

Digital Media Usage and the Engagement of Older People from Rural Areas in Technological Projects: Co-design Sessions¹

Ana MELRO, PhD
DigiMedia, University of Aveiro
PORTUGAL
anamelro@ua.pt

Lídia OLIVEIRA
Associate Professor, DigiMedia, University of Aveiro
PORTUGAL
lidia@ua.pt

Ana Carla AMARO
Assistant Professor, DigiMedia, University of Aveiro
PORTUGAL
aamaro@ua.pt

Abstract: The question posed in the call “How the widespread of new technologies are changing the norms and practices of the later life?” was transformed in the main motivation to write the paper. LOCUS scientific research project addresses the subjects of Internet of Things, its impact in maintenance and sustainability of Cultural Heritage and the important role of older generations to these operations. What the research team noticed is that sometimes it is the dissemination of technologies (and accompanying infrastructures) that promote their use and the creation of the need. And when the technologies do not exist, the infrastructures are compromised and/or nonexistent. It is considered that there is a before and an after period in the way in which the implementation of technological projects influences rural areas and older people. This also means that there is a high relevance in the second question of the call “How social actors, groups, institutions and mainstream media provide, spread

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or constrain ways of growing older via digital devices?" But also, a high importance of the project developed for the scientific knowledge advancement in the study areas (Communication, Technology, Sociology, Demography, Geography, etc.). The main conclusions of the paper are that digital technologies contributes to those Cultural Heritage maintainance and sustainability, however, this is only possible with the mediation of older people. Consequently, those people need to know or learn how to manage digital media and technology in order to contribute for the projects and technology development. Older people aim to participate in these projects and that also influences on their proficiency on technologies (on a win-win basis).

Keywords: elderly, digital technologies, rural areas, action-research projects, co-design projects

Utilisation des médias numériques et engagement des personnes âgées des zones rurales dans les projets technologiques: sessions de co-désign

Résumé: La question posée dans l'appel à articles a été le principal déclencheur de motivation pour la rédaction de cet article. Le projet de recherche scientifique LOCUS aborde les sujets de l'Internet of Things, son impact dans la maintenance et la durabilité du patrimoine culturel et le rôle important des générations plus âgées dans ces processus. L'équipe de recherche a remarqué que c'est parfois la diffusion des technologies (et des infrastructures d'accompagnement) qui favorisent leur utilisation et la création du besoin. Et lorsque les technologies n'existent pas, les infrastructures sont compromises et / ou inexistantes. On considère qu'il existe une période avant et après dans la manière dont la mise en œuvre des projets technologiques influence les zones rurales et les personnes âgées. Cela signifie également qu'il y a une grande pertinence dans la deuxième question de l'appel. Mais aussi, une grande importance du projet développé pour l'avancement des connaissances scientifiques dans les domaines d'étude (communication, technologie, sociologie, démographie, géographie, etc.). Les principales conclusions du document sont que les technologies numériques contribuent à la conservation et à la durabilité du patrimoine culturel, mais cela n'est possible qu'avec la médiation de personnes plus âgées. Par conséquent, ces personnes ont besoin de savoir ou d'apprendre à gérer les médias et les technologies numériques afin de contribuer aux projets et au développement technologique. Les personnes âgées visent à participer à ces projets et cela influe également sur leur maîtrise des technologies (sur une base gagnant-gagnant).

Mots-clés: personnes âgées, technologies numériques, zones rurales, projets de recherche-action, projets de co-conception

Introduction

With the increase of life expectancy in most countries² (Cui, Canudas-Romo, & Booth, 2019; Fenelon & Boudreaux, 2019; Guillot & Payne, 2019) as a result of technological evolution (which then has impact in different society areas), there is a need for population to change and adapt, as well as the services and products available to them.

Additionally, people remain active until later on, which promotes the use of digital and technological means to facilitate their communication, daily practices and consumption (Zhao et al., 2020). But to what extent will these processes be facilitated when access to media is reduced?

The reference is specifically related to rural areas, where access to digital and technological means tends to be reduced (Cello, Marchese, & Patrone, 2015; de Souza, Costa, & Frances, 2012; Zhang & Wolff, 2004). This paper presents a study carried out in a rural area in the interior of Portugal, in the Center region (a village called Amiais). The village has 15 permanent residents who do not frequently use digital media for various reasons, being the low access to tools, the lack of necessity to use the first ones or the lack of knowledge to work with them as some of the main reasons. Added to this is the fact that the local existent technological infrastructures do not allow the use of digital media in a quick and agile way.

Thus, if, on the one hand, the need to use digital media does not translate into a true need, on the other hand, this necessity is not created by the infrastructures either, because they do not exist or exist in a very weak way. As previously stated, this last aspect answers the question posed in the call “How the widespread of new technologies are changing the norms and practices of the later life?”, since sometimes it is this dissemination of technologies (and accompanying infrastructures) that promotes their use and the creation of the need.

The paper aims to answer the following questions: (1) How are digital media used in Amiais village by the 45 to 90-year-old population? (2) How do they perceive technology and digital media and the potential importance they may have in their daily practices and consumptions? (3) What changes can occur with the perception of this importance? (4) What influence can projects with a high technological dimension have on the perception of the digital media importance and even on the way they are being used?

It is considered that there is a before and an after period in the way in which the implementation of technological projects influences rural areas and older people. This also means that there is a high relevance in the second question of the call (2) How social actors, groups, institutions and mainstream media provide, spread or constrain ways of growing older via digital devices? But also, a high importance of

² https://ec.europa.eu/eurostat/databrowser/view/sdg_03_10/default/table?lang=en, visited on January 7th, 2019.

the project developed for the scientific knowledge advancement in the study areas (Communication, Technology, Sociology, Demography, Geography, etc.).

The paper is organized into four sections. In the first one the authors briefly present LOCUS project, its team, phases and goals. In this presentation it is included the characterization of Amiais, the village where the project is being implemented, including its inhabitants and stakeholders (highly relevant for the project to achieve its goals).

The second section considers LOCUS' technology tasks, describes them and explains their importance for the project development and how it includes the participants' presence. In the same section the technology tools and the tasks where they are included are described, as well as the challenges envisioned for Amiais inhabitants to actively participate in those tasks.

The third section describes LOCUS methodology, specifically the tasks that includes people participation, namely, informal interviews, participant observation and co-design sessions. It is a research project described as an action-research one, which leads to some important challenges, but also curious results (in a scientific way).

The fourth and last section discusses LOCUS' results so far. It tries to answer the questions previously asked and compares this project to some similar ones in terms of technological use and appropriation by the participants.

This paper brings to the discussion a relevant topic which is not addressed in science as many times as it should, that is the understanding of the impact that the development of technological projects has on people and territory.

1. LOCUS' Main Goals and Characterization

LOCUS – playfuL cOnneCted rUral territorieS is an action-research project. Its main focus and research object is Cultural Heritage (CH) and its guardians, meaning people that was born in the beginning and/or the midst of the past century (XXth century) and are alive now and able to share their knowledge and memories about the work, playful, familial and religious practices. LOCUS intends to collect the stories and histories about people and the territory. And this is the first phase of the project.

After this, with the database created gathering all the relevant information concerning local CH, an IoT system will be developed which will integrate a mobile application, a bracelet and physical artifacts positioned in the territory. This system will offer the possibility for the user to interact with the territory, the history, the stories and the monuments. The interaction will be available in several formats: Augmented Reality (AR), textual information and video/audio information. The main goal is to give the user the possibility to access all this information in a playful way, by actively interacting with the territory and/or the app (uploading/downloading images, answering to riddles, performing traditional activities, etc.).

The last phase is the massification of the previously explained pilot. The pilot will be implemented in Amiais (a village which will be characterized in the following paragraphs), as a test version. But the ultimate goal is to make it available in a wider way, in order to maintain and contribute to disseminate the knowledge about CH existence and importance.

LOCUS will employ an ethnographically based (Atkinson & Hammersley, 1994) and agile participatory design approach (Cockton, Lárusdóttir, Gregory, & Cajander, 2016; Kope, Nielek, & Wierzbicki, 2018; Salah, Paige, & Cairns, 2014) to the process of co-designing, developing and evaluating an IoT system. Beyond this main goal, it has the following specific objectives:

- a) Engage inhabitants and stakeholders in the co-design, development and evaluation process;
- b) Assemble and test a strategy to integrate Participatory Design and Agile Development methodologies;
- c) Understand how smart objects and IoT systems and applications should be designed to promote playful (PL) and intergenerational (IG) interactions and experiences, in the context of which rural CH can be learned and shared;
- d) Understand how individual characteristics (age, background, culture, digital literacy, goals, roles, etc.) may impact the way people interact in/with a PL and IG IoT system and how they cooperate in creating and exploring cultural contents;
- e) Develop an insight on how the physical and technological characteristics of smart objects impact PL and IG interactions and collaborative exploration and creation of cultural content;
- f) Envision a way to ensure the sustainability of the IoT system and to migrate the LOCUS intervention strategy and IoT system to other similar rural territories.

To achieve these goals, LOCUS has a multidisciplinary team. Researchers from the Communication and Social Sciences, Computer and Technology Sciences, Music and Gamification, Philosophy and Rural Studies. All these scientific areas contribute to enrich the study and promote an interesting intersection of areas in the understanding of the project topics: CH, IoT, AR, intergenerationality, aging, rural areas, etc.

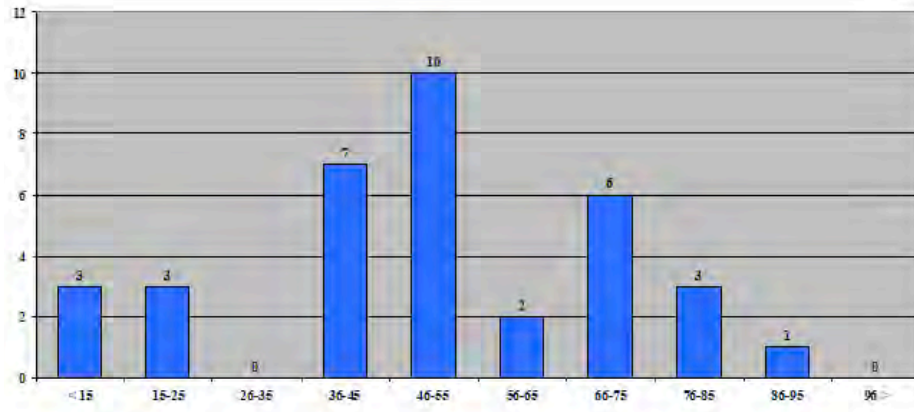
LOCUS pilot is being developed in Amiais, a rural village, located in the Portugal Center Region. Amiais has 15 permanent inhabitants, most of them aged between 60 and 90 years old. In the last 5 to 6 years it has been look for as holiday and/or weekend residence. The following table presents the distribution of its inhabitants:

Table 1. Amiais' residents / houses characterization

Code	Sex	Age	Residence type
P1	M	87	Permanent
P2	F	85	Permanent
P3	M	80	Permanent
P4	F	78	Permanent
P5	M	65	Permanent
P6	F	69	Permanent
P7	F	40	Permanent
P8	F	7	Permanent
P9	F	42	Permanent
P10	M	42	Permanent
P11	F	40	Permanent
P12	F	3	Permanent
P13	F	8	Permanent
P14	F	62	Permanent
P15	F	66	Permanent
E1	M	42	Holiday home (emigrant)
E2	F	20	Holiday home (emigrant)
E3	M	40	Holiday home (emigrant)
E4	M	52	Holiday home (emigrant)
E5	F	50	Holiday home (emigrant)
E6	F	49	Holiday home (emigrant)
E7	M	50	Holiday home (emigrant)
E8	M	18	Holiday home (emigrant)
E9	M	20	Holiday home (emigrant)
W1	M	50	Weekend home
W2	F	51	Weekend home
W3	M	72	Weekend home
W4	F	73	Weekend home
W5	M	70	Weekend home
W6	M	50	Weekend home
W7	F	50	Weekend home
W8	M	50	Weekend home
W9	F	50	Weekend home
Hh1	M	72	Holiday home
Hh2	M	40	Holiday home

F: Female; M: Male

When represented graphically, there is a clear predominance of people aged between 35 and 85 years old (graph 1).



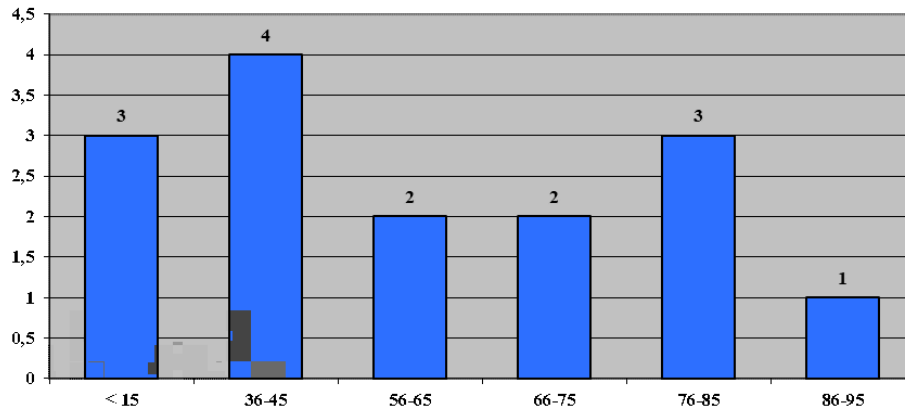
Graph 1. Amiais' inhabitants age (Nr.)

As for the distribution of women and men, this is quite balanced, as shown in Graph 2.



Graph 2. Amiais' inhabitants' sex (Nr.)

But, if one only considers the permanent inhabitants (people that lives in Amiais the entire year), which is importante for the co-design sessions, the age distribution is as follows on graph 3.



Graph 3. *Amiais' permanent inhabitants age (Nr.)*

Amiais is a village located in Sever do Vouga County and in Couto de Esteves Parish. Figure 1 shows the specific location of Amiais.

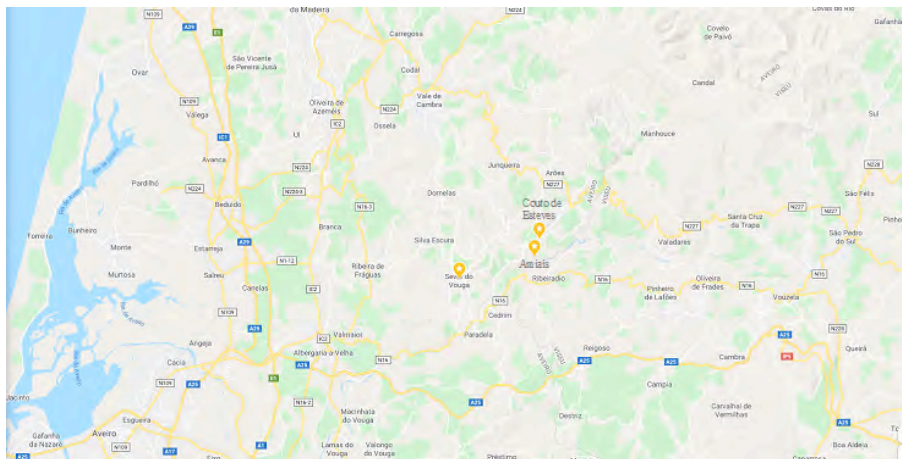


Figure 1. *Amiais' location* (Source: Google Maps)

At the moment, LOCUS have developed two of its the main stages: ethnographic research and reflection and creativity. During the ethnographic research, researchers were able to uncover the rituals, habits, motivations and stories of Amiais and its inhabitants, visitors and stakeholders. Also, by engaging people in conversations and activities, researchers were able to unveil what they find playful and how they might establish playful interactions with others and with objects. Participant observation, interviews and focus groups were used to gather data.

The main goals of the ethnographic research stage were (1) access to the inhabitants, stakeholders (such as local government entities, cultural and recreational associations, schools...) and visitors, getting to know them and (2) engage people in conversations to know their life stories, motivations and wishes, understand what they find playful, how they establish playful interactions with others and with objects and probe other issues of interest.

Followed by all the techniques in the ethnographic research it was possible to start the second stage entitled 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 were promoted, to brainstorm and envision scenarios and narratives for IoT playful intergenerational experiences in Amiais village.

Unfortunately, these co-design sessions were interrupted by the coronavirus-19, which made it impossible to continue working with the elderly or even to travel to Amiais. The team is now considering the different options available to continue the work field.

The main results of these two stages are presented in the paper Methodology section.

2. LOCUS' Technology Tasks and Tools

This second section considers LOCUS' technology tasks, describes them and explains their importance for the project development and how it includes the participants' presence. Also, the technology tools and the tasks where they are included are described, as well as the challenges envisioned for Amiais' inhabitants to actively participate in those tasks.

The list of traditional activities (please read 3.1. Interviews, informal conversations and participant observation of this paper) that was possible to assemble from the interviews and informal conversations were an important starting point to formulate scenarios which will incorporate technological tools. Based on these scenarios and narratives, the needed IoT infrastructure testbed is going to be drawn and the technical specifications for its implementation (specific network coverage, required amount of hardware and middleware, and so on) are going to be identified. Along with those, the functional and technical requirements for the bracelet and the mobile App prototypes are also going to be defined.

Which leads the team to stage three of the LOCUS project: Agile and Participatory design & development. As one can understand, since it wasn't possible to finish the second stage (because of the reasons mentioned before), the third one is also in stand-by, but some of the technological features are already being incorporated in the scenarios.

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, greatly reducing costs and time to market (Cockton et al., 2016; Meyer, 2014). The goal here is to select and invite the inhabitants and stakeholders to integrate the design and development team; to assemble a strategy to integrate Participatory and Agile Development methodologies; to ensure an effective participation of inhabitants and stakeholders in the design and development process; to iteratively design, implement and test the IoT system prototype.

Stage four, which also includes a large amount of technological development will go from a large-scale evaluation to a fully functional IoT System. Once a stable and robust version of the prototype has been developed, this stage will begin, which will involve a large-scale evaluation of the IoT system through case studies with different user groups (children, young people, seniors, intergenerational...). Data will be collected through participant observation and individual interviews and the prototype LOGS will also be analysed.

The goals of this stage are to carry out case studies with different user groups (children, young people, seniors, intergenerational, foreigners, etc.), for large-scale testing and evaluation of the developed IoT system prototype; to redefine, if appropriate according to case studies results, the architecture, functionalities, interaction design, content, etc., of the IoT system. Considering all the data gathered, all the results and all the documentation produced in previous tasks, to develop a fully functional IoT system that can be used by Amiais village visitors.

The IoT system will be the main technical result of LOCUS, whose sustainability will be envisioned, together with a model to migrate the LOCUS intervention strategy and IoT system to other similar rural territories, in the next and last stage of the project.

This stage also comprises the development of a model for the promotion of rural territories in a playful and immersive Cultural Heritage Tourism approach that will make possible the migration of the used methodology and of the developed IoT system, to other rural territories that share Cultural Heritage aspects with Amiais village.

Finally, stage five is the design of a sustainability and strategy migrability model. Based on the results of the previous phases, it will be possible to develop a set of strategies to ensure the IoT system sustainability beyond the lifetime of the project and an IoT model for the promotion of rural territories in a playful and immersive CH Tourism approach, making it possible to migrate the LOCUS intervention strategy and IoT system to other similar rural territories.

The goals for this stage are to install the IoT infrastructure testbed drafted in the previous task; to develop a prototype of a bracelet with an embedded RFID reader and sensors; to develop an application (App) that pairs the bracelet with a smartphone via Bluetooth.

As a springboard to accomplish the main goals of LOCUS, a network architecture of an IoT testbed will be adapted. That IoT testbed consists of wireless linked IoT Nodes and Gateways, sim cards for cellular connection and joint RFID tag/QR code labels which can be deployed both at static locations (e.g., facades), as well as on everyday objects or vehicles (agricultural tools, musical instruments, ox carts, etc.). Over this testbed, several use cases will be implemented:

- i) Environmental monitoring;
- ii) Location-based information;
- iii) Playful interactions;
- iv) Participatory sensing and cultural content production.

Sprints of design, development and testing (by the target audience through direct observation methods) will bring to life consecutive versions of the IoT system, until a final prototype version is achieved. Once a sufficiently robust version of the IoT system prototype has been developed, it will be possible to start the large-scale test and evaluation of the IoT system prototype.

3. Methodology

In this section LOCUS methodology will be described, specifically the tasks that includes people participation, namely, informal interviews, participant observation and co-design sessions. It is a research project described as an action-research one, which leads to some important challenges, but also to interesting results.

The topics that will be discussed in this section are part of LOCUS' three important tasks: Ethnographic research (task 5); Data analysis, interpretation, discussion and consolidation (task 6) and Prototyping the IoT infrastructure, wearable device and mobile App (task 7). Which then will help the development and implementation of the next final four tasks (Agile Participatory Design & Development of the IoT system prototype; Large-scale test and evaluation of the IoT system prototype; Development of a fully functional IoT system; Design sustainability and strategy migrability models). These final tasks are thereby "fed" by the previous ones.

3.1. 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 in order to facilitate the site recognition and getting to know the inhabitants and the frequent visitors (tourists).

In every travel to the site, LOCUS team would (and will continue to do so) take that as an opportunity to just walking around the village and talk with whom was on the streets. And there were always a lot of people working, enjoying some time in the sun or visiting. During those travels it was possible to have some informal conversations regarding the use of technology, the main traditions in several aspects

(familial, labour, school, commercial transactions, ways of living, etc.), but, most important, the ones that include playful activities among children and adults. And when talking with visitors, the focus was to know what leads them to Amiais.

Table 2 shows the visits which allowed the team to achieve the goals previously mentioned.

Table 2. Ethnographic research visits and events (informal conversations)

Date	Visit or event purpose
2019.09.25	Recognition of the territory. Getting to know the residents.
2019.03.26	Recognition of the territory. Getting to know the residents. Interviews with stakeholders.
2019.05.24	Recognition of the territory. Getting to know the residents. Interviews with stakeholders.
2019.08.10	Moonlight Serenade at Amiais. Getting together with the residents and stakeholders.
2019.09.28	Traditional Leafless. Getting together with the residents and stakeholders.

Another important technique was the 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 behaviours in the exact moment they are produced and exactly as they are, without the mediation of a document or a testimony.”³ (Quivy & Campenhoudt, 1995, p. 196).

In fact, the former informal conversations and the visits were important for participant observation to take place, 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, p. 84).

What the research team noticed was that a lot of activities and gathering moments were specially and specifically organized in Amiais in order to contribute to the project development. And this was a great sign of trust and engagement with LOCUS’ goals.

Different moments were marked as important for LOCUS team to be present, observe and take notes. Table 3 lists those moments.

³ Author’s translation.

Table 3. Ethnographic research visits and events (participant observation)⁴

Date	Visit or event purpose
2019.04.27-28	Participation in the festivities of <i>São Francisco de Assis</i> and <i>Nossa Senhora do Amparo</i> . Participant observation.
2019.07.13-14	Participation in the festivities of <i>Festa do Senhor</i> . Photography exhibition Watermills and the Balconies in Flower contest. Participant observation.
2019.08.10	Moonlight Serenade at Amiais. Getting together with the residents and stakeholders.
2019.09.28	Traditional Leafless. Getting together with the residents and stakeholders.

Almost simultaneously to the previous data collection techniques, formal interviews with stakeholders were conducted. This 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 close doors it will encounter; (3) if any closed door, understand how it was possible to open it; (4) getting to know the territory, its economical challenges, the technological advancements (if any) and the changes occurred in the last years; (5) getting to know the people and any resistance that the team should know of; and (6) understand the dimension of collaboration the team should expect from those stakeholders.

Four interviews were conducted: to 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). Table 4 shows the date those interviews took place.

Table 4. Ethnographic research visits and events (interviews)⁵

Date	Visit or event purpose
2019.03.26	Recognition of the territory. Getting to know the residents. Interviews with stakeholders.
2019.05.24	Recognition of the territory. Getting to know the residents. Interviews with stakeholders.

No doubt they are stakeholders, but they assume a much important role in the territory, they are agents of change, they actively contribute to the territory development and for life's people changing. They care about them, their security and

⁴ Some of the visits in this table are also in Table 2. The team would sometimes take the opportunity to accomplish two or more goals with one travel.

⁵ Some of the visits in this table are also in Tables 2 and 3. The team would sometimes take the opportunity to accomplish two or more goals with one travel.

well-being. And if collaborate with LOCUS would mean improvements for the territory and people, than they were completely open to collaborate. And that was what happened, and what still happens now.

From the interviews and informal conversations, it was possible to assemble a set of playful activities, whether connecting them to a labour/school, religious and/or familial dimension or understanding the playful dimension by itself. A list of the most relevant traditional activities was constructed, as it follows, by categories:

- Category Party/Feast:
 - *São Francisco de Assis e Nossa Senhora do Amparo*;
 - Harvesting and corn leaf removal (*Desfolhada*).
- Category Labour:
 - Linen, rye and corn cultivation;
 - Wine cultivation;
 - Milk production;
 - Animal production.
- Category Family:
 - Easter;
 - Sundays.
- Category Playfulness:
 - Scarf game;
 - *Pião*;
 - *Patela*;
 - *Bugalho* game.
- Category Religion:
 - *Alminhas* (little souls);
 - Religious feasts.

It was possible to understand that some of these categories intersect, for example, the Easter is a time where families reunite, but it was a religious party. And a lot of playful activities took place during labour activities.

As already claimed, it was also possible to understand the inhabitants' technological stage of use. This was quite relevant, since LOCUS intends to develop a mobile app, which implies the use of a smart bracelet, a smartphone and some software tools, like IoT and AR. It was possible to conclude that there weren't many

technological tools inhabitants use, some of them have tablets and smartphones, but the majority only have access to television, radio and telephone.

Another important result taken from the application of these techniques was the technological infrastructure availability, namely, network quality, the presence of this network in the village (were there any wi-fi devices and how was the maintenance provided) and how much of it could LOCUS use. It was quite quickly understood that there is no 3G available, but worse than that is the mobile phone network, which is inexistent in some places.

However, people were/are available to collaborate with LOCUS. And one can conclude that from all the informal conversations, but, and most important, from the co-design sessions, to which the inhabitants were all invited to participate, and there was a numerous group that showed up.

3.2. Co-design sessions

The previous described techniques were instruments and a way which allowed 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 understand and interpret their needs.” (Sánchez de la Guía, Puyuelo Cazorla, & de-Miguel-Molina, 2017, p. S4547) in an iterative way.

The main goals of these sessions are to discuss and reinforce the informal conversations, participant observations and interviews results. Also, the sessions intended to promote brainstormings which allow the definition and characterization of scenarios and narratives for intergenerational playful experiences using IoT.

At the moment, it was only possible to organize two co-design sessions. The first one took place on November 23rd, 2019, in Amiais. The team, with the previous authorizations from the President of Couto de Esteves Parish and the Priest, used the chappel. This is an important place, since it is familiar to the inhabitants and the main goal was for them to feel comfortable.

The session began at 3.00 p.m. and finished at 5.30 p.m. Table 5 lists the participants.

Table 5. 1st co-design session participants

Code	Sex	Age	Residence type
P1	M	87	Permanent
P2	F	85	Permanent
P4	F	78	Permanent
P5	M	65	Permanent
P6	F	69	Permanent
P7	F	40	Permanent
P8	F	7	Permanent

P10	M	42	Permanent
P14	F	62	Permanent
W3	M	72	Weekend home
W4	F	73	Weekend home

F: Female; M: Male

The invitation for the session was delivered to all the inhabitants in Amiais by the President of the Couto de Esteves Parish. The team prepared and invited the inhabitants and stakeholders for a traditional feast of that time of the year, which is called *Magusto* (a feast where people eat chestnuts and drink *jeropiga*, an alcoholic traditional drink, similar to port wine).

As one can observe in Table 5, 11 inhabitants joined LOCUS first co-design session, but also 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 mostly the relevance of Amiais' traditions and customs, as dimensions of cultural heritage, of which the participants are the keepers par excellence. But mostly, 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. It was also at that time that the collection of information began, in a brainstorming format, using, for this purpose, a scenario paper with some information previously written and that was glued to a wall in front of the participants, so that the team could fill in with the participants' comments.

The paper was intitled Amiais' traditions. Tellings, singings and games. In the paper five categories were written: Party/Feasts, Labour, Family, Neighbours, School.

The second session took place on December 7th, 2019, in the same location as the previous one. It also started at 3 p.m. and ended at 5 p.m. Table 6 shows the participants.

Table 6. 2nd co-design session participants

Code	Sex	Age	Residence type
P1	M	87	Permanent
P2	F	85	Permanent
P4	F	78	Permanent
P6	F	69	Permanent
P10	M	42	Permanent
P11	F	40	Permanent
P12	F	3	Permanent
P13	F	8	Permanent

P14	F	62	Permanent
W4	F	73	Weekend home
W7	F	50	Weekend home

In this second session it was also possible to have a high number of participants, but no stakeholders were present.

A conversation with the participants was initiated in order to consolidate the activities that had been collected in the visits carried out in a moment before these sessions, but also in the previous session. Three documents listing the different activities were used, divided by topics: play, work, family/neighbours and religion (table 7 shows the example for the playful activities). This document is a continuation of the scenario paper used in the previous session.

Once again, the session format was brainstorming. Some of the activities were already included, but there was place left to include new ones. The columns considered the following questions: what the activity goal was; who played/participated in the activity; in which moments did the activity took place; which objects were necessary for the activity; if the activity was in group or individually.

Table 7. Playful activities

Name	What the activity goal was?	Who played/participated in the activity ?	Which objects where necessary for the activity?	Was the activity in group or individualy ?
<i>Bilharda</i>	Try to hit some sticks in the air	Girls	Two sticks	Two people
Grandson Game		Girls	Five stones	Two people
<i>Bugalho Game</i>	Each player tries to put the <i>bugalho</i> in the hole.	Girls	Three <i>bugalhos</i> The holes in the ground	
Stories				

(Werewolf/ Lamb)				
Janeiras				
River		Boys		
Dools		Girls		
Fan			Stick Tree leafs	Individual

Most of 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 used for them were the result of 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 and the same thing happened when they returned from school.

Religion was (and still is) very important in the villages, not very different in Amiais and Couto de Esteves, often being moments of family reunion, where food was scarce, but it was always possible and enjoyable to extend the invitation to close friends.

Additionally, it was intended to gather information about the importance of some specific spaces in Amiais. Thus, a map of the village was used, from which the inhabitants identified the places where they used to spend time during youth and adulthood, for playful and/or work purposes. Also, some residences were identified.

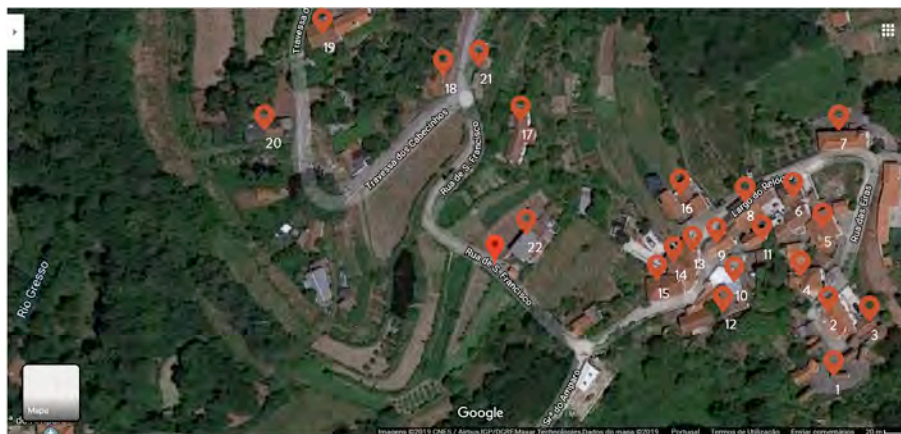


Figure 6. Amiais' map with identified points of interest (Source: Google Maps)

1 – Communitarian threshing floor

3 – P15 house

2 – P14 house

4 – W1 and W2 house

5 – E6, E7, E8 and E9 house	14 – E1, P7, E2 and P8 house
6 – P10, P11, P12 and P13 house	15 – E3 house
7 – W6 and W7 house	16 – Not possible to identify
8 – Not possible to identify	17 – W3 and W4 house
9 – P9 house	18 – P3 and P4 house
10 – Not possible to identify	19 – P1 and P2 house
11 – Not possible to identify	20 – Not possible to identify
12 – Not possible to identify	21 – Square
13 – P6 house	22 – P5 house

The map activity was a very interesting one, with children and older people working together in order to identify the places and houses. For past memories the elderly assumed an important role; for present memories the children helped to complement the information, in a truly intergenerational activity.

4. Results Discussion

This section discusses LOCUS' results so far. It answers some of the questions asked in the Introduction and compares this project to similar ones in terms of technological use and appropriation by the participants.

As said before, Amiais' village has 15 permanent residents. However, as seen in Table 1, there are 35 people who has a house in Amiais, being it a weekend/holiday house or a permanent one.

The age, residence and permanency at place are important variables (graphs 1, 2 and 3) for the understanding of the impact of technology projects for the use of digital media by older people. As concluded before, most of the permanent residents do not frequently use digital media for various reasons: low access to tools, lack of necessity to use them; lack of knowledge to work with them; and local inexistence of technological infrastructures. Some of these facts were already achieved by Sengpiel & Dittberner (2008), in their study "The computer literacy scale (CLS) for older adults". As stated by the authors, "Especially older adults often lack the necessary knowledge and motivation to use computer technology, even though they could benefit greatly from it. Inversely, it could be considered a characteristic of a technical device to require more or less computer literacy to use it effectively." (Sengpiel & Dittberner, 2008, p. 7).

Which take us to the question: how are digital media used in Amiais' village by the 45 to 90-year-old population? The previous age graphs show that, when comparing the Amiais' inhabitants (people that have a home there, but not necessarily live

there – graph 1) with Amiais' permanent inhabitants (graph 3) three of the youngest age groups disappeared. That way, the answer to the question was already given by Sengpiel & Dittberner (2008): older adults frequently do not have sufficient expertise and motivation to use technological devices, meaning that Amiais' population is included in these characteristics, whether by its age and/or by its rurality. This pattern of low technological use can only change by the help of children and grandchildren. However, LOCUS' research team believes it has an important role in this change, by promoting the inhabitants' participation in the mobile app development and by introducing new terms and concepts in the conversations.

But how do Amiais' inhabitants perceive technology and digital media and the potential importance they may have in their daily practices and consumptions? They do not perceive technology as something negative or harmful, they just don't feel the need to use it. Furthermore, the lack of infrastructures provided by the telecommunication companies don't let that need grow.

However, something that was mentioned frequently in the informal conversations is the contact with children and grandchildren that live in other countries. The access to new media and to good network could provide for some alternatives to the contact via telephone, like tablets and smartphones. Which then lead to the use of video calls apps, for example. This could be the first step for affinity for technology interaction, "defined as the tendency to actively engage in intensive technology interaction, as a key personal resource for coping with technology." (Franke, Attig, & Wessel, 2019, p. 456).

And what changes can occur with the perception of this importance? One believes that this question was already answered in the previous paragraph. In fact, if inhabitants perceived new media and technology access as a way to provide more and better communications with absent family members; as way to develop their own skills in other areas; and also as a way to improve the territory and to play an important role in touristic development, maybe the perception of technology importance could be bigger each day. LOCUS' research team also has a role in the creation of this perception.

Finally, what influence can projects with a high technological dimension have on the perception of the digital media importance and even on the way they are being used? As a way to prevent the lack of inhabitants' knowledge regarding the technological use and the lack of technological local infrastructures, LOCUS has predicted the implementation of teaching-learning processes, training sessions. In order to eliminate or at least decrease the barriers in the inhabitants' interaction in co-design sessions (and in participatory design ones) some informal explanations will occur, as the need of them is being felt.

LOCUS also has predicted the lack of technological infrastructures. This is a concern and it is being taken care of by the computer science team. The main goal is to contribute to the territory development (and not only to the people one) and this is a way to do it.

The main concern is to ensure that the inhabitants and stakeholders have, in fact, a voice in LOCUS' outcome, specifically in the IoT system.

Conclusion

To discuss the understanding of the impact that the development of technological projects have on people and territory was the main focus of this paper, an important topic which is not addressed in science as many times as it should.

With all that has been said, one believes it is now the time and place to give some future research paths. The impact of technological projects cannot only be evaluated in quantitative terms, but also in qualitative ones. In quantitative terms it is important that this kind of scientific research projects understand if the visitor's number has increased, as well as the number of people interested in living in the place (rural areas) either permanently or having a holiday/weekend house.

What is noticed is that the infrastructures development has this impact. In fact, during the time LOCUS' team is in the territory some houses were bought and rehabilitated. Previous to the beginning of LOCUS, some monuments were improved, and the roads were enhanced. That contributed to the qualification of Amiais as Village of Portugal¹, resulting in an increase number of tourists. Would the improvement of technological infrastructures, namely, access to better Wi-Fi networks, promotes this increasing demand?

But the impact must also be evaluated in qualitative terms. People use more technology, use it to be closer to their family and friends, learn new skills and use them to increase their well-being. On the other hand, this increase in use promotes the interest of large technological companies in improving access to network infrastructures for that population.

Cultural Heritage cannot be forgotten. The impact that the use of technology has had on the maintenance and sustainability of local cultural heritage. The way it favored access to this cultural heritage and even favored the interaction of users with the place and the cultural heritage, enriching it.

It would be interesting to evaluate and understand the feeling of belonging to a project co-created by Amiais' inhabitants, by ensuring them the participation in the development process, specifically, in the development of the IoT and AR application and tools, even though they were totally unknown concepts to them at the beginning of the project.

LOCUS has a lot of interrelated layers which contribute for the project as a whole. The methodological layer (which may translate into guidelines, for example), a technical layer (related with the infrastructure and all the physical and logical dimensions of the IoT system), an anthropological or ethnographic layer (which will

¹ <https://www.aldeiasdeportugal.pt/>, visited on April 1st, 2020.

consider the particular elements of the Cultural Heritage) and an Intergenerational communication layer (which will address the characteristics of this communication and the essential elements for its promotion).

And all these layers have an impact in people and in territory. The research team aims it would be a positive impact.

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