechanisms that guide the user in the different challenges in the virtual territory (for example, maps of the village, more precise directions, or the

incorporation of guiding characters for an escorted narrative exploration). In the same logic of improving the narrative to keep users motivated throughout the virtual village exploration, technical aspects that showed some difficulties during the use tests are being enhanced.

The users' perception of the natural territory through the virtual experience of Amiais in Second Life was measured through the questionnaire (see graphic 3). The participants unanimously considered that the virtual experience allowed them better know Amiais. They felt welcome in the virtual village, and the characters were welcoming. After the virtual experience, most participants said they would like to visit the real Amiais, participate in local festivities, and socialize with the inhabitants to understand the community traditions.

Another topic analyzed was Cultural Heritage. Throughout the exploration of the virtual territory



Graphic 4: Virtual-Real Convergence

and the immersive narrative, users were presented with various information about the cultural aspects and traditions of Amiais. Desfolhada, the central theme of the immersive narrative, is one of the landmarks of Amiais' cultural heritage. Thus, to test the learning of the contents and the transmission of the cultural heritage through the narrative, four questions were asked in the questionnaire related to the information present in the exploration of Amiais in Second Life: "What is the name of the village festival?"; "When does the village festival take place in the physical territory?"; "Whose granaries are on the community threshing floor?"; and "What is threshing corn?". Nine out of ten users correctly answered all the questions, revealing that users were attentive to the information they received during the game and apprehended the cultural contents transmitted throughout the narrative.

To verify the convergence of virtual-real (see graph 4), the participants were also asked about the potential of visiting the real territory of Amiais after the virtual experience. The responses were unanimous, and all expressed a willingness to do so. In the same way, the majority indicated that they would participate and help prepare the Desfolhada party in the real territory if they had the opportunity. However,

most participants did not feel integrated into the Desfolhada party through the proposed virtual narrative. One of the participants justified the answer by saying, "I missed being at the party itself, despite feeling like I was contributing to it". In other words, the nar-

rative gives participants information and content related to the traditions and cultural heritage of the village of Amiais, which users consume and learn throughout the immersive virtual experience. However, the feeling of belonging and integration into local traditions could only happen if the tradition (in this case, the Defolhada party) took place in the virtual experience.

The contact with the virtual territory and cultural contents aroused the participants' curiosity and desire to visit the real territory and know and participate in the local traditions. The participants' immersion in the virtual environment of Amiais, the interaction with village characters, and the scenario elements provided forms of playful learning that allowed sharing of information about traditions and local culture, which relate to the main goal of this research on the potential of using a metaverse for sharing and disseminating cultural heritage. Therefore, it is considered that the experience of virtualizing the territory of Amiais in a metaverse like Second Life presents itself as an adequate tool for preserving and disseminating local and cultural heritage. Hence, its use should be promoted.



LOCUS Model: Sharing
Cultural Heritage on
digital platforms

LOCUS Model: Sharing Cultural Heritage on digital platforms

Cultural heritage is characterized by its complexity, both materially and immaterially. Cultural heritage crystallizes in everyday objects, special objects associated with rituals and festive moments, religious rituals, ways of doing things, eating, establishing relationships, and occupying space. In addition, cultural heritage manifests itself as the identity of the place and the people who belong to it through language, play, stories from the collective imagination, and affective bonds with dynamics, people and objects.

Sharing the cultural heritage of a place implies a work of immersion in that place, of psychosocial contamination, in the sense that the researcher has to experience the culture, and has to be open to active listening to people and socio-territorial agents. An anthropological and ethnographic work is imperative to be carried out. By deepening phases until the moment when we feel pretense of the place and can smell the aroma of time (Han, 2016), which requires taking the time, without haste, to breathe the essence of the place.

Cultural heritage is the essential element of the soul of places (Ellard, 2018). A place exists to the extent that it is inhabited by the cultural heritage that gives it its soul. Otherwise, it will not be a place, but just a space, an uncharacterized

territory incapable of speaking with those who interact with it.

Humans do not relate to pure space, but to symbolically constructed space, that is, it is not just about geography, but a geocultural and geoemotional relationship, which gives meaning to places. People transform space into the territory and populate the territory with places. Cultural heritage constructs and emanates dialectically from places. As Augé (1994) clearly shows, some spaces remain non-places because they cannot have a soul, do not allow or promote relations between their inhabitants and agents.

The first step towards building a strategy for sharing cultural heritage on digital platforms is identifying the key elements that give identity to the place. For this, it is necessary to build a dynamic approach to the inhabitants of the place, with the mission of listening to them, their life stories, their existential relationships with the place, how the place was a crucial element in their life trajectory, their awareness of the metamorphoses that the place has undergone, and how ideas, myths, stories and experiences were the condition and conditioning of their individual and collective life. This dynamic listening is the key element for defining an intervention

focused on cultural heritage that aims at the use of digital platforms as a means of enjoyment and attractiveness of places.

The key idea of the LOCUS Model: Sharing Cultural Heritage on digital platforms is that it starts in the physical place and aims to attract users of digital platforms to the physical place presented/represented there. May digital platforms be triggers to bring people to territories,

particularly rural territories with low population density, but with a high density of traditions, knowledge and openness to sharing their cultural heritage. This contributes to cognitive justice, epistemological diversity, intercultural sharing, and combating the waste of experience (Sousa Santos, 2002).

LOCUS Model

Phase A – Discovery

A1 [Identify] – knowing who inhabits the place, who are the stakeholders, what are the formal supports for disseminating the cultural heritage of the place, what are the projects that exist or have existed focused on the place, what are the dynamics of communication between the inhabitants and the agents of dynamization and governance of the place, which are the spaces/architectural elements, natural or imaginary with greater symbolic load, which are the public spaces of meeting/conviviality of the people. Phase A1 is essential for the research/action team to qualify as an interlocutor in that place.

A2 [Hearken] – promote meetings (formal and informal) with the interlocutors of the place (inhabitants and stakeholders) in which it should be shown that they are fundamental to the success of the proposed digital communication strategy/platform, considering that they are the holders of knowledge, experience, know-how and the identity of the place.

At the end of Phase A, the team has a global

knowledge of the reality of the place, the cultural heritage, the agents of the territory, which allows it to advance to Phase B, at the end of which it will be able to define and characterize in depth each element and each dynamics linked to material and immaterial cultural heritage. This causes Phase B to be called the conceptualization phase.

Phase B – Understand

In all sub-phases of Phase B, the co-design approach must be adopted, in which the inhabitants of the place and the stakeholders are considered as elements of the research team. To this end, the work must be carried out in an iterative cycle of dialogue and discussion, whether in terms of technologies, functionalities, approaches, or in terms of content and communication strategies.

B1 [Participate] – Participate in the place's socio-cultural, religious and recreational activities to take advantage of these experiential contexts to apprehend the cultural heritage. Streamlining activities to recreate activities that were typical

and significant in the past (e.g. Leafless, games from childhood and youth) and trigger moments of sharing and anamnesis that allow reconstitution and sharing. These dynamics are fundamental to emerging and share the cultural heritage with those who are new to this context (research team).

B2 [Systematize] – the research team must register and systematize the information collected in the fieldwork, that is, in the various listening and participation activities. This systematization and archiving of information are fundamental to the project's continuity because it allows supporting decisions, documentation and demonstration. Ethical conditions must be guaranteed, namely authorization to collect photographic and video images, as well as authorization to use images and other material where the people involved can be identified. Information categories should be established for the systematization of information, an archive of photographs, videos, sounds, stories, various narratives, records and transcripts of interviews, memos of visits and activities, etc. should be created.

B3 [Depurate] – in this sub-phase the team must make decisions about the key elements and dynamics of the cultural heritage of the place that will be central in the creation of digital platforms, which will support the communication process that aims to propagate the cultural heritage of the place through user-centered interactive mechanisms, through narratives, interaction, gameplay and other immersive approaches that link the users to the place and encourage them to visit the place physically.

Phase C – Co-Design

C1 [Conceptualize] – decide which technologies will be used, being clear that there may be

coexistence and complementarity of technologies. Digital technologies can be used disconnected from the territory presence, with technological approaches as geolocation and sensing physical elements of the territory. This requires the user to be in the place to be used. Likewise, it is necessary to determine which contents and approaches should be considered.

C2 [Prototype] – developing a low-fidelity version of the digital platform(s) to be adopted and their functionalities.

C3 [Test] – the prototype must be tested with a pilot (one or multiple potential users) in order to identify interaction difficulties and expectations that are not being considered. The results of this phase should be taken into account in sub-phase C4.

C4 [implement] – developing the final version of digital platforms to support the sharing of the place's cultural heritage.

Phase D – Spread

D1 [Dissemination] – Definition and execution of a communication campaign, together with stakeholders, organizations linked to tourism and with the place inhabitants, to give visibility to digital platforms for sharing the place's cultural heritage. And, in this way, it gives visibility and promotes tourism in places with low population density, contributing to tourism of sustainability and identity.

D2 [Sustainability] – define and implement a strategy for maintaining, updating and monitoring the digital platforms for sharing the place's cultural heritage, so that the necessary regeneration is carried out to keep them updated and attractive.

The following diagram presents the LOCUS Model that can be replicated by projects that aim to use digital platforms for the dissemination of cultural heritage.

To take advantage of the LOCUS model, to be applied in different territorial contexts, researchers, regional development agencies and/or other government bodies must have multidisciplinary territorial development teams, capable of implementing projects using the LOCUS Model guaranteeing the cultural heritage is not lost with the disappearance of the elderly, considering they will take with them the memory, knowledge and wisdom

that, if it is not preserved, shared with the new generations and with visitors to the places, will be permanently lost.

The LOCUS Model is a contribution to the promotion of systematic and structured interventions of sharing Cultural Heritage on digital platforms, giving visibility to the material and immaterial heritage and memory that provides identity to places and contributes to the economic and social sustainability of places, as well as to the well-being of the inhabitants of the place who see their recognized knowledge and traditions and their voice as a contribution to make the future possible.

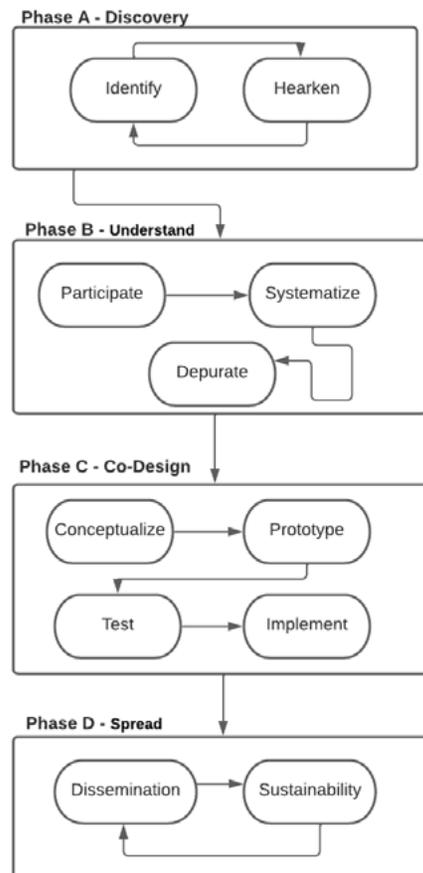


Figure 40 – LOCUS Model

LOCUS – Playful
Connected Rural
Territories: what a journey!

LOCUS – Playful Connected Rural Territories: what a journey!

The LOCUS project was a long journey of four years crossed by a pandemic that changed everyone's lives on a global scale and which, of course, radically altered the LOCUS approach.

The project's initial plan aimed to co-design, develop and evaluate an IoT system and understand its potential to support playful intergenerational engagement in creating and exploring cultural content and learning about the Cultural Heritage of rural territories from the Center Region of Portugal, namely Amiais Village, in Sever do Vouga. By implementing a playful and immersive Cultural Heritage Tourism approach to foster Amiais' cultural and socioeconomic development, LOCUS allows visitors to have immersive gamified experiences, by using a wearable device (bracelet) and their smartphones to interact with augmented everyday things around the village and to collaboratively learn about Amiais' culture and produce and share georeferenced multimedia contents.

With the pandemic and the respective restrictions that prevented the research team from being present in the physical space of Amiais, the option was to recreate Amiais in the SecondLife metaverse. Thus, the physical space of Amiais was reconstructed in this metaverse, modeling, in 3D, the characteristics of the territory (its altimetry, the terrain and all the elements that configure the territory), the public spaces (such as the streets, paths and the community threshing floor), the exteriors of all buildings and the interiors of buildings

and public structures (chapel and threshing floor baskets). With Amiais recreated in the metaverse, it was possible to make contents that recreated elements and dynamics of the cultural heritage of Amiais and provided users with interactive experiences that allowed them to enjoy the place and be curious to visit Amiais in the physical space. Throughout the book, there was an opportunity to detail the development of the project and the evaluation of the fruition experience in the metaverse.

Future work should rely on developing more immersive narratives to explore the virtual territory of Amiais. Those should integrate new cultural experiences for users related to traditions (for example, experiencing the Desfolhada party itself). Also, based on the interaction with elements of the territory, it should add more informative layers to disseminate more content about Amiais that simultaneously create more significant learning and knowledge in the user and arouse greater curiosity in visiting the real space of Amiais.

Finally, considering that the LOCUS project's work for the Amiais village can be replicated in other places of cultural interest, this book also presents a model composed of four major phases subdivided into multiple actions. Thus, the LOCUS Model is a guide for future work to develop projects to promote and preserve the Cultural Heritage of territories through digital platforms.

A large, light green letter 'R' is the central focus of the page. It has a white cutout on its left side, forming a shape similar to a 'D'. The letter is positioned on the left side of the page, with its right edge extending towards the center. The background is white.

References

References

- Abdullah, A. R. (2016). *Language and Virtual Identity in Second Life: An Ethnographic Sociolinguistic Study*. LAP LAMBERT Academic Publishing.
- Aldeias D Portugal. *Aldeias de Portugal: Um Espaço Coletivo de Construção*. (n.d.). Retrieved January 2, 2021, from <https://www.aldeiasdeportugal.pt/sobre-a-ata/>
- Alivizatou-barakou, M., Kitsikidis, A., Tsalakanidou, F., Dimitropoulos, K., Giannis, C., Nikolopoulos, S., Al, S., Denby, B., Buchman, L., Adda-decker, M., Alivizatou-barakou, M., Kitsikidis, A., Tsalakanidou, F., & Dimitropoulos, K. (2017). *Intangible Cultural Heritage and New Technologies : Challenges and Opportunities for Cultural Preservation and Development* To cite this version : HAL Id : hal-02194801 *TECHNOLOGIES : CHALLENGES AND OPPORTUNITIES FOR* (M. Ioannides et al. (Ed.); 2017th ed.). Springer International Publishing. <https://doi.org/978-3-319-49606-1>
- Almeida, A. N. de, Alves, N. de A., & Delicado, A. (2011). As Crianças e a Internet em Portugal. Perfis de uso. *Sociologia, Problemas e Práticas*, 65, 9–30.
- Alsawaier, R. (2017). The Effect of Gamification on motivation and engagement. *International Journal of Information and Learning Technology*, 45(November 2017), 49. <https://doi.org/10.1108/IJILT-02-2017-0009>
- Amato, F., Moscato, V., Picariello, A., Colace, F., De Santo, M., Schreiber, F. A., & Tanca, L. (2017). Big data meets digital cultural heritage: Design and implementation of SCRABS, a smart context-aware browsing assistant for cultural environments. *Journal on Computing and Cultural Heritage*, 10(1). <https://doi.org/10.1145/3012286>
- Anastasiadis, T., Lampropoulos, G., & Siakas, K. (2018). Digital Game-based Learning and Serious Games in Education. *International Journal of Advances in Scientific Research and Engineering*, 4(12), 139–144. <https://doi.org/10.31695/ijasre.2018.33016>
- Andrade, J. G., & Dias, P. (2020). A phygital approach to cultural heritage: Augmented reality at regaleira. *Virtual Archaeology Review*, 11(22), 15–25. <https://doi.org/10.4995/var.2020.11663>
- Arnab, S., & Clarke, S. (2017). Towards a trans-disciplinary methodology for a game-based intervention development process Sylvester. *British Journal of Educational Technology* (, 48(2), 279–312. <https://doi.org/10.1111/bjet.12377>
- Augé, M. (1994). *Não-Luagres – Introdução a uma antropologia da sobremodernidade*. Bertrand Editora.
- Avram, G., Ciolfi, L., & Maye, L. (2020). Creating tangible interactions with cultural heritage: lessons learned from a large scale, long term co-design project. *International Journal of CoCreation in Design and the Arts*, 16(3), 251–266. <https://doi.org/10.1080/15710882.2019.1596288>
- Barcelos, T. S., Carvalho, T., Schimiguel, J., & Silveira, I. F. (2011). Análise comparativa de

- heurísticas para avaliação de jogos digitais. *10th Brazilian Symposium on Human Factors in Computer Systems & 5th Human-Computer Interaction, August*, 187–196.
- Belhi, A., Bouras, A., & Foufou, S. (2017). Digitization and preservation of cultural heritage: The CEPROQHA approach. In *2017 11th International Conference on Software, Knowledge, Information Management and Applications (SKIMA), Software, Knowledge, Information Management and Applications (SKIMA), 2017 11th International Conference on* (pp. 1–7). <https://doi.org/10.1109/SKIMA.2017.8294117>
- Berger, M., Jucker, A. H., & Locher, M. A. (2016). Interaction and space in the virtual world of Second Life. *Journal of Pragmatics*, *101*, 83–100. <https://doi.org/10.1016/j.pragma.2016.05.009>
- Bergvall-kåreborn, B., Howcroft, D., Ståhlbröst, A., & Wikman, A. M. (2010). Participation in Living Lab : Designing Systems with Users. In D. J. I. P.-H. J., V. J., B. D., & R. N.L. (Eds.), *Human Benefit through the Diffusion of Information Systems Design Science Research*. (pp. 317–326). Springer.
- Blakely, S. (2014). *Religion, Greek, Archaeology of in Smith, C. (ed) Encyclopedia of Global Archaeology*. Springer US.
- Blundoa, D. S., Ferrari, A. M., Hoyoc, A. F., Riccardid, M. P., & Muiña, F. E. G. (2018).). Improving sustainable cultural heritage restoration work through life cycle assessment based model. *Journal of Cultural Heritage*, *32*, 221–331.
- Bogdanovych, A., Rodriguez-Aguilar, J. A., Simoff, S., & Cohen, A. (2010). Authentic interactive reenactment of cultural heritage with 3D virtual worlds and artificial intelligence. *Applied Artificial Intelligence*, *24*(6), 617–647. <https://doi.org/10.1080/088839514.2010.492172>
- Bolter, J. D., & Grusin, R. (2000). *Remediation: Understanding New Media* (The MIT Pr). The MIT Press. <http://www.amazon.com/Remediation-Understanding-Jay-David-Bolter/dp/0262522799>
- Boomsma, C., & Hafner, R. (2018). Should We Play Games Where Energy Is Concerned ? Perceptions of Serious Gaming as a Technology to Motivate Energy Behaviour Change among Social Housing Residents. *Sustainability*, *2018*(2018), 18. <https://doi.org/10.3390/su10061729>
- Borges, J. (2011). Participação política, Internet e competências infocomunicacionais: estudo com organizações da sociedade civil de Salvador. In *Faculdade de Comunicação: Vol. Doutoramen*. Universidade Federal da Bahia.
- Boulos, M. N. K., Hetherington, L., & Wheeler, S. (2007). Second Life: An overview of the potential of 3-D virtual worlds in medical and health education. *Health Information and Libraries Journal*, *24*(4), 233–245. <https://doi.org/10.1111/j.1471-1842.2007.00733.x>
- Brancati, N., Caggianese, G., Frucci, M., Gallo, L., & Neroni, P. (2017). Experiencing touchless interaction with augmented content on wearable head-mounted displays in cultural heritage applications. *Personal and Ubiquitous Computing*, *21*(2), 203–217. <https://doi.org/10.1007/s00779-016-0987-8>
- Brunner, P. H. (2007). Reshaping Urban Metabolism. *Journal of Industrial Ecology*, *11*(2), 11–13. <https://doi.org/10.1162/jie.2007.1293>
- Bujari, A., Ciman, M., Gaggi, O., & Palazzi, C. E. (2017). Using gamification to discover cultural heritage locations from geo-tagged

- photos. *Personal and Ubiquitous Computing*, 21(2), 235–252. <https://doi.org/10.1007/s00779-016-0989-6>
- Burkett, I. (2012). An Introduction to Co-Design. *Ingridburkett.Com*, 1–3. <http://ingridburkett.com/wp-content/uploads/2017/09/Introduction-to-Codesign-2.pdf>
- Buscemi, J. (2020). *Who's still on 'Second Life' in 2020?* MIC.
- Câmara, A. G., Murteira, H., & Rodrigues, P. (2009). City and spectacle: A vision of pre-earthquake Lisbon. *VSM 2009 – Proceedings of the 15th International Conference on Virtual Systems and Multimedia*, 239–243. <https://doi.org/10.1109/VSM.2009.43>
- Camilo, J., Fabregat, R., & Carrillo-ramos, A. (2020). applied sciences Survey : Using Augmented Reality to Improve Learning Motivation in Cultural Heritage Studies. *Applied Science*, 10(13), 26.
- Caporarello, L., Magni, M., & Pennarola, F. (2017). Learning and gamification: a possible relationship? *EAI Endorsed Transactions on E-Learning*, 4(16), 153488. <https://doi.org/10.4108/eai.19-12-2017.153488>
- Carroll, J., & Reich, B. H. (2017). Technology Portfolios: How Individuals Manage Multiple Digital Technologies. *SIGMIS Database*, 48(1), 75–92. <https://doi.org/10.1145/3051473.3051478>
- Caulfield, B. (2021). *What Is the Metaverse?* Nvidia.
- Čejka, J., Zsíros, A., & Liarokapis, F. (2020). A hybrid augmented reality guide for underwater cultural heritage sites. *Personal and Ubiquitous Computing*, 2020, 14. <https://doi.org/10.1007/s00779-019-01354-6>
- Cesaria, Ferdinando, et al. (2019). Gamification in Cultural Heritage: A Tangible User Interface Game for Learning About Local Heritage Ferdinando. In *Digital cultural heritage apis* (Vol. 9, p. 411/422). Springer, Cham.
- Chen, J. C. C. (2016a). The crossroads of English language learners, task-based instruction, and 3D multi-user virtual learning in Second Life. *Computers and Education*, 102, 152–171. <https://doi.org/10.1016/j.compedu.2016.08.004>
- Chen, J. C. C. (2016b). The crossroads of English language learners, task-based instruction, and 3D multi-user virtual learning in Second Life. *Computers and Education*, 102, 152–171. <https://doi.org/10.1016/j.compedu.2016.08.004>
- Choi, Woong; Baker, Drew; Takahashi, Sachie; Hachimura, K. (2010). *Implementation of Japanese Intangible Cultural Heritage Noh Play in Second Life. Cidade e Espectáculo: uma visão da Lisboa pré-terramoto*. (n.d.). Lisbon Pre 1755 Earthquake.
- Cockton, G., Lárusdóttir, M., Gregory, P., & Cajander, Å. (2016). Integrating User-Centred Design in Agile Development. In *Human-Computer Interaction Series*. Springer International Publishing. https://doi.org/10.1007/978-3-319-32165-3_1
- Conclusions on cultural heritage as a strategic resource for a sustainable Europe. (2014). *Official Journal of the European Union*.
- Cozza, M., Tonolli, L., & Andrea, V. D. (2016). Subversive Participatory Design : Re ections on a case study. *ACM International Conference Proceeding Series 2*, 53–56.

- Cozzani, G., Pozzi, F., Dagnino, F. M., Katos, A. V., & Katsouli, E. F. (2017). Innovative technologies for intangible cultural heritage education and preservation: the case of i-Treasures. *Personal and Ubiquitous Computing*, 21(2), 253–265. <https://doi.org/10.1007/s00779-016-0991-z>
- Dekhili, S., & Hallem, Y. (2020). An examination of the relationship between co – creation and well-being : an application in the case of tourism. *Journal of Travel & Tourism Marketing*, 37(1), 33–47. <https://doi.org/10.1080/10548408.2019.1694122>
- Deng, Z., Lin, Y., Zhao, M., & Wang, S. (2015). Collaborative planning in the new media age: The Dafo Temple controversy, China. *Cities*, 45, 41–50. <https://doi.org/10.1016/j.cities.2015.02.006>
- Deterding, S., Dixon, D., Khaled, R., & Nacke, L. (2011). From game design elements to gamefulness: Defining “gamification.” *Proceedings of the 15th International Academic MindTrek Conference: Envisioning Future Media Environments, MindTrek 2011, September*, 9–15. <https://doi.org/10.1145/2181037.2181040>
- Di Giulio, R., Boeri, A., Longo, D., Gianfrate, V., Boulanger, S. O., & Mariotti, C. (2021). ICTs for Accessing, Understanding and Safeguarding Cultural Heritage: The Experience of INCEPTION and ROCK H2020 Projects. *International Journal of Architectural Heritage*, 15(6), 825–843. <https://doi.org/10.1080/15583058.2019.1690075>
- Di Giulio, Roberto, Boeri, A., Longo, D., Gianfrate, V., Boulanger, S. O. M., & Mariotti, C. (2021). ICTs for Accessing, Understanding and Safeguarding Cultural Heritage: The Experience of INCEPTION and ROCK H2020 Projects. *International Journal of Architectural Heritage*, 15(6), 825–843. <https://doi.org/10.1080/15583058.2019.1690075>
- Díaz, P., Aedo, I., & Bellucci, A. (2016). Integrating user stories to inspire the co-design of digital futures for cultural heritage. *ACM International Conference Proceeding Series*. <https://doi.org/10.1145/2998626.2998645>
- Duh, E. S., Guna, J., Pogačnik, M., & Sodnik, J. (2016). Applications of Paper and Interactive Prototypes in Designing Telecare Services for Older Adults. *Journal of Medical Systems*, 40(4), 1–7. <https://doi.org/10.1007/s10916-016-0463-z>
- E., L., T., de la H., M., S., & D., G. (2019). Setting Up and Conducting the Co-design of an Intergenerational Digital Game : A State-of-the-Art Literature Review. In Z. J. & S. G (Eds.), *Human Aspects of IT for the Aged Population. Design for the Elderly and Technology Acceptance*. (Vol. 1, pp. 56–69). Springer. <https://doi.org/10.1007/978-3-030-22012-9>
- Ellard, C. (2018). *A Alma dos Lugares – como a paisagem e o ambiente alteram o nosso comportamento e as nossas decisões*. Contraponto Editores.
- European Commission. (2006). *Mediappro: A European Research Project: The Appropriation of New Media by Youth*.
- Ferati, M., Babar, A., Carine, K., Hamidi, A., & Mörtberg, C. (2018). Participatory Design Approach to Internet of Things: Co-designing a Smart Shower for and with People with Disabilities. In M. Antona & C. Stephanidis (Eds.), *Universal Access in Human – Computer*

- Interaction. Virtual, Augmented, and Intelligent Environments – UAHCI: International Conference on Universal Access in Human-Computer Interaction* (pp. 246–261). Springer International Publishing AG.
- Ferguson, Rebecca; Rodney and Weinbren, D. (2014). Heritage and the recent and contemporary past. In *Understanding Heritage and Memory* (Vol. 51, Issue 06, pp. 277–315). UK: Manchester University Press. <https://doi.org/10.5860/choice.51-2973>
- Ferretti, V., Bottero, M., & Mondini, G. (2014). Decision making and cultural heritage: An application of the Multi-Attribute Value Theory for the reuse of historical buildings. *Journal of Cultural Heritage*, 15(6), 644–655. <https://doi.org/10.1016/j.culher.2013.12.007>
- Freitas, P. (2011). *Apropriação do espaço em Mundos Virtuais: A comunidade portuguesa em Second Life®*.
- Gent, E. (2021). *What Can the Metaverse Learn From Second Life?* IEEE Spectrum.
- Gomes, C. A., Ferreira, S., Gouveia, T., Rito, P., Morais, N., & Sousa, B. (2018). Intergenerational Participatory Design: contributions to the development of an App. *International Symposium on Computers in Education (SIIE)*, 1(6).
- Gössling, S. (2021). Tourism, technology and ICT: a critical review of affordances and concessions. *Journal of Sustainable Tourism*, 0(0), 1–18. <https://doi.org/10.1080/09669582.2021.1873353>
- Goutx, D., Sauvagnargues, S., Mermet, L., Goutx, D., Sauvagnargues, S., Mermet, L., Within, G., & Exercises, C. (2021). *Managing the Game Within Crisis Exercises To cite this version : HAL Id : hal-02923825 Managing the Game Within Crisis Exercises*.
- Graziano, T., & Privitera, D. (2020). Cultural heritage, tourist attractiveness and augmented reality: Insights from Italy. *Journal of Heritage Tourism*, 15(6), 666–679.
- Griol, D., Sanchis, A., Molina, J. M., & Callejas, Z. (2019). Developing enhanced conversational agents for social virtual worlds. *Neurocomputing*, 354, 27–40. <https://doi.org/10.1016/j.neucom.2018.09.099>
- Han, B.-C. (2016). *O Aroma do Tempo – Um Ensaio Filosófico sobre a Arte da Demora* (1aed.2007). Relógio D' Água.
- Holm, A., Burnside, D., & Mitchell, A. (1987). The development of a system for monitoring trend in range condition in the arid shrublands of Western Australia. *The Rangeland Journal*, 9(1), 14. <https://doi.org/10.1071/rj9870014>
- Hornung, D., Müller, C., Shklovski, I., Jakobi, T., & Wulf, V. (2017). Navigating Relationships and Boundaries. *Proceedings of Conference on Human Factors in Computing Systems*, 7057–7069. <https://doi.org/10.1145/3025453.3025859>
- Jelen, B., Monsey, S., & Siek, K. A. (2019). Older Adults as Makers of Custom Electronics. *Extended Abstracts of the 2019 CHI Conference on Human Factors in Computing Systems – CHI '19*, 1–6. <https://doi.org/10.1145/3290607.3312755>
- Kalman, H. (2017). Destruction, mitigation, and reconciliation of cultural heritage. *International Journal of Heritage Studies*, 23(2017), 538–555. <https://doi.org/10.1080/13527258.2017.1289475>
- Kapoor, K. K., Tamilmani, K., Rana, N. P., Patil,

- P., Dwivedi, Y. K., & Nerur, S. (2018). Advances in Social Media Research: Past, Present and Future. *Information Systems Frontiers*, 20(3), 531–558. <https://doi.org/10.1007/s10796-017-9810-y>
- Katsoni, V., Upadhya, A., & Stratigea, A. (2017). Tourism, Culture and Heritage in a Smart Economy. In *Third International Conference IACuDiT, Athens 2016*. <http://www.springer.com/series/11960>
- Kensing, F., & Greenbaum, J. (2013). Heritage: having a say. In I. T. Robertson & J. Simonsen (Eds.), *Routledge International Handbook of Participatory Design. SECTION I, Participatory Design – contributions and challenges* (pp. 21–36). Routledge.
- Kim, S., Song, K., Lockee, B., & Burton, J. (2018). Gamification in Learning and Education. In *Gamification in Learning and Education*. <https://doi.org/10.1007/978-3-319-47283-6>
- Kleinans, R., Van Ham, M., & Evans-Cowley, J. (2015). Using Social Media and Mobile Technologies to Foster Engagement and Self-Organization in Participatory Urban Planning and Neighbourhood Governance. *Planning Practice and Research*, 30(3), 237–247. <https://doi.org/10.1080/02697459.2015.1051320>
- Kopec, W., Balcerzak, B., Nielek, R., Kowalik, G., Wierzbicki, A., & Casati, F. (2017). Older adults and hackathons: a qualitative study. *Empirical Software Engineering*, 23(4), 2–8.
- Lerner, J. E. (2016). Learning in Virtual Worlds: Research and Applications. In *American Journal of Distance Education* (Vol. 30, Issue 4). <https://doi.org/10.1080/08923647.2016.1232562>
- Li, J., Krishnamurthy, S., Pereira, A., & Wesemael, P. Van. (2020). *Community participation in cultural heritage management : A systematic literature review comparing Chinese and international practices*. 96(March 2019). <https://doi.org/10.1016/j.cities.2019.102476>
- Liang, X., Lu, Y., & Martin, J. (2021). A review of the role of social media for the cultural heritage sustainability. *Sustainability (Switzerland)*, 13(3), 1–17. <https://doi.org/10.3390/su13031055>
- Linden, J. (n.d.). *Second Life community. Scripting object behavior*. Retrieved October 1, 2021, from <https://community.secondlife.com/knowledgebase/english/scripting-object-behavior-r62/>
- Lindsay, S., Jackson, D., Schofield, G., & Olivier, P. (2012). Engaging Older People using Participatory Design. *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, 1199–1208.
- Lisboa, A. V., Féres-Carneiro, T., & Jablonski, B. (2007). Transmissão intergeracional da cultura: um estudo sobre uma família mineira. *Psicologia Em Estudo*, 12(1), 51–59.
- Lowenthal, D. (2018). *THE PAST IS A FOREIGN COUNTRY – REVISITED*. Cambridge University Press.
- Mahardika, H., Thomas, D., Ewing, M. T., & Japutra, A. (2019). Experience and facilitating conditions as impediments to consumers' new technology adoption. *The International Review of Retail, Distribution and Consumer Research*, 29(1), 79–98. <https://doi.org/10.1080/09593969.2018.1556181>
- Maksimović, M., & Cosović, M. (2019, May). Preservation of Cultural Heritage Sites using IoT. *2019 18th International Symposium INFOTEH-JAHORINA, INFOTEH 2019*

- *Proceedings*. <https://doi.org/10.1109/INFOTEH.2019.8717658>
- Manganaro, M. (2002). *Culture, 1922 THE EMERGENCE OF A CONCEPT*. New Jersey.
- Mattar, J. (2008). *Ambientes Virtuais de Aprendizagem 3D Online: Ensinando e Aprendendo no Second Life*. 1–11.
- Mazzanti, M. (2002). Cultural heritage as multi-dimensional, multi-value and multi-attribute economic good: toward a new framework for economic analysis and valuation. *Journal of Socio-Economics*, 31, 529–558.
- Mendes, M. (2011). *Uma Experiência no Second Life*. Universidade Aberta.
- Meyer, B. (2014). *Agile! The Good, the Hype and the Ugly*. Springer International Publishing.
- Monteiro, P. (2001). *Legados de Sever do Vouga. Moinhos de Água*. Câmara Municipal de Sever do Vouga.
- Mortara, M., & Catalano, C. E. (2018). 3D virtual environments as effective learning contexts for cultural heritage. *Italian Journal of Educational Technology*, 26(2), 5–21. <https://doi.org/10.17471/2499-4324/1026>
- Mortara, M., Catalano, C. E., Bellotti, F., Fiucci, G., Houry-Panchetti, M., & Petridis, P. (2014). Learning cultural heritage by serious games. *Journal of Cultural Heritage*, 15(3), 318–325. <https://doi.org/10.1016/j.culher.2013.04.004>
- Müller, C., Hornung, D., Hamm, T., & Wulf, V. (2015). Practice-based design of a neighborhood portal: Focusing on elderly tenants in a city quarter living lab. *Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems (CHI '15), 2015-April*, 2295–2304. <https://doi.org/10.1145/2702123.2702449>
- Nemtinov, V. A., Borisenko, A. B., Nemtinova, Y. V., Gorelov, A. A., & Tryufilkin, S. V. (2018). Implementation of technology for creating virtual spatial temporal models of urban development history. *Scientific Visualization*, 10(3), 99–107. <https://doi.org/10.26583/sv.10.3.07>
- Nicholson, S. (2015). A recipe for meaningful gamification. *Gamification in Education and Business*, 2015, 1–20. https://doi.org/10.1007/978-3-319-10208-5_1
- Oliveira, L., Amaro, A. C., & Melro, A. (2020). *Handbook of Research on Cultural Heritage and Its Impact on Territory Innovation and Development*. IGI Global, Information Science Reference.
- Organização das Nações Unidas para a Educação, C. e C. (1972). *Convenção para a proteção do património mundial, cultural e natural*.
- Orso, V., Spagnolli, A., Gamberini, L., Ibañez, F., & Fabregat, M. E. (2015). Involving Older Adults in Designing Interactive Technology : The Case of SeniorChannel. *Proceedings of the 11th Biannual Conference on Italian SIGCHI*, 102–109.
- Östlund, B., Fischer, B., Marshall, B., Dalmer, N., Fernandez-ardévol, M., Garcia-santesmases, A., & Lopez, D. (2020). Using Academic Work Places to Involve Older People in the Design of Digital Applications . Presentation of a Methodological Framework to Advance Co-design in Later Life. In G. Q. & Z. J. (Eds.), *Human Aspects of IT for the Aged Population. Technologies, Design and User Experience* (Vol. 1, pp. 45–58). Springer International Publishing. <https://doi.org/10.1007/978-3-030-50252-2>
- Paasovaara, S., Lucero, A., & Olsson, T.

- (2016). Outlining the Design Space of Playful Interactions Between Nearby Strangers. *Proceedings of the 20th International Academic Mindtrek Conference*, 216–225.
- Páscoa, R. (2016). *Experiências de Interculturalidade em eLearning: Um estudo de caso no Second Life®*. Universidade Aberta.
- Pedell, S., Keirnan, A., Priday, G., Miller, T., Mendoza, A., Lopez-lorca, A., & Sterling, L. (2017). Methods for Supporting Older Users in Communicating Their Emotions at Different Phases of a Living Lab Project. *Technology Innovation Management Review*, 7(2), 7–19.
- Pellegrino, J. W., & Hilton, M. L. (2012). *Education for Life and Work: Developing Transferable Knowledge and Skills in the 21st Century* This PDF is available from The National Academies Press at http://www.nap.edu/catalog.php?record_id=13398 *Education for Life and Work: Developing Transferable* (Issue January).
- Pereira, P., & Martins, J. (2018). Sustainable Heritage Management Towards Mass Tourism Impact: the HERIT-DATA project. *International Conference on Intelligent Systems (IS)*, 801–806. <https://doi.org/10.1109/IS.2018.8710555>
- Petrelli, D. (2019). Tangible interaction meets material culture: reflections on the meSch project. *Interactions*, 26(5), 34–39.
- Pinelle, D., Wong, N., & Stach, T. (2008). Heuristic evaluation for games: Usability principles for video game design. *Conference on Human Factors in Computing Systems – Proceedings*, 1453–1462. <https://doi.org/10.1145/1357054.1357282>
- Psomadaki, O. I., Dimoulas, C. A., Kalliris, G. M., & Paschalidis, G. (2019). Digital storytelling and audience engagement in cultural heritage management: A collaborative model based on the Digital City of Thessaloniki. *Journal of Cultural Heritage*, 36, 12–22. <https://doi.org/10.1016/j.culher.2018.07.016>
- Punch, M. (1994). Politics and Ethics in Qualitative Research. In N. Denzin & Y. Lincoln (Eds.), *Handbook of Qualitative Research* (pp. 83–97). SAGE Publications.
- Quintin, E., Sanz, C., & Zangara, A. (2017). *The Impact of Role-Playing Games through Second Life on the Oral Practice of Linguistic and Discursive Sub-competences in English*. October, 148–155. <https://doi.org/10.1109/cts.2016.0042>
- Quivy, R., & Campenhoudt, L. (1995). Manual de Investigação em Ciências Sociais. In *Trajectos*. Gradiva.
- Rabaça, C. A., & Barbosa, G. G. (2001). *Dicionário de comunicação*. Editora Campus.
- Rabaça, C. A., & Barbosa, G. G. (2002). *Dicionário de comunicação* (5th ed.). Editora Campus. <https://books.google.pt/books?id=HoBbAAAACAAJ>
- Raju, D. K. (2018). Participatory design for creating virtual environments. *ACM International Conference Proceeding Series*, 63–66. <https://doi.org/10.1145/3297121.3297129>
- Ribeiro, J. (2011). *Os jogos tradicionais e os valores associados à memória e à cultura local. A complementaridade da embalagem ao produto*. Escola Superior de Artes e Design.
- Ribeiro, M. I., Fernandes, A. J., & Lopes, I. M. (2020). Smart Tourism: A Bibliometric Analysis of Scientific Publications from the Scopus and Web of Science Databases. In Springer (Ed.), *International Conference on Tourism, Technology*

and Systems (pp. 1–14).

Rice, M., & Carmichael, A. (2013). Factors facilitating or impeding older adults' creative contributions in the collaborative design of a novel DTV-based application. *Universal Access in the Information Society*, 12(1), 5–19. <https://doi.org/10.1007/s10209-011-0262-8>

Robbins, S., & Bell, M. (2011). *Second Life For Dummies* (vol. 92). John Wiley & Sons, 2011.

Roberts, E., Anne, B., Skerratt, S., & Farrington, J. (2017). A review of the rural-digital policy agenda from a community resilience perspective. *Journal of Rural Studies*, 54(2017), 372–385. <https://doi.org/10.1016/j.jrurstud.2016.03.001>

Robinson, M., & Picard, D. (2011). Tourism, Culture and Sustainable Development. *Sustainable Development*, 54(1&2), 97.

Robson, K., Plangger, K., Kietzmann, J. H., McCarthy, I., & Pitt, L. (2015). Is it all a game? Understanding the principles of gamification. *Business Horizons*, 58(4), 411–420. <https://doi.org/10.1016/j.bushor.2015.03.006>

Rogers, Y., Paay, J., Brereton, M., Vaisutis, K., Marsden, G., & Vetere, F. (2014). Never Too Old : Engaging Retired People Inventing the Future with MaKey MaKey. *Proceedings of the 32Nd Annual ACM Conference on Human Factors in Computing Systems*, 3913–3922.

Rubio, J. P. (2018). Estado y religión: tendencias conceptuales incidentes en la apreciación pública del fenómeno religioso. *Revista de Estudios Sociales*, 63, 42–54.

Sailer, M., Hense, J. U., Mayr, S. K., & Mandl, H. (2017). How gamification motivates: An experimental study of the effects of specific game

design elements on psychological need satisfaction. *Computers in Human Behavior*, 69, 371–380. <https://doi.org/10.1016/j.chb.2016.12.033>

Sanagustín-Fons, M. V., Tobar-Pesántez, L. B., & Ravina-Ripoll, R. (2020). Happiness and cultural tourism: The perspective of civil participation. *Sustainability (Switzerland)*, 12(8), 1–20. <https://doi.org/10.3390/SU12083465>

Sánchez de la Guía, L., Puyuelo Cazorla, M., & de-Miguel-Molina, B. (2017). Terms and meanings of “participation” in product design: From “user involvement” to “co-design.” *The Design Journal*, 20(sup1), S4539–S4551. <https://doi.org/10.1080/14606925.2017.1352951>

Sanders, E. B.-N., & Stappers, P. J. (2008). Co-creation and the new landscapes of design. *CoDesign*, 4(1), 5–18. <https://doi.org/10.1080/15710880701875068>

Sarac, H. S. (2014). Benefits and Challenges of Using Second Life in English Teaching: Experts' Opinions. *Procedia – Social and Behavioral Sciences*, 158, 326–330. <https://doi.org/10.1016/j.sbspro.2014.12.095>

Schiau, I., Ivan, L., & Bîră, M. (2018). Involving older people in participatory action research: An example of participatory action design. *Romanian Journal of Communication and Public Relations*, 20(1), 11–24. <https://doi.org/10.21018/rjcp.2018.1.250>

Schneider, J. (2020). *QRCA Views. Taking a Second Look at Second Life*. <https://qrcaviews.org/2020/11/10/taking-a-second-look-at-second-life/>

Sengpiel, M., Volkman, T., & Jochems, N. (2019). Considering older adults throughout the development process – The HCD + approach.

- In R. W. D. de Waard, K. Brookhuis, D. Coelho, S. Fairclough, D. Manzey, A. Naumann, L. Onnasch, S. Röttger, & A. Toffetti (Eds.), *Proceedings of the Human Factors and Ergonomics Society Europe Chapter Annual Conference* (Vol. 4959, pp. 5–16).
- Sharma, S., Rishi, O. P., & Sharma, A. (2021). IoTeST: IoT-Enabled Smart Tourism—Shaping the Future of Tourism. *Advances in Intelligent Systems and Computing*, 1187, 569–576. https://doi.org/10.1007/978-981-15-6014-9_67
- Shepherd, R. (2006). UNESCO and the politics of cultural heritage in Tibet. *Journal of Contemporary Asia*, 36(2), 243–257. <https://doi.org/10.1080/00472330680000141>
- Simonsen, J., & Robertson, T. (2013). *Routledge International Handbook of Participatory Design*. Routledge International. <https://doi.org/10.4324/9780203108543.ch3>
- Singly, F. (2009). A Apropriação da Herança Cultural. *Educação & Realidade*, 34(1), 9–32.
- Siricharoen, W. V., & Vinh, P. C. (2017). Question matrix method according to divided dimensions of infographics evaluation. *Personal and Ubiquitous Computing*, 21(2), 219–233. <https://doi.org/10.1007/s00779-016-0988-7>
- Soares, I. C. M., Leite, Y. V. P., Salazar, V. S., & Giesta, L. C. (2015). Experiência De Consumo Em Realidades Virtuais: Um Estudo De Caso Realizado no Second Life. *Review of Administration and Innovation – RAI*, 12(1), 98. <https://doi.org/10.11606/rai.v12i1.100318>
- Sousa Santos, B. (2002). *A crítica da razão indolente: contra o desperdício da experiência. Para um novo senso comum: a ciência, o direito e a política na transição paradigmática* (4th ed.). Cortez Editora.
- Stone, M. E., Lin, J., Dannefer, D., & Kelley-moore, J. A. (2016). The Continued Eclipse of Heterogeneity in Gerontological. *Journals of Gerontology – Series B Psychological Sciences and Social Sciences*, 72(1), 162–167. <https://doi.org/10.1093/geronb/gbv068>
- Team, E. (n.d.). *Get a Life: Second Life Game to Teach Nutrition Habits*. Mark’s Daily Apple.
- Tecnologia e preservação de Patrimônios históricos da humanidade*. (2018). <http://turismoeinovacao.com/tecnologia/tecnologia-e-preservacao-de-patrimonios-historicos-da-humanidade/>
- Thabrew, H., Fleming, T., Hetrick, S., & Merry, S. (2018). Co-design of eHealth Interventions With Children and Young People. *Frontiers in Psychiatry*, 9(OCT), 1–6. <https://doi.org/10.3389/fpsyt.2018.00481>
- UNESCO. (n.d.). *Definition of the cultural heritage* | United Nations Educational, Scientific and Cultural Organization.
- Uysal, M., Perdue, R. R., & Sirgy, M. J. (Eds.). (2012). *Handbook of tourism and quality-of-life research: Enhancing the lives of tourists and residents of host communities* (Spinger).
- Volo, S. (2017). *Emotions in Tourism: From Exploration to Design*. December, 31–40. https://doi.org/10.1007/978-3-319-42773-7_3
- Vosinakis, S., & Tsakonas, Y. (2016). Visitor experience in google art project and in second life-based virtual museums: A comparative study. *Mediterranean Archaeology and Archaeometry*, 16(5 Special Issue), 19–27. <https://doi.org/10.5281/zenodo.204963>
- Vygotsky, L. S. (2008). *Pensamento e Linguagem*. Relógio D’Água.

Winkelmann, K., Keeney-Kennicutt, W., Fowler, D., & Macik, M. (2017). Development, Implementation, and Assessment of General Chemistry Lab Experiments Performed in the Virtual World of Second Life. *Journal of Chemical Education*, 94(7), 849–858. <https://doi.org/10.1021/acs.jchemed.6b00733>

Zamenopoulos, Theodore; Alexiou, K. (2018). *Co-Design as Collaborative Research*. University of Bristol and the AHRC Connected Communities Programme. https://connected-communities.org/wp-content/uploads/2018/07/Co-Design_SP.pdf

Zamyatina, N., Solntseva, O. G., & Madiyarova, E. (2021). *Smart Tourism : International Expertise in Strategic Solutions*. January. <https://doi.org/10.1007/978-3-030-59126-7>

Zimmer, J., & Vezzani, M. (2017). Second Life para Educação à Distância: uma experiência entre estudantes brasileiros e portugueses. *Anais Dos Workshops Do VI Congresso Brasileiro de Informática Na Educação (CBIE 2017)*, 1(Cbie), 427. <https://doi.org/10.5753/cbie.wcbie.2017.427>

