



HAL
open science

Tell a Tail: Leveraging XR for a Transmedia on Animal Welfare

Paulo Bala, Mara Dionisio, Sarah Oliveira, Tânia Andrade, Valentina Nisi

► **To cite this version:**

Paulo Bala, Mara Dionisio, Sarah Oliveira, Tânia Andrade, Valentina Nisi. Tell a Tail: Leveraging XR for a Transmedia on Animal Welfare. 19th International Conference on Entertainment Computing (ICEC), Nov 2020, Xi'an, China. pp.223-239, 10.1007/978-3-030-65736-9_19 . hal-03686035

HAL Id: hal-03686035

<https://inria.hal.science/hal-03686035>

Submitted on 2 Jun 2022

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



Distributed under a Creative Commons Attribution 4.0 International License

Tell a Tail: Leveraging XR for a Transmedia on Animal Welfare

Paulo Bala^{1,2*}, Mara Dionisio^{1,2*}, Sarah Oliveira³, Tânia Andrade³, and
Valentina Nisi^{4,2}

¹ FCT, Universidade Nova de Lisboa, Portugal

² ITI-LARSyS, Portugal

³ Universidade da Madeira, Portugal

⁴ IST, Universidade de Lisboa, Portugal

{mara.dionisio,paulo.bala,valentina.nisi}@iti.larsys.pt

Abstract. Playful interactions and storytelling become a powerful conduit for educational-entertainment experiences aimed at informing and critiquing social issues. In this paper, we describe the design of a transmedia experience, which uses its separate channels to deconstruct a complex social issue, while maintaining a coordinated and consistent story experience. *Tell a Tail* explores the welfare issues of companion animals through (1) a branching comic book extended with Augmented Reality scenes, and (2) an immersive 360° documentary about the rescue of abandoned companion animals. Our contribution is the rationale and design of an initial working prototype of the transmedia experience. Initial pilot evaluations revealed that the prototypes were well received, with participants praising the content and the medium used to deliver it. Through reflection on findings of the pilot studies and design decisions of the prototypes, we delineate how the affordances of different XR technologies can be used to inform and raise awareness of a social issue.

Keywords: Transmedia Storytelling · Interactive Storytelling · Animal Welfare · EXtended Reality · Augmented Reality · Virtual Reality.

1 Introduction

In recent years, concepts like “Critical Play” [12] and “Newsgames” [6] have accentuated the importance of meaningful play, by using playful interaction to inform and/or critique political and social issues. Stories are suitable conduits for critiquing the status quo as they help us understand the world [15] and through narrative persuasion and character involvement, can educate, engage and persuade the audience to take action [16]. Projects in the field of Interactive Narratives [34] and in Transmedia Storytelling (TS) [31] have shown potential to influencing social change. In this paper, we narrow our focus on companion Animal Welfare issues by aligning playful interactions, storytelling and emerging

* These authors contributed equally

XR technologies (eXtended-Reality, encompassing: VR, Virtual Reality; AR, Augmented Reality; CR, Cinematic Reality).

For many years, animals were considered only in terms of the benefits they brought to human survival as tools (e.g. dogs for hunting, shepherding, guarding) or objects (e.g. cows for sustenance)[8]. The domestication of certain animals, their antropomorphization and inclusion as members of the family, accentuated their nature as sentient beings, having great importance in the discourse on Animal Welfare rights [8], leading to legislation on Animal Welfare standards. Showcasing the complexity of the Animal Welfare issue, regardless of enacted legislation (e.g. criminalization of cruelty and abandonment) and support programs, many problems persist in many communities (e.g. abandonment of companion animals; overpopulation of stray animals; underfunded/overpopulated kennels). In our specific context, Madeira Island, several government-sponsored programs already exist (e.g. sterilization, microchip identification). Nevertheless, recent policy changes enforcing “No Kill” animal shelters, have left these overpopulated and unable to take in stray animals. Several NGOs (Non-Governmental Organizations) formed by private citizens help to relieve this burden partially, but abandonment and the existence of stray dogs are still pending effective solutions and are negatively impacting the Island’s main economic activity, Tourism.

Abandonment of companion animals is one of the most urgent targets for intervention worldwide [32]. A common strategy is the (re)education of the public concerning this issue. School visits or programs specifically target (re)education of adolescents. For example, Kim and Lee [21] describe a socio-scientific program for middle school students, implemented both at school and in the community, aimed at making students responsible and proactive citizens. Kim and Lee’s work [21] is heavily based on community engagement (e.g. visiting local shelters). However, physical tours are demanding logistically both for schools and shelters and are not scalable to larger programs; virtual tours could easily replace these. Furthermore, by using traditional mediums like books and videos, Kim and Lee [21] miss an opportunity to introduce interactive and engaging content to students. A broader strategy to (re)educate the public is through the use of Social Marketing [23] campaigns (intended to inform and influence behaviour around a social issue through marketing principles). For example, a campaign in Portugal [33] used social networks to raise awareness about a new law criminalizing animals’ mistreatment and abandonment. Transmedia Storytelling falls in line with this broader strategy of (re)educating the public. TS projects are distributed through different media (e.g. web, social media, books, etc.) but come together as a coordinated and unified entertainment experience [19]. This story structure holds great potential to explore complex social issues, decomposing the problem into more manageable and understandable components.

Inspired by the potential of Transmedia aligned with emerging XR technologies, in this paper we describe the design and development of *Tell a Tail*, a TS experience aimed at adolescents (10-19 years old), focusing on companion Animal Welfare issues in Madeira Island. *Tell a Tail* is composed of two main media elements: (1) *Tell a Tail Comic AR*, a branching story, realised as an

AR enhanced comic book, aiming to raise awareness about abandonment, pet care and education practices; and (2) *Tell a Tail 360°*, an interactive and immersive 360° documentary on Animal Welfare, focused on the work of NGOs and kennels. While the two story-artefacts share the same story world, projects explore different topics and stakeholder’s views. The first is specifically aimed at pre-teens (10-13), the second is targeting teens (13-19). Through initial pilot evaluations, we discuss how the union of Transmedia, interactivity and XR technology creates multiple design opportunities such as the use of interactivity to connect knowledge to actionable solutions or the use of media immersion to make participants part of the action. Hence, the main contribution of this work is the design of a transmedia artefact that explores how to leverage XR technologies to inform and raise awareness about a specific social issue.

2 Related Work

2.1 Transmedia for Social Change

In Transmedia Storytelling, Jenkins defends that each medium uniquely contributes to the story world, creating a unified and coordinated entertainment experience [18]. In our work, we explore the role that TS can assume in raising awareness about social issues. When used as a tool to introduce social change, TS is called “Transmedia For Change” (T4C) [31], being correlated with Transmedia activism and personal growth, meaning a change in society or community. Pratten believes that the story is the main component of the experience, and needs to be told to the right people at the right time [31]. Complementing Pratten’s vision, Weinreich states that in order for such type of transmedia to provoke change, the narrative must be engaging, not only in the topic it tackles but in the content of the story itself [37]. A good practice is crafting real characters, believable conflict, and a good story arch to make it believable. In the story, the problem should be exposed, and a solution should be presented in order to “put your audience in situations where they need to make decisions related to the actions you want your audience to take, and show the consequences of those decisions” [1]. However, a significant and intrinsic limitation of transmedia is that it requires an advanced media literate audience, because of its complex narrative structure. When considering children as the consumers, creators should take into account their information-processing capabilities, memory capacity and their attention span [30]. Hence, the TS approach raises concerns on how it can be applied to audiences in late childhood and early adolescence, arguing that it requires children to have the cognitive maturity with advanced media literacy skills needed to make connections between narratives from the different media platforms to provide a fulfilling experience of the story world [30,40].

Several projects explore the union of storytelling and transmedia engagement, to provide its audience with positive messages, by inspiring better choices and/or providing actionable solutions to the issue [1]. TS projects such as Lizzy Bennett Diaries [7], Fragments of Laura [10] and Priya’s Shakti [9] use recognizable conventions of TS and borrow elements from other types of media such as digital

storytelling, documentary film making and art illustration. In this way, hybrid formats emerge “focused on raising awareness about particular social issues or telling the stories of marginalized groups, who otherwise do not have a voice in the public sphere” [13]. To the best of our knowledge, few projects explore the intersection of TS and Animal Welfare. Bear 71 [26] is a TS project where by engaging with the world of a female grizzly bear through several channels such as webcams, augmented reality and geolocation tracking, participants are able to explore the effects that human settlements have on wildlife. Susi [4] is a trans-media project about an old elephant who lives locked up in Barcelona’s zoo since 2002. The project started with an interactive documentary about Susi’s story in an effort to move her into a sanctuary. While Susi remains in the zoo and this goal is yet to be achieved, it raised a citizens’ movement ZOO XXI [2], which is about to achieve a change of model in Barcelona’s zoo. Another trans-media activism experience about wildlife conservation is Endangered Activism [14]. This project makes use of several platforms but also several locations around the world, raising awareness about Animal Welfare conflicts unique to each location. While all these projects show the potential of TS in raising awareness towards Animal Welfare, none of them address the issue of companion animals.

2.2 XR for Social Change

XR technology has the potential to create engaging and novel experiences, many of which are focusing on improving the state of the world by targeting individuals or communities. AR experiences, leveraging AI and computer vision, can help users understand the world, for example, helping visually impaired people navigate spaces [20]. AR experiences can also introduce content into the world with a purpose, as seen in Norouzi et al.’s work [28] where a simulated virtual dog is used for emotional support. Finally, AR experiences can also be used to create empathy for social causes. For example, the World Wildlife Fund used AR to allow users to take photos with endangered leopards [39] and the British National Health System used AR-tracked markers to simulate and show the importance of blood donations [27]. AR has also been used in conjunction with traditional mediums like graphic novels to make digitally-augmented comic books [22] aimed at augmenting the story rather than duplicating. To our knowledge, Priya’s Shakti [9] is one of the few AR comics focusing on social change.

The immersive nature of VR and CR experiences strongly bonds users to story and characters. Peña et al.’s [29] work on Immersive Journalism laid the foundations for VR nonfiction experiences [5] through works such as “Hunger in L.A.” where the audience’s experience, placed in line for a food bank, mirrors the virtual characters. One of the most significant advantages of VR and CR experiences is to be able to transport users in time and space, making them “live” experiences that would not be possible in reality [24,38]. As such, Thomas et al. [36] use VR to depict the presence of trash in the ocean, while Markowitz et al. [25] used VR to stage ocean field trips in the classroom to present the effects of ocean acidity. VR and CR have also been used to promote the animal cause and the organizations that support it: iAnimal [11] used 360° video to show the

living conditions of farmed animals, while Windor’s Green Dog Rescue [3] used a 360° video to show a puppy adoption event.

3 *Tell a Tail* Transmedia

After initial research on companion animals in the Island (including community surveys, interviews with NGOs members, literature review, visits to local shelters, etc.), we identified a complex social problem with several dimensions: uneducated public (how to train dogs, veterinarian care, microchipping, sterilization), preconceptions (preference for breed dogs, pet shops), challenges in the management of kennels and NGOs (overpopulation, lack of funds, lack of volunteers), among others. Due to the vast number of dimensions identified, we opted for the creation of a transmedia world, where different media channels could address different themes of the complex Animal Welfare issue, targeting different audiences’ age range. Baring in mind the limitations of TS regarding audiences’ media-literacy skills. [30,40], we splintered the Tell a Tail transmedia world into two sub-projects targeted at two different but close age groups. Each sub-project is self-contained, employing design strategies appropriate to the target audience while maintaining an overall consistent aesthetic. Additionally, web components (Instagram, YouTube, website) provide the audience with multiple entryways to the transmedia, as well as fulfilling a promotional role. *Tell a Tail* TS leverages XR to create engaging novel experiences for adolescents: (1) *Tell a Tail Comic AR*, is a branching fictional comic book with AR scenes for pre-teens (10-13), and (2) *Tell a Tail 360°*, an immersive nonfiction documentary for teens (13-19).

3.1 *Tell a Tail* Augmented Reality Comic Book

Story In the comic book, story participants can follow the adventures of Chris and her dog Penny. Chris is a pre-adolescent girl struggling to fit in at school, with some self-esteem problems, and easily influenced by her peers. As the narrative unfolds, we witness Chris growing and grappling with the inherent responsibilities of owning a dog. Through a branching narrative, the audience can explore different issues and misconceptions regarding companion Animal Welfare. The overall story is structured to touch upon several themes collected from the field research, such as common reasons behind animal abandonment, how to train and take care of a pet, and how pets have feelings. These topics are present over the two main branches in which the narrative unfolds: (1) Adoption branch, where Penny is adopted from a kennel; and (2) Shop branch, where Penny is purchased in a pet shop. However, each path then tackles a broad set of specific companion Animal Welfare issues, through the unfolding of Chris and Penny’s adventures. For example, the Adoption branch shows to the audience that animals adopted from a kennel can be happy, healthy and affectionate. Moreover, the branch exemplifies how raising a pet, in this case, Penny, takes time and patience (proper dog training and feeding habits). As this story branch develops, Chris goes through personal problems and quickly dismisses her dog,

portraying how easy it is to ignore and forget that a dog has needs and feelings. The Shop branch, on the other hand, exposes the reality of most pet shops and puppy mills, where dogs are bred for profit without regards or proper care, and how important is sterilization to prevent overpopulation. By following Chris and her classmates’ adventures, this story branch touches upon the misconception that breed dogs are “special” and better companion animals than those without pedigree. These two story branches never intertwine along the development of the story. Each branch leads to two different endings.

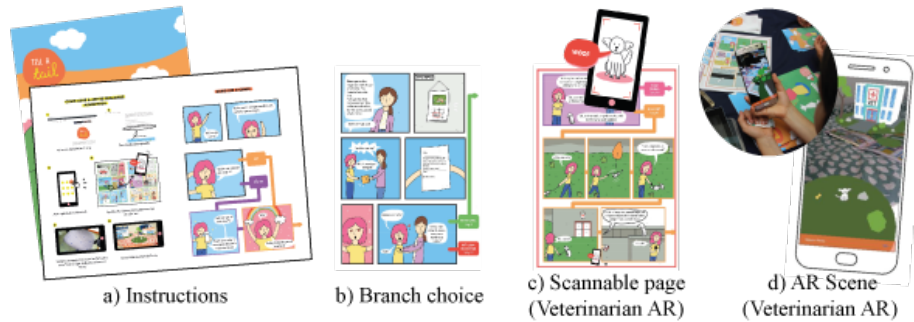


Fig. 1. *Tell a Tail Comic AR*

Twelve AR scenes extend the comic book story to present the audience with Penny’s specific perspective. In these scenes, Penny reacts to situations and talks in the first person, exposing to the readers the animals’ perspective on the events. The AR scenes are distributed in equal numbers among the two main story branches. The goal of the AR scenes is to create a stronger bond between Penny and the reader, making them aware of how animals are sentient and have a different perspective than ours. Furthermore, the AR scenes complement the comic books’ attempt to educate its audience about correct Animal Welfare. For example, in point AR3 - “Veterinarian” (see fig. 1.c/d) we see Penny’s perspective of going to the vet: while initially scared of the vet and vaccines, Penny is relieved when her owner gives her a treat as a reward. This AR scene highlights the importance of providing vet care and the power of positive reinforcement education for pets. In this way, pets associate things that they do not like with something that they do.

User Experience Design The *Tell a Tail Comic AR* combines the traditional experience of reading a comic book with the agency and immersion of an AR world. Considering the target audience of pre-teens, the number of decisions (branches) was limited in order to achieve a stronger dramatic impact for each branch choice. Furthermore, the visual style is minimalist but joyful, privileging clarity over complexity in the attempt to keep the young audience’s interest.

In the two initial pages, the comic book instructs the audience on how to make choices about the story branching, see fig. 1.a. Each branch is color coded, and the border of each panel is highlighted according to the branch. For example, in fig. 1.b, the color red corresponds to the Adoption branch and green to the Shop branch. To move forward in the story, the reader follows to the page presented at the edge. In several panels, the graphical symbol of a smartphone, see fig. 1.c, indicates the availability of an AR scene. These scenes are complementary to the main story, and introduce Penny’s perspective on the events, exploring her feelings and fears. To uncover the AR scene, the reader utilizes the camera view of the AR application to scan the comic book page. This will trigger the placing of a 3D environment into the surrounding real world (see fig. 1.d). The AR scene is comprised of mix between a 3D background environment and a 2D model of Penny. The application allows the reader to create a significant connection with Penny through her clear and simple dialogue and by physically exploring her interactions with the environment. The graphic style of the AR scenes matches the one in the comic book, maintaining consistency between the mediums. The prototype was developed in Unity 2019.3.0a11, using the ARCore module for image and motion tracking and the Fungus package for the narrative inside the AR scenes.

3.2 *Tell a Tail Immersive Documentary*

Story Based on the initial context research, *Tell a Tail 360°* follows a documentary narrative approach portraying the fieldwork of a local NGO, the challenges faced by a kennel and how a Veterinary Hospital responds to animal abuses. This narrative was organized into two branches, (1) the Kennel Branch and (2) the Vet Hospital Branch. In the first branch, the audience follows the kennel manager during her daily routine at the shelter, showing the conditions, spaces (cat and dog shelters) and the challenges they face, stressing the importance of sterilizing and chip identification in controlling the number of abandoned animals. In the second branch, the audience finds more information about the veterinary services applied to a rescued dog, raising awareness about proper animal health care, and what happens when this is neglected. This branch starts inside the veterinary hospital (see fig. 2) where a team is performing procedures to a mistreated dog, Chico. The audience then has the freedom to explore around the hospital facilities to learn about several rescued dogs (through the NGO’s Instagram posts), or to learn more about Chico. By doing the latter, the audience follows the fieldwork of the local NGO who rescued Chico, an ill guard dog, left in the blazing sun by his owners, without water/food.

User Experience Design To experience the *Tell a Tail 360°* prototype, the participant is required to put on a Head Mounted Display (HMD) with a Bluetooth controller. At the beginning of the experience, a two-stage tutorial is presented: the first stage shows instructions on how to adjust the HMD and how to use the controller (to select, go back and skip); the second stage, introduces

user interface elements (e.g. what is selectable). After the tutorial, the audience is positioned at the kennel entrance, where its manager introduces herself and hints that the viewer can explore different content paths by clicking on interactive points (IPs). The IPs are outlined (white line at 50% opacity, see fig. 2) and are responsive to the controller (becoming green lines at 100% opacity when hovered); choosing the kennel manager selects the Kennel branch while choosing the kennel gate selects the Vet Hospital Branch. This initial meeting place functions as a “Homepage” because it is the main departure and arrival setting from and to the narrative branches in the documentary. In both branches, selecting an IP might lead to: 1) 360° videos where the user is prompted to choose their path between multiple interaction points; 2) 360° videos where no action is needed from the user; 3) 360° panorama images where 2D images (representing Instagram posts, etc.) are overlaid. After visiting both branches, the experience restarts. The prototype was developed in Unity 2019.3.0a11 and is compatible with Oculus Go HMDs. Additionally, a non-HMD version was developed where controller actions were replaced with mouse and keyboard actions, and looking in the 360° video was done by clicking and dragging the mouse.



Fig. 2. Veterinary Hospital branch of *Tell a Tail 360°* with two examples of IPs

4 *Tell a Tail Comic AR* Pilot Evaluation

Tell a Tail Comic AR was invited to be showcased at a public school, in a classroom setup. The goal of this pilot study was to understand to which extend the AR component of the experience would enhance the storytelling and the message of the comic book. Furthermore, it would allow uncovering potential shortcomings in the interaction with the comic book and the AR application. A total of 17 pre-teens participated in this pilot evaluation and were randomly divided into two groups (*Comic* group and *Comic+AR* group) each in a different classroom. A short questionnaire was delivered at the beginning of the experience, covering age demographics. From the total participants, 5 were males, 11 were females, and one preferred not to answer. Fifteen participants were 10 years old, one participant was 11 years old, and another was 12 years old. Participants in the *Comic* group would only experience the comic book, and therefore only provided with a copy of the comic book. While participants in the *Comic+AR* group

would experience the comic book with the AR application, and each participant was provided with a comic book, a smartphone with the AR application and earphones. Due to a limitation in the number of mobile phones, 11 participants were assigned to *Comic* group and 6 participants to *Comic+AR* group.

Participants were given around 30 minutes to interact with *Tell a Tail Comic AR* freely. During this time, one researcher would do observation and take notes. The observation guidelines for *Comic* group were the following: “Did participants understand the concept of branching narratives?”; “Did participants freely explore the comic book?” “Did participant search for alternate endings?”. In the *Comic+AR* group, participants were observed with particular attention to these actions: “Did participants have difficulties in scanning the comic book pages and/or placing the AR world”; “Did participants explore the AR world and/or follow Penny?”; “Did participants seem immersed in the AR world?”.

From the observations of the *Comic+AR* group, it was noted that participants firstly open up the mobile application, before opening the comic book. As the app was not reacting (without scanning the markers in the book) they proceed to open the comic book and read the instructions. We observed that 4 of the 6 participants, were very eager to discover what the mobile application could do, so they very quickly started flipping through the book pages to find the AR icon. Nothing happened as they pointed the camera phone directly into the AR icon, instead of the whole page, although this was explained in the instructions. This originated some initial frustration that was quickly overcome as some of the participants explained the correct way to use the application to the others. Moreover, because of their short height, it was hard for participants to scan the page while sitting. Since the scanning process requires some distance between the camera phone and the comic book page (in order to cover the whole area), participants had to stand up, to trigger the AR scene. This led participants to gather into groups, interacting with and observing what others were doing. As soon as the AR Scene started, they would call Penny’s name and chase her around the classroom space, very amused. They would say out loud that they found Penny and try to touch and pet her by putting their hands in front of the phone’s camera. After interacting with the AR scenes, some participants grabbed the comic book to look what was going to happen next, saying out loud: “What is going to happen to Penny?” and “Oh no, poor Penny!”. Participants would often look at each other’s screens and wanted to follow along with what was happening in each other’s stories. We noticed that some participants would just flip through the entire comic book looking for AR scenes. We also observed that generally, participants had some difficulty in placing the AR world overlaid on the physical world, as they did not understand the required actions. ARCore recognition system works properly in well-illuminated areas and with textured surfaces. The classroom where the study was performed was not very well-illuminated, and most table surfaces were plain white, which caused some tracking issues with ARCore. At this point, the researcher stepped in and explained these limitations. Soon after, participants got creative and searched the classroom for areas where the AR world could be placed more easily, such as

backpacks, jackets, etc. We observed that some participants were unsure if AR scene had finished, because of not noticing the “Exit” button or not realizing that they had to press it to end that AR point. Some participants asked if they could engage for longer with the prototype.

From the observations for the *Comic* group, we noted that participants were quietly sitting at their desks and focusing on reading the comic book while correctly following the branching paths. They quickly started reading and following the paths they had chosen to. Participants seemed to be fully immersed and engaged with the story as they would not look up or stop reading. Only one participant at a certain point got confused and asked about where a specific story branch would lead. However, the rest of the participants did not seem to have any troubles in following the branching narrative. When participants reached an end, some of them would go back a couple of pages, considering a new branch to follow. Some participants asked to keep reading the comic longer than the allotted time. At the end of the session, some participants expressed their enjoyment of the graphical style of the comic book, particularly the bright colours.

5 *Tell a Tail 360°* Pilot Evaluation

In order to evaluate the prototype, we organized a pilot study at a public school, in a classroom setting. The goal of this pilot was to understand to which extend the narrative medium would affect the overall experience. A classroom of 18 students (all male, between 15 and 18) was divided into 2 groups of 9 students each. Group *HMD* experienced the HMD version of the prototype (running on an Oculus Go) and prior to the experience were informed on the use of HMD. Group *Non-HMD* experienced the non-HMD version of the prototype (running on the school’s laptops) and prior to the experience were informed on the interactions available. Both groups were briefed on the study, given consent forms and asked to fill out a questionnaire with demographic information and statements on NGOs (e.g. S1 “I’m motivated to volunteer in an NGO”). Each participant interacted for 10 minutes with the prototype during which the researcher took observational notes about the overall reactions and difficulties faced. After this, they were asked to fill a post questionnaire including 8 statements in the form of ordinal items with 5 levels (“Strongly Disagree” to “Strongly Agree”), including a repeat statement from the pre-questionnaire (S1). The remaining statements were: S2 “The technology used was important to keep my attention”, S3 “The chosen topics were appropriate”, S4 “The duration of the experience was appropriate”, S5 “I’m interested in visiting a kennel”, S6 “I would repeat the experience”, S7 “I’m motivated to research about the Animal Welfare topic”, S8 “Being able to choose my path made my experience more memorable”.

The data was analyzed using SPSS 26, and graphs were made in R using `ggplot2`; all data was non-parametric, so Kruskal-Wallis tests were performed to compare groups, but no statistically significant difference was found. Fig. 3 shows boxplots for statements S2-S8. Additionally, Wilcoxon sign rank test were performed to compare pre and post responses to S1. For the *Non-HMD*

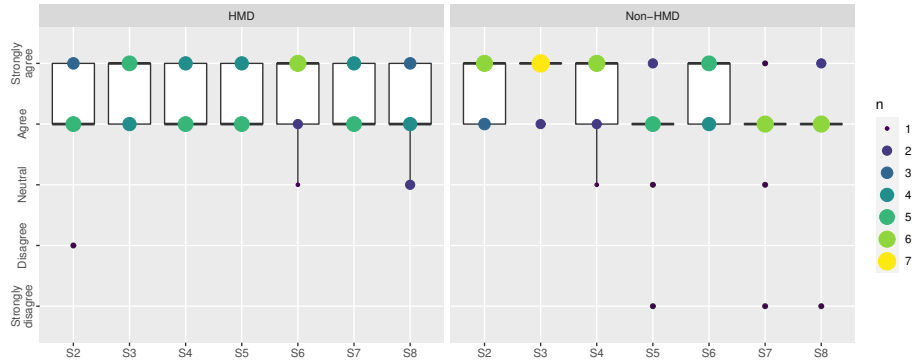


Fig. 3. Boxplots for statements S2-S8 for group *HMD* and *Non-HMD*. The overlaid coloured circles represent a count(*n*) of answers for the specific agreement level.

group, we found a statistically significant change in the desire to volunteer ($Z = -2.46, p = 0.014$), with a median value of 2 (Neutral) before the experience and a value of 3 (Agree) after the experience. For the *HMD* group, we did not find a statistically significant change in the desire to volunteer ($Z = -1.89, p = 0.0591$), with a median value of 2 (Neutral) both before and after visualizing the narrative. Fig. 4 representing the change of responses in S1, shows that all participants either increased or maintained their agreement with the statement.

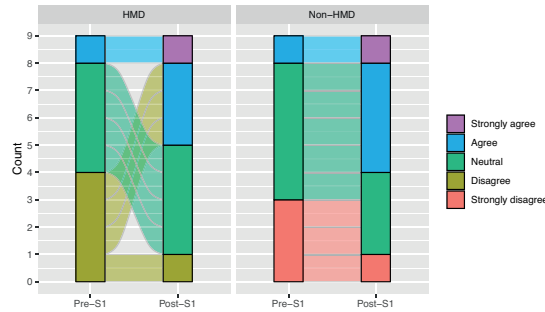


Fig. 4. Alluvial diagram for S1 (“I’m motivated to volunteer in an NGO”), before and after the experience for the *HMD* and *Non-HMD* groups

From the observations, we note that participants in *HMD* group showed more enthusiasm during the experience, making remarks regarding the events happening inside the virtual environment, conveying expressions such as surprise,

curiosity, and mentioned how close they were to the animals. The observations made during this evaluation point out some technical issues that can be resolved for future iterations. Some participants in the *HMD* group reported difficulties using the remote, while some participants in the *Non-HMD* group showed difficulties remembering keys for navigation actions (e.g. S for Skip).

6 Discussion

The *Tell a Tail* pilot evaluations highlight the potential of Transmedia storytelling aligned with emerging XR technologies. We will first address each prototype pilot evaluation separately, before discussing the implications for the overall Transmedia project. Regarding the *Tell a Tail Comic AR*, generally speaking, participants in both groups of the pilot study appreciated the experience. The pre-teens highly praised the visuals of both the comic book and the AR application, perceiving the combination of the comic book with AR as something rather novel to them. Several differences in terms of the user experience were found between the participants of the two groups. While participants in both groups showed that they were excited about the prototype, the excitement of the *Comic+AR* group was much higher than *Comic* group. The excitement in the participants of *Comic+AR* group came from having to use a mobile device and discovering the AR scenes, hence the excitement was heavily influenced by technology. In *Comic* group, participants were excited about the possibility of making choices and having various branches to follow and how this lead to different possible endings, hence the excitement was heavily influenced by the power of interactive storytelling. One thing noticed was that most participants in *Comic+AR* group did not pay much attention to the story; they would flip the comic book pages just looking for the AR content. While in *Comic* group, participants were keen to get to know the story and follow all its possible outcomes. These observations' results indicate that while AR technology can provide users with a sense of excitement, it can at the same time become distracting and detach the users from the story itself, making them only focus on what the technology can do. It is yet to analyze if, after the novelty factor wears off (brought by the AR technology), participants would read the comic book and appreciate its story content. A significant positive aspect emerging from *Comic+AR* group' interactions with the prototype, was the instant connection that they made with the main character Penny, enabled through the interaction with the AR scenes and observed in the out-loud comments made by the participants. This connection was not as clearly observed in *Comic* group; as they were not so vocal as in *Comic+AR* group, keeping their emotions to themselves. Furthermore, in *Comic+AR* group, we noticed that participants had more opportunities for content engagement enabled by the AR scenes. Usability issues were found in the AR application. The visual cues used were not clear enough and the placement of the AR world due to difficulties in surface detection lead to some frustration. The issues encountered accentuate the need for a better introduction to the technology and the interactions available. This can be achieved by redesigning the

“onboarding” process (introduction of a technology to new users) and streamline the transition from comic to AR.

The *Tell a Tail 360°* pilot evaluation shows promising results, in particular regarding the possible inclusion of this prototype in educational settings, with both prototypes *HMD* and *Non-HMD* being well received by the participants. Overall, as can be seen in fig. 3, most participants in the *HMD* group strongly agreed or agreed with all the statements, while participants’ opinion in the *Non-HMD* group was more diverse. In regards to statements on “technology used” (S2), “chosen topics” (S3) and “duration of the experience” (S4), both groups expressed similar opinions, towards strongly agreeing or agreeing; this is expected since topics and duration are the same for both prototypes, and both prototypes used engaging technology to deliver content. Likewise, both groups wanted to “repeat the experience” (S6); we speculate that this was incentivized by the branching narrative, the novelty factor of the technology, and the content itself. Regarding “visiting a kennel” (S5) and “research about the Animal Welfare topic” (S7), participants from the *HMD* group more consistently focused their responses on the strongly agree or agree. We speculate that the novelty factor of VR had some impact in this, as the immersive nature of the experience might have generated interest to either visit or investigate the topics further. Lastly, participants in the *Non-HMD* group had a lower level of agreement than the *HMD* group on “choosing my path made my experience more memorable” (S8). One possible reason for this is that since interaction performed through a mouse click is analogous to browsing a website, it is quite common in their daily lives; again, the novelty factor of HMDs might have made the choices of the experience more memorable for *HMD* group. While only a statistically significant difference was found for the *Non-HMD* group in regards to desire to volunteer in Animal Welfare related activities, results for both groups are encouraging. As can be seen in the alluvial diagram in fig. 4, all participants either maintained or increased the desire to volunteer; this is promising since these types of experiences could be used to promote activism in students, “demystifying” the experience of volunteering in animal-related NGOs. Furthermore, these results might indicate that the presentation mode (*HMD* vs *Non-HMD*), and the inherent novelty factor, might not be a factor in determining their future commitment. This would be consistent with Steinemann et al.’s [35] study on increasing donation behaviour in a Game for Change, where the presentation mode was not a factor, but interactivity was. Similarly to the *Tell a Tail Comic AR* pilot, usability issues were identified, in particular, on the use of the controller in the *HMD* group. The solution for this is two-fold: (1) a renewed focus on “onboarding” would help participants with no experience in this type of medium, and (2) simplifying the number of actions possible with the controller would reduce task loading.

Looking at the transmedia experience as a whole, from both pilot evaluations results it is clear that the participants’ appreciated both the content and the technology used to deliver it. To note is that our target audience having grown up in a digital age, comfortably deals with technology. We believe that this predisposition to embrace technology is a good strategy to communicate

companion Animal Welfare issues with such audience. Their natural engagement with technology can be carried over to the socially engaged message. However, this is a subject for further evaluation in the next iteration of the prototypes.

A common link between the pilot studies is the fact that the use of XR technologies implies a novelty factor, which has both advantages and disadvantages (like “onboarding” or access to technology). While experiencing the XR technologies, participants were engaged with the content, but it is yet to be understood to what extent this translates into being informed or able to critically understand the message regarding companion Animal Welfare. Furthermore, designers should leverage the relationship between XR technology and the message since different XR technologies might carry over the message more effectively than others. The interactivity enabled by an AR game puts the participant in a situation where their actions have immediate repercussion on the world and may lead to a solution of the issue. For example, in *Tell a Tail Comic AR*, the participant is able to see an immediate effect on Penny when they apply a positive reinforcement (dog treat), see fig. 1.d. Furthermore, the immersive nature of XR and the “feeling of being there” [17] can also be leveraged to put the participant in the situation and create a stronger bond with the story and characters. For example, in *Tell a Tail 360°*, seeing the poor conditions from which the dog was rescued in a 360° environment, see fig. 2, might establish a stronger connection with the animal and the cause at large. Hence, XR technology features can and should be exploited for the best delivery of the story message.

7 Future Work and Conclusion

Acknowledging the fact that these were pilot evaluations with several limitations (sample size, gender diversity, evaluation measures, iterating prototypes, etc.), a long term evaluation needs to be conducted to accurately assess the impact of XR technologies in Transmedia Storytelling and their effectiveness in communicating Animal Welfare issues. In summary, *Tell a Tail* tackles a current, multi-faceted and complex societal concern, companion Animal Welfare. The intricate nature of this topic makes it suitable for a Transmedia world. In fact, the TS story structure allows for complex worlds that can expand as the issues in contemporary society evolve, by providing new content over different channels, pushing for novel experiences to raise awareness on the matters at stake. Both *Tell a Tail Comic AR* and *Tell a Tail 360°* show how XR technology can produce an emotional link with the Animal Welfare topic while providing an entertaining experience. Nevertheless, it is important to note that educating audiences is a complex process, and this project provides an entry to the topic, reporting on a preliminary exploration on how to use Transmedia Storytelling to sensitize young audiences towards Animal Welfare.

Acknowledgments: This work has been supported by MITIExcell (M1420-01-0145-FEDER-000002), MADEIRA 14-20 FEDER funded project Beanstalk (2015-2020), LARSyS-FCT Plurianual funding 2020-2023 (UIDB/50009/2020) and FCT Ph.D. Grant PD/BD/128330/2017 and PD/BD/114142/2015.

References

1. The Immersive Engagement Model: Transmedia Storytelling for Social Change, <http://www.social-marketing.com/immersive-engagement.html>
2. ZOOXXI | Zoo XXI, <http://zooxxi.org/en/>, library Catalog: zooxxi.org
3. ABC7: 360 VIDEO: Green Dog Rescue puppies at ABC7 (2018), <https://www.youtube.com/watch?v=YWpG9T3N0EY>
4. Aire, A., Zonca, C.: Susi, an elephant in the room, <https://www.facebook.com/SusiWebdoc/>
5. Bevan, C., Green, D.P., Farmer, H., Rose, M., Cater, K., Stanton Fraser, D., Brown, H.: Behind the Curtain of the "Ultimate Empathy Machine": On the Composition of Virtual Reality Nonfiction Experiences. In: Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems - CHI '19. pp. 1–12. ACM Press, Glasgow, Scotland Uk (2019). <https://doi.org/10.1145/3290605.3300736>, <http://dl.acm.org/citation.cfm?doid=3290605.3300736>
6. Bogost, I., Ferrari, S., Schweizer, B.: Newsgames: journalism at play. MIT Press, Cambridge, Mass (2010), oCLC: ocn606234291
7. Bushman, J.: The Lizzie Bennet Diaries, <https://www.jaybushman.com/lizzie-bennet>, library Catalog: www.jaybushman.com
8. Carr, N.: Defining Domesticated Animals and Exploring Their Uses by and Relationships with Humans within the Leisure Experience. In: Carr, N. (ed.) Domestic Animals and Leisure, pp. 1–13. Leisure Studies in a Global Era, Palgrave Macmillan UK, London (2015). https://doi.org/10.1057/9781137415547_1
9. Chattopadhyay, D.: Can comic books influence consumer awareness and attitude towards rape victims and perpetrators in India? The case of *Priya's Shakti*. Journal of Graphic Novels and Comics pp. 1–19 (Dec 2017). <https://doi.org/10.1080/21504857.2017.1412992>, <https://www.tandfonline.com/doi/full/10.1080/21504857.2017.1412992>
10. Dionisio, M., Nisi, V., Nunes, N., Bala, P.: Transmedia Storytelling for Exposing Natural Capital and Promoting Ecotourism. In: Nack, F., Gordon, A.S. (eds.) Interactive Storytelling. pp. 351–362. Lecture Notes in Computer Science, Springer International Publishing, Cham (2016). https://doi.org/10.1007/978-3-319-48279-8_31
11. Equality, A.: iAnimal - a virtual reality experience into the lives of farmed animals (2017), <https://ianimal360.com>, library Catalog: ianimal360.com
12. Flanagan, M.: Critical play: radical game design. MIT Press, Cambridge, Mass. London (2013), oCLC: 935016500
13. Gair, S., Van Luyn, A. (eds.): Sharing qualitative research: showing lived experience and community narratives. No. 21 in Routledge advances in research methods, Routledge, Taylor & Francis Group, Abingdon, Oxon ; New York, NY (2017)
14. Galpin, S., Galpin, D.: Endangered Activism: A Transmedia Experience, <https://endangeredactivism.org/where-in-the-world>, library Catalog: endangeredactivism.org
15. Green, M.C., Brock, T.C.: The role of transportation in the persuasiveness of public narratives. Journal of Personality and Social Psychology **79**(5), 701–721 (2000). <https://doi.org/10.1037/0022-3514.79.5.701>, <http://doi.apa.org/getdoi.cfm?doi=10.1037/0022-3514.79.5.701>
16. Green, M.C., Brock, T.C., Kaufman, G.F.: Understanding Media Enjoyment: The Role of Transportation Into Narrative Worlds. Communication Theory **14**(4), 311–327 (Nov 2004). <https://doi.org/10.1111/j.1468-2885.2004.tb00317.x>, <https://academic.oup.com/ct/article/14/4/311-327/4110790>

17. Heeter, C.: Being There: The Subjective Experience of Presence. *Presence: Teleoperators and Virtual Environments* **1**(2), 262–271 (Jan 1992). <https://doi.org/10.1162/pres.1992.1.2.262>, <http://www.mitpressjournals.org/doi/10.1162/pres.1992.1.2.262>
18. Jenkins, H.: *Convergence culture: where old and new media collide*. New York University Press, New York (2006), oCLC: ocm64594290
19. Jenkins, H., Deuze, M.: Editorial: Convergence Culture. *Convergence: The International Journal of Research into New Media Technologies* **14**(1), 5–12 (Feb 2008). <https://doi.org/10.1177/1354856507084415>, <http://journals.sagepub.com/doi/10.1177/1354856507084415>
20. Katz, B.F.G., Kammoun, S., Parseihian, G., Gutierrez, O., Brillhault, A., Auvray, M., Truillet, P., Denis, M., Thorpe, S., Jouffrais, C.: NAVIG: augmented reality guidance system for the visually impaired. *Virtual Reality* **16**(4), 253–269 (Nov 2012). <https://doi.org/10.1007/s10055-012-0213-6>, <https://doi.org/10.1007/s10055-012-0213-6>
21. Kim, G., Lee, H.: A case study of community-based socioscientific issue program: focusing on the abandoned animal issue. *Journal of Biological Education* **0**(0), 1–15 (Nov 2019). <https://doi.org/10.1080/00219266.2019.1699150>
22. Kljun, M., Pucihar, K.v., Alexander, J., Weerasinghe, M., Campos, C., Ducasse, J., Kopacin, B., Grubert, J., Coulton, P., Čelar, M.: Augmentation not duplication: Considerations for the design of digitally-augmented comic books. In: *Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems*. CHI '19, Association for Computing Machinery, New York, NY, USA (2019). <https://doi.org/10.1145/3290605.3300333>, <https://doi.org/10.1145/3290605.3300333>
23. Lee, N., Kotler, P.: *Social marketing: influencing behaviors for good*. SAGE Publications, Thousand Oaks, Calif, 4th ed edn. (2011), oCLC: ocn733232905
24. Loon, A.v., Bailenson, J., Zaki, J., Bostick, J., Willer, R.: Virtual reality perspective-taking increases cognitive empathy for specific others. *PLOS ONE* **13**(8), e0202442 (2018). <https://doi.org/10.1371/journal.pone.0202442>, <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0202442>, publisher: Public Library of Science
25. Markowitz, D.M., Laha, R., Perone, B.P., Pea, R.D., Bailenson, J.N.: Immersive Virtual Reality Field Trips Facilitate Learning About Climate Change. *Frontiers in Psychology* **9**, 2364 (Nov 2018). <https://doi.org/10.3389/fpsyg.2018.02364>
26. Mendes, J., Allison, L.: Bear 71: Wildlife [Transmedia] Storytelling From NFB Canada (Nov 2012), <http://www.bear71.nfb.ca/#/bear71>
27. NHS: NHS Virtual Blood Donation (2017), <https://www.youtube.com/watch?v=-zNWP41zrJQ>
28. Norouzi, N., Kim, K., Lee, M., Schubert, R., Erickson, A., Bailenson, J., Bruder, G., Welch, G.: Walking your virtual dog: Analysis of awareness and proxemics with simulated support animals in augmented reality. In: *2019 IEEE International Symposium on Mixed and Augmented Reality (ISMAR)*. pp. 157–168. IEEE (2019)
29. de la Peña, N., Weil, P., Llobera, J., Spanlang, B., Friedman, D., Sanchez-Vives, M.V., Slater, M.: Immersive Journalism: Immersive Virtual Reality for the First-Person Experience of News. *Presence: Teleoperators and Virtual Environments* **19**(4), 291–301 (Aug 2010). https://doi.org/10.1162/PRES.a_00005, http://www.mitpressjournals.org/doi/10.1162/PRES.a_00005
30. Pietschmann, D.: *Limitations of Transmedia Storytelling for Children: A Cognitive Developmental Analysis* p. 24 (2014)

31. Pratten, R.: Getting started with transmedia storytelling: a practical guide for beginners - 2nd edition (2015), oCLC: 923758058
32. Santos Baquero, O., Akamine, L., Amaku, M., Ferreira, F.: Defining priorities for dog population management through mathematical modeling. *Preventive Veterinary Medicine* **123**, 121–127 (Jan 2016). <https://doi.org/10.1016/j.prevetmed.2015.11.009>
33. Sousa, B., Soares, D.: Combat to Abandonment and Mistreatment of Animals: A Case Study Applied to the Public Security Police (Portugal). In: Galan-Ladero, M.M., Alves, H.M. (eds.) *Case Studies on Social Marketing: A Global Perspective*, pp. 245–252. Management for Professionals, Springer International Publishing, Cham (2019). https://doi.org/10.1007/978-3-030-04843-3_21
34. Steinemann, S.T., Iten, G.H., Opwis, K., Forde, S.F., Frasseck, L., Mekler, E.D.: Interactive Narratives Affecting Social Change: A Closer Look at the Relationship Between Interactivity and Prosocial Behavior. *Journal of Media Psychology* **29**(1), 54–66 (Jan 2017). <https://doi.org/10.1027/1864-1105/a000211>, <https://econtent.hogrefe.com/doi/10.1027/1864-1105/a000211>
35. Steinemann, S.T., Mekler, E.D., Opwis, K.: Increasing Donating Behavior Through a Game for Change: The Role of Interactivity and Appreciation. In: *Proceedings of the 2015 Annual Symposium on Computer-Human Interaction in Play - CHI PLAY '15*. pp. 319–329. ACM Press, London, United Kingdom (2015). <https://doi.org/10.1145/2793107.2793125>, <http://dl.acm.org/citation.cfm?doid=2793107.2793125>
36. Thomas, A., Kumar, A., Krehel, R., Vasey, K., Khoo, E.T., Marsh, T., Junting, B.L.: Oceans we make: immersive VR storytelling. In: *SIGGRAPH Asia 2018 Virtual & Augmented Reality*. pp. 1–2. SA '18, Association for Computing Machinery, Tokyo, Japan (Dec 2018). <https://doi.org/10.1145/3275495.3275513>, <https://doi.org/10.1145/3275495.3275513>
37. Weinreich, N.K.: *Hands-On Social Marketing: A Step-by-Step Guide to Designing Change for Good*. SAGE Publications (Oct 2010), google-Books-ID: rn4mO5AZglcC
38. Westervelt, A.: Reality Is Too Confining (Oct 2014), <https://www.conservationmagazine.org/2014/10/reality-is-too-confining/>, library Catalog: www.conservationmagazine.org
39. WWF: “Take a Photo with the Leopard” environmental information campaign (2016), <https://wwf.panda.org/?300852/Take-a-Photo-with-the-Leopard-environmental-information-campaign-Leopard-has-Never-Been-so-Close>
40. Young-Sung, K., Daniel, H.B.: An exploration of the limitations of transmedia storytelling: Focusing on the entertainment and education sectors. *Journal of Media and Communication Studies* **10**(4), 25–33 (Apr 2018). <https://doi.org/10.5897/JMCS2018.0607>, <http://academicjournals.org/journal/JMCS/article-abstract/38B0EB756758>