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ABSTRACT

The widespread affordability of digital technologies is encouraging artists to experiment and make use of them in their artworks. This paper describes the design and in-the-wild evaluation of DreamScope, a bespoke 360° mobile virtual reality (VR) interface designed for immersive interaction in the Lucid Peninsula physical narrative art installation. We evaluated the VR interface by means of a questionnaire based on the Positive and Negative Affect Scale (PANAS) and individual items related with the interaction within the exhibition. Results extracted from 53 subjects highlight how the interface supported engagement, positive affect and reflections on the narrated scenario of the art installation. The study reported in this paper provides evidence of the positive role of 360° mobile VR in strengthening the narrative and the artist's intent in the Lucid Peninsula artistic installation.

CCS CONCEPTS

• Human-centered computing \rightarrow Ubiquitous and mobile computing \rightarrow Empirical studies in ubiquitous and mobile computing; • Human-centered computing \rightarrow Human computer interaction (HCI);

KEYWORDS

Usage Scenarios and Applications • Interactive narrative in the real world • Mobile Interaction • Virtual Reality • Interactive Storytelling •Evaluation Methods.

1 INTRODUCTION

The widespread affordability of digital technologies is continuously encouraging artists to experiment and make use of them in their artworks. This is leading to increasing adoption of interactive technologies in art works and settings, such as museums, galleries and theatres. The fascination of artists with technologies goes back a long time and predates computers,

manifesting the convergence of art and electronics in the late 60s, with works such as PULSA and Kluver and Raushenberg Experiments in Technology and Art [1] to name a few. But it is only in the early 1990s that New Media Art emerged as a movement in which artists start creating new forms of digitally enabled interactive expression [2]. What was originally an exploration of computer-controlled device for art expression, such as screens and audio/video feedback, quickly expanded to the physical environment and augmentation of human perception [3]. Technological advances in physical computing, the Internet of Things (IoT) and VR increasingly influence the interactive art scene allowing artists to make use of technology as a creation as well as a support tool for their art [4]. However, bringing new technologies into scene unlocks the need for artists to consider audience feedback as constructive measures that can improve the impact of digital interactive technologies on the artwork itself. Nevertheless, evaluation of artistically oriented digital and interactive systems is still an open research challenge.

In this paper, we present Lucid Peninsula—a physical narrative which encompasses a digital interactive component (DreamScope). The paper frames the challenge of designing and evaluating interactive art installations within the current the state of the art. Finally, we present Lucid Peninsula evaluation and its main results. By sharing our discussion and conclusions we envisage contributing to both communities of creative practitioners and scholars, inform them and inspire them through our findings.

1.1 Lucid Peninsula, a Physical Narrative Art Installation

The Lucid Peninsula Installation and the Dreamscope interactive interface emerged from a collaboration between an art collective and a group of technologists and HCI researchers in the context of The Future Fabulators EU Media and Culture Project¹. Lucid Peninsula was designed using techniques from physical narration, context-aware narrative, and future pre-enactment to translate future and fictional scenarios into story worlds. The underlying art piece is a physical installation, developed to engage the wider audience with a possible dystopic future, in which the practice of Lucid Dreaming plays a role [5]. The Lucid Peninsula exhibits through a physical narrative-the physical manifestation of a narrative, achieved by reconstructing the environment as well as the memories pertaining to the characters that inhabited such world at the time of the story. In Lucid Peninsula, changes to the Earth's atmosphere have led to the emergence of new species, conditions, and ways of life, including Lucid Dreaming practices. The landscape is the borderline between the land and the sea, convoluted and intertwined. Fragments of memories and dreams belonging to the inhabitants of the previous era still linger in this new world, hovering over certain locations.

To augment the audience experience of Lucid Peninsula and help them connect to this dystopic world, we developed DreamScope. The DreamScope interface allows the audience to see the Lucid Peninsula world in 360° VR form and experience the dreams and memories of its inhabitants. DreamScope is composed of a stereoscopic viewer (DreamViewer) and a mobile application (DreamCatcher). The Viewer and Catcher work in tandem to augment and deepen the audience experience with the artistic installation. They strengthen the artist's message and help the users make sense of the artistic world of which the art installation is an instance.

2 RELATED WORK

In the recent decades with advances of physical computing, virtual reality and the Internet of Things (IoT) artists have often chosen technology to complement their artistic expressions [5]. In this section, we highlight how interaction design and HCI become useful tools for artists expressing themselves through interactive physical installations. For the purpose of this work we refer in particular to Installation Art - a contemporary art form in which the viewer is required to physically enter the work in order to experience it [6]. The integration of technology with this art form is mainly focused on the usage of new input and output modalities, leading to a diverse and eclectic field of work. Previous work has focused on the use of speech [7], gaze [8] or body movement [9], among others, as input for interactive artwork. Similarly, technology was applied to outputs in interactive artwork such as in the use of actuated/kinetic devices [10] or projection and touchscreens [11]. Another emerging trend in interactive artwork is the use of mobile devices. Bluff and Johnston for example, make use of mobile devices, to control and adjust an interactive installation [12]. While VR has been an experimental ground for artist for decades, (Jeffrey Shaw Golden Calf for example, was exhibited at Ars Electronica, Linz, Austria, in 1994) more recently we have witnessed a renaissance of the VR practices. According to Smith's [13], in the last few years artists manifested a strong desire to use VR to create expressive 3D experiences. Char Davies's artwork, for instance [14], makes use of VR headsets for the environmental exploration of other worldly shapes and particles. Similarly, Galantay et al.'s augmented reality work [15] proposes to over impose 3D media into the spatial context around the participant. Combined with the commercialization of easy-to-use VR platforms (such as Oculus VR and Google Cardboard²) this trend accentuates the potential of VR in interactive art installations. Supply and demand seems aligned for VR platforms to become a mainstream medium for interactive artwork. Moreover, some of these art driven installations and physical narratives follow a Critical Design paradigm, like for example, Time's Up's Turnton, a small city on the sea³ or Blast Theory's Desert Rain [16]. In Critical Design systems and installations are built to 'reveal potentially hidden agendas and values' [17] Critical Design has, for instance, aimed at making people reflect on their everyday practices and the implications of our action on possible futures [18][19]. In order to evaluate and understand better the artworks effects on its audience and people's reactions to such art works, HCI methods can play a role [20].

Debates on the methods and generalizable qualities of interactive art evaluations have been active for quite a while. Recently Interactive Art has become a focus of interest in HCI. Mixed Reality Lab collaboration with Blast Theory art collective yielded several seminal publications on this topic, arguing for how combination of ethnography, audience feedback and analysis of system logs led to new design insights [21] [22]. On the other hand, Höök et al. [23] report that most HCI research in interactive art installations only describes the system itself and provides weak data for evaluation in the form of informal chats, small study sizes. Progressing from Höök argument, Morrison et al. [24] introduce the concept of ludic engagement-privileging pleasure over function in order to evaluate artistic installations, highlighting how to evaluate such works requires an integration of art-criticism techniques and HCI methods, and an understanding of the different nature of engagement in these environments. Aasbakken et al.'s [11] make use of shadowing, scales and questionnaires (User Interaction Satisfaction, the System Usability Scale and the EGameFlow Questionnaire) as well as input logging, to determine the caveats of using touchscreen and physical buttons with projections. Morreale and De Angeli [9] studied audience enjoyment of interactive art works through observations, interviews, questionnaires and offline analysis of log data and videos (to detect behaviors that they assumed were linked to enjoyment of the artwork). In line with previous research, suggesting that emotions are a strong indicator of enjoyment [25], Jacucci et al. [6] concentrate on the study of emotions through emotion scales (Positive and Negative Affect Scales - PANAS), questionnaires and video-recordings. These works do not adhere to the idea that artwork should follow HCI

¹ https://timesup.org/FutureFabulators

² https://vr.google.com/cardboard/

³ http://rixc.org/en/exhibitions/2015/470/

principles but rather believe that the adaptation of usability techniques, goals and methods can be beneficial to artists, streamlining the expression of their work and uncovering possible barriers to the enjoyment and comprehension of the artwork [23].

Building on these previous works, in our study, we apply the PANAS scale in evaluating an interactive narrative art installation, enriched by a series of questions directly probing users about their engagement, enjoyment, curiosity and perception of the artefacts used. We envisage, findings and discussion from our study, although hard to apply to different settings and art installations, might still sensitives and inspire Interactive Art researchers and practitioners.

3 LUCID PENINSULA: THE PHYSICAL NARRATIVE ART INSTALLATION

The Lucid Peninsula physical narrative takes the form of an interactive art installation designed to offer the audience means to experience a dreamlike, post-apocalyptic story world where our lives would be dramatically different from today. For the design and functionality of DreamScope we followed a Design Fiction approach [26]. For this purpose, the whole system and its installation are centred around an imaginary world, beyond classical interactive systems. In such story world, made tangible through the artistic installation, the audience can experience the Lucid Peninsula world, interact with its objects, meet its characters and have a peek at their lifestyles, reflect on, and ask themselves questions such as: Could I live in this world?

3.1 Story World

The Lucid Peninsula story world emerged from a future scenario planning activity undertaken by artists, technologists and designers together, collaborating in Future Fabulators a Culture Europe in June 2014. Lucid Peninsula is a futuristic world that feels familiar, yet strange: an eternal twilight of dreamlike metaphors and shape-shifting beings. Environmental living conditions have radically changed and the search for green plants has become crucial for survival. The outside air is toxic: not immediately lethal, but requiring special gear and treatment after exposure. As long as people continue to travel to the Lucid Peninsula, a place, to rest and recover before the next leg of the journey, will be necessary. As travellers rest or sleep through the recovery process, the capacity to dream is vital: to be lucid, to share and live in dreams, is a necessity. The act of Lucid Dreaming is an important part of life in this future world sustained by memories of a time when things were different.

3.2 Art Installation

The physical installation (see Figure 1) recreates a special environment with an air-purifying machine, medical gear necessary for the detoxing process, a machine to archive dreams and memories, and the interactive DreamScope virtual interfaces. The art installation reconstructs the very room where inhabitants of such world undergo the detoxing treatment, which is enabled by the injection of a special disinfectant in the bloodstream (called "General Infection Negation Liquid") and the generation of high oxygen breathable air in the room by a plant activated purifying machine. From inside the room the person can peek outside at the barren world of the Lucid Peninsula, detect air conditions, presence of other species and dream activity hovering above certain locations.

To further engage and immerse the audience in the Lucid Peninsula experience we augmented the physical installation with two virtual interfaces: a stereoscopic viewer device (the DreamViewer) and a mobile 360° VR catcher device (the DreamCatcher). The DreamViewer resembles a binocular that the audience can use to explore the world outside and absorb data relating to factors such as air quality, presence of plant and other life forms, etc. The DreamCatcher is a mobile device the audience can borrow to extend the experience outside the recovery room represented by the installation. This is accomplished by using the mobile device to look for markers in the physical world, "catching" the dreams of the inhabitants of the peninsula. The dreams are "mixed" with memories of the world before it was transformed.



Figure 1: Physical Installation of Lucid Peninsula; Top: Participants engaging with the DreamViewer; Middle Air purifying machine; Bottom Left: GIN Bottles; Bottom Right: DreamScope Advertising.

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3.3 Dream Viewer

With the DreamViewer (see Figure 2) visitors can enjoy a 180° panoramic view of the outside world, as if they are looking through a window of the room. The 3D world depicts a desert-like landscape with orange sky and large red sun. It simulates the landscape outside the recovery room, highlighting buildings that the user can explore in the outside world and the dream activity present in or around them. Users can zoom in on buildings in the landscape to apprehend more details of the structure. This interface is supported through the use of a Google cardboard virtual reality kit built into a Steampunk styled brass, leather and oiled canvas holder. Dream viewer was built using the Unity game engine ⁴ and receives input from the compass, the accelerometer and gyroscope in order to show the virtual environment of the Lucid Peninsula in the 180° panoramic view.



Figure 2: DreamScope Viewer; Top: Participant holding the DreamViewer device; Middle: DreamViewer Stereoscopic bespoke lenses with a metal encasing; Bottom: Screenshot of the Lucid Peninsula World.

3.4 Dream Catcher

With DreamCatcher visitors discover the dreams of the Lucid Peninsula inhabitants. A poster in the fictional recovery room alerts users that they can encounter and experience fragments of dreams through the mobile DreamCatcher device. This device makes use of an Android application built in Unity and it features image recognition software to capture specific markers, triggering the virtual environments of characters' dreams (see Figure 3). The dreams are narrated over a 360° panorama of the space where the dream is embedded. The dreams revolve around three main locations, a garden, a restaurant and a library. These locations are highlighted in the DreamViewer 180° VR panorama (to create awareness in the user) and then are chosen by the artist as locations in the physical world. Participants are required to leave the Detoxing Room, borrow a mobile device from the artist or reception, and roam around in search of the dreams. When the visitor gets to a place where a dream is available a visual marker (see top of Figure 3) indicates the presence of a dream. Visitors can scan the marker using the camera of the mobile device and trigger an interactive 360° panoramic view of the Lucid Peninsula location. The participant can then explore the 360° panorama loaded on the mobile device by rotating around themselves while holding the phone upfront. Through this scanning gesture the fictitious environment of the Lucid Peninsula world reveals itself through the mobile screen.



Figure 3: DreamScope Catcher: Top - participant capturing the marker triggering lucid dream like content. Middle: Participant interaction with the interface to discover the inhabitants dreams; Bottom: Screenshots of the visuals depicting past and present of the Lucid Peninsula world.

⁴ https://unity3d.com

By tapping the screen, users can create circular viewing portals that show what the Lucid Peninsula world looked like in the present. An audio narration recounts the dream mixed with memories from the dreamers. The dreams themselves focus on the past and how the world once was (our current world) and the nostalgia the present inhabitants feel about such distant times, mixed with stories of their present lives.

4 EVALUATION METHODOLOGY

The Lucid Peninsula physical narrative installation was successfully presented in the context of two exhibitions, at IMA, Hainburg, Austria, and in Cluje, Romania. In both settings, responding to informal probing, the diverse audiences found the DreamScope interface entertaining and thought-provoking. Based on these preliminary positive results, we decided to design and perform a systematic evaluation of the installation at the next exhibitions. The opportunities manifested during the Art Exhibitions of the Creativity and Cognition Conference held in Glasgow in the summer of 2015, and the International Conference for Interactive Storytelling, held in Copenhagen in the fall of 2015.



Figure 4: Participants filling out the questionnaire.

4.1 Measurements

We designed a specific survey touching upon a series of parameters such as: i) Demographics and background of the audiences; ii) Engagement and enjoyment experienced while visiting the exhibition; iii) Level of immersion; iv) Quality of the interaction experience while using the mobile devices; and v) How the interactive artefacts supported the artist intent. Finally, we gathered data about: vi) Provoked emotions by applying Positive and Negative Affect Scales (PANAS). The methods chosen are conductive to data that is quantitative when compared to more open-ended techniques such as interviews, think-aloud protocols or participant observation (either live or recorded), which rely on a subjective understanding of the personality and attitudes of the audience [6]. We purposefully designed the questionnaire to limit the response time to a maximum of five minutes not to disrupt the visitors' experience of the rest of the exhibition, being Lucid Peninsula just a part of a bigger show. The demographics data gathered were quite simple, consisting of gender, age range and occupation. Table 1 below summarizes the questionnaire items related to engagement and enjoyment, immersion, technology interaction and exhibition theme. Scores are derived from a scale 1 "not at all", 2 "a little", 3 "moderately", 4 "quite a bit" and 5 "extremely". All items are positively formulated, except for items t1 and t2, which are negatively formulated.

PANAS is composed by positive and negative affect subscales, each consisting of 10 terms. Respondents are asked to rate the extent to which they have experienced each emotion in a 5-point scale from 1 (Very Slightly or Not at All) to 5 (Extremely) [27]. Positive affect (PA) represents the extent to which a person feels enthusiastic, active and alert, reflecting the state of full concentration, high energy and engagement, whereas negative affect [27], [28] is characterized by sadness and lethargy leading to a subjective distress and un-pleasurable engagement [29]. Positive affects results include being interested, excited, strong, enthusiastic, proud, alert, inspired, determined, attentive and active while negative affects results include being distressed, upset, guilty, scared, hostile, irritable, ashamed, nervous, jittery and afraid.

4.2 Participants

A total of 53 participants answered to the questionnaire; 51% were males and 49% were females. The sample's age range with highest number of participants was between 26-35 years old (49%). 23% between 36-45, 15% between 16-25 and finally only 13% of the participants between 46 and 65 years old. From the participants who responded the questionnaire, 60% were researchers participating in the conferences where the exhibition was held.

4.1 Data Analysis

All statistical analyses were performed using the SPSS package. Preliminary analyses were conducted on all items and scales to ensure no violation of the assumptions of normality, linearity and homoscedasticity. We also checked the reliability of the scales applied in our questionnaire to insure the consistency of the measures in the context of our sample. A scale reliability is considered high when Cronbach's alpha Value α >0.75. Internal reliability for both PANAS PA and NA revealed Cronbach's α =0.81 for the PA scale, and α =0.86 for the NA scale respectively.

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5 FINDINGS

Results show high levels of enjoyment and engagement in the exhibition, as represented by items ee1 and ee2 in Figure 5. Results show a strong and positive relationship ([r=0.69, n=52, p<0.05]) between enjoyment and engagement, with high levels of enjoyment associated with high levels of engagement.

Results highlight that the installation was successful in arousing the participants' curiosity in futuristic scenarios (as seen in item ex1 in Figure 5). Furthermore, results show strong correlation between engagement and curiosity in future scenarios ([r=0.54, n=52, p<0.05] but also between enjoyment and curiosity in future scenarios ([r=0.58, n=53, p<0.05])).

This shows that increasing curiosity is awakened when discovering the future scenario of Lucid Peninsula, consequently the more engagement and enjoyment participants felt.



Figure 5: Boxplot for analysis dimension. The horizontal axis represents the items (see Table 1) while the vertical axis represent the Likert scale. Outliers values are represented by small circles while extreme outliers are represented by small stars.

Table 1: Questionnaire Items in Addition to the PANAS scale

| Engagement and Enjoyment |
|--|
| ee1) I felt engaged with the installation |
| ee2) I enjoyed visiting the installation |
| Immersion |
| i1) It felt I could interact with the world of the exhibition as |
| if I was in the real world |
| i2) While I was experiencing Lucid Peninsula I was unaware |
| of what was happening around me |
| Technology Interaction |
| t1) I was annoyed with the way information was presented |
| on audio/multimedia |
| t2) The multimedia devices provided were complicated to |
| use |
| t3) The interaction with the multimedia devices was clear |
| and understandable |
| Exhibition Theme |
| ex1) The installation aroused my curiosity and interest about |
| possible future scenarios |
| ex2) The digital artefacts helped imagine possible future |
| scenarios |
| ex3) The objects and the setting facilitated the experience of |
| the Lucid Peninsula world |
| ex4) I can reflect the significance of the objects and their |
| meaning. |
| ex1) The installation aroused my curiosity and interest about |
| possible future scenarios |
| |
| |

6

Our data showed that both DreamCatcher and the DreamViewer were successful in engaging the audience. The digital artefacts encouraged imagining the future set narrative and its scenarios. This was confirmed by the high values reported by the users (as seen in item ex2 in Figure 5). Participants answers revealed that the digital artefacts were not complicated to use and that the interaction was clear and understandable; item t2 score is very low demonstrating that the devices were not complicated to use and therefore had a clear and understandable interaction, as seen in Figure 5 (item t2, item t3). Results also show strong negative correlations between engagement and the underlying complexity of the digital artefacts ([r=0.52, n=51, p < 0.05]) and between enjoyment and the complexity of the devices being ([r=0.54, n=53, p<0.05]). Positive medium correlation was also identified between feeling engaged and clear interaction ([r=0.4, n=51, p<0.05]). Results show an understandable interaction between the participants and the digital artefacts coinciding with engagement and enjoyment within the installation. It is noteworthy to highlight that the data shows a medium level of relationship between enjoyment and the digital artefacts ([r=0.47, n=53, p<0.05]). However, this relationship is weaker for physical objects and enjoyment ([r=0.3, n=53, p<0.05]).

We also discovered synergies between the digital artefacts helping to depict possible future scenarios and the physical objects facilitating the experience in the exhibition ([r=0.5, n=53, p<0.05]). Furthermore, a strong relationship between the digital

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artefacts helping to convey possible future scenarios and ability to reflect the significant of the objects and their meaning ([r=0. 65, n=53, p<0.05]) was identified. These results indicate that digital artefacts support the meaning of the artwork by facilitating its interpretation.

Moreover, we found a strong positive correlation between curiosity and objects, and a positive medium (almost strong) correlation between feeling engaged and ability to reflect on the significance of the objects.

The total mean scores on the PA and NA scales was M=2.9 (SD=0.72) and M=1.5 (SD=0.5) respectively, see Figure 6. Mean values of Positive Affect items and Negative Affect items are show in Figure 6. In general items display a strong agreement, with participants reporting more positive, than negative affect. Variance analysis (ANOVA) exploring the impact of age and gender on the PANAS scores showed no significant differences. In our initial analysis, we inspected the responses to single items of the instrument.

Results indicate relationship between positive affect and engagement ([r=0.48, n=46, p<0.05]). Furthermore, results show a

valid weaker relationship, between positive affect and digital artefacts helping to imagine future scenarios ([r=0.39, n=47, p<0.05]).

6 DISCUSSIONS AND FUTURE WORK SETUP

Lesson learned from the evaluation of Lucid Peninsula and its DreamScope interactive Interface can be summarized at two different levels: i) how the DreamScope interactive interface complements the Lucid Peninsula physical narrative art installation; ii) how the evaluation methods used served the purpose of understanding audience engagement and satisfaction with the Art installation in general, and about the more general effect of DreamScope from a Critical Design perspective. As Bardzell and Bardzell [17] point out: the analysis of systems and installations from a Critical Design perspective can foster theory building.



Figure 6: Positive and Negative Affect Results. Top row (positive affect results): i) interested; ii) excited; iii) strong; iv) enthusiastic; v) proud; vi) alert; vii) inspired; viii) determined; ix) attentive; x) active. Bottom row (negative affect results): i) distressed; ii) upset; iii) guilty; iv) scared; v) hostile; vi) irritable; vii) ashamed; viii) nervous; ix) jittery; x) afraid..

The evaluation results show that the Lucid Peninsula physical narrative installation delivers a rich and engaging experience to its audience. Participants reported enjoyment in exploring its world and the evaluation results reveal that the experience was enriched by using the digital and physical artefacts to create a thoughtprovoking environment. The audience curiosity about critical design inspired future scenario was incited through the use of the digital devices, showing that the DreamViewer and DreamCatcher worked in tandem to augment and deepen the audience experience with the physical narrative installation. Using VR and mobile technologies strengthened the artist's message and helped users make sense of the artistic world. This is a promising sign that mobile and VR technology could be further explored in the art field to expand the artistic experience in accordance with the artist intended message.

Participants self-reported high levels of positive affect echoing findings in [27] and [6]. These high levels reflect the state of full concentration, high energy and engagement of the audience during the experience of the Lucid Peninsula installation. Since we measured engagement individually and participants reported high levels of engagement as well as high levels of positive affect, we were able to confirm the link between positive affect and engagement when using interactive digital content in the Lucid Peninsula physical narrative [30].

In a closer analysis of the data from the PA scale the item "Proud" scored the lowest value (see Figure 6). From this finding we can hypothesize, due to the high positive emotions in items such as engagement and curiosity, that this low value could derive from reflecting on the dystopic future portrayed in the installation. This reasoning finds support in the high scores of the "Distressed" item from the NA scale (see Figure 6). These are indicators that encourage us to think that the tangible future physical narrative installation might have worked as a warning of a possible environmental catastrophic futures for those who experience it. However, a thorough analysis to confirm this hypothesis is required before we can safely assume that individual affect value is linked to how the art installation is understood by the audience.

From the overall results, participants agreed on considering that digital artefacts helpful in enjoying and experiencing a meaningful art installation. This success is connected with the application of virtual reality interfaces echoing previous work [31] where it was reported that the use of such technology was associated with high levels of positive affect, and therefore engagement. Furthermore, the symbiotic relationship between combining an art installation with both digital and physical artefacts can bring forth a better overall experience, leveraging on the themed aspect of art installations.

6.1 Limitations and future work

Concerning our evaluation methods and the use of bespoke questionnaire items, we can confirm their usefulness in evaluating important areas for this specific artwork, such as the complexity of use of mobile and VR technology. However, as a limitation of our work, we recognize that the usage of more complex scales such as in the work of Aasbakken et al. [11], could provide a more detailed level of information, but at the cost of disrupting the audience experience of the art exhibition as a whole. The trade-off between an exhaustive evaluation method and the level of evaluation needed for the artwork is dependent, not only on the artist's needs, but also the context of the exhibits, and the respect for the Art works themselves. In fact people come to an art exhibition to experience art, and not to be engaged in evaluation protocols. Moreover, the use of observation methods could enrich the data without disrupting the audience experience. Methods like interviews could be helpful to complement the evaluation of the artwork, namely on how the audience understands the artistic concepts and on the quality of the interaction with the artwork, but they would be more intrusive. So, these methods might be more appropriate for laboratory settings or explicitly testing contexts and nor for "in the wild" testing during and art show, such as our case

The Lucid Peninsula physical narrative combined with our storytelling approach of DreamViewer and DreamCatcher appear to be a synergetic design fiction [17] that leverages on an appealing story and a powerful installation to convey the message.

Results also show that there are correlations between the different categories of our questionnaire and the PANAS questionnaire. In general, our evaluation framework shows promising results in understand important issues such as engagement and positive affect in an artistic installation. Nevertheless, in the future additions of "fly on the wall" style observation methods could be added to the evaluation adding qualitative details to the data collected, without disrupting the audience experience.

Specific probing and evaluation on individual portions of the art installation would be an interesting future research direction. Moreover, testing the art installation in several different conditions and comparing results could be an interesting way to fine-tune our findings. For example, the following three conditions could be tested separately and then compared: i) the art installation made of solely physical artefacts; ii) the art installation made of solely digital artefacts and a iii) hybrid installation would allow us to understand how the physical and digital artefacts support each other and the story world of the Lucid Peninsula. Additionally, solely evaluating the digital artefacts (DreamViewer and DreamCatcher) out of context would be helpful from an interface design and usability point of view, helping interaction designers in bridging the artist and the audiences needs and how to cater for them. However, one can defend that there is a symbiotic relationship between the digital interfaces and the physical and digital art installation, and modifying one of its components might affect the underlining meaning of the artwork as a whole.

7 CONCLUSIONS

In this paper we present the design and evaluation of Lucid Peninsula, a physical narrative art installation complemented by a set of VR interactive interfaces, which have been exhibited and evaluated "in the wild". We report on the study of 53 users experiencing the installation and reflecting on the positive effects of the digital interface, how it facilitated engagement in the experience and reflection on the overall artistic message. The use of the PANAS scale and bespoke questionnaire items demonstrated to be an efficient way to elicit indications of the engagement and enjoyment of the experience overall. Nevertheless, due to the subjective nature of art expression and human experience, qualitative evaluation methods such as observations and in depth interviews, if not disruptive of the Art experience itlsef, would shed further light on the insights.

ACKNOWLEDGMENTS

We wish to acknowledge Future Fabulators, EU Culture and Media Project Funds (2013-1659/001-001 CU7 COOP7) for sponsoring our investigation, our fellow researchers at all partner institutions, Time's Up, and FoAM for their help and contributions, the LARSyS (PEst-OE/EEI/LA0009/2013) research group for support and Fundac ão para a Cie ncia e a Tecnologia for supporting the research through the Ph.D. Grants PD/BD/114142/2015 and PD/BD/128330/2017.

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