MStoryG: Exploring Serendipitous Storytelling Within High Anxiety Public Spaces

Clinton Jorge, Valentina Nisi, Julian Hanna, Nuno Nunes, Miguel Caldeira, Amanda Marinho

MStoryG: Exploring Serendipitous Storytelling Within High Anxiety Public Spaces

Clinton Jorge[1,*], Valentina Nisi[2], Julian Hanna[1], Nuno Nunes[2], Miguel Caldeira[1], and Amanda Marinho[1]

[1,2]University of Madeira, Madeira-Interactive Technologies Institute, Funchal, Portugal
1{firstname.lastname}@m-iti.org 2{njn,valentina}@uma.pt

Abstract: The proliferation of interactive displays within public spaces has steered research towards exploring situated engagement, user interaction and user-generated content on public displays. However, user behaviors such as *display blindness* and *display avoidance*, *social embarrassment* and *participation inequality* are just some of the limiting factors restricting user commitment to interaction and participation. So-called "non-places", which include transportation terminals, are homogenized public spaces that seem to exist outside conventional notions of time and identity. These anonymous, fast-paced, high-anxiety spaces provide a significant challenge for designers hoping to engage the attention of passersby. Our study proposes to go beyond a traditional technology-centered approach and examine the relationship between individual, object, and space. We attempt to engage airport travelers in serendipitous interactive storytelling through reminiscence and nostalgia. We present our "in-the-wild" study at the baggage claim area of an international airport where 26 hours of observations and 49 semi-structured interviews were collected.

Keywords: Pervasive Display, Interactive Storytelling, Airport Installations, Public Installations, Participation Inequality.

1   Introduction

Modern society is becoming increasingly mediated through (and dependent on) technology. People are governed more and more by hectic routines and tight deadlines, leading to increased stress and anxiety [9]. In an attempt to escape the limits of mundane reality, people look for a sense of wonder in their lives [41], more often than not through immersion in the imaginary world of fictional stories [40].

Storytelling is pervasive and ubiquitous; it was considered central to society long before humans could read and write, and represents a fundamental component of human experience. Stories perform a critical function in society, allowing for dialogue between people, culture, and time (c.f. Madej [31]). The telling of stories is an intrinsic part of people's lives, a creative process through which people share and reflect on life experiences, solve problems, or teach lessons [25, 45]. Storytelling began as an oral technique, matured as a written form and in recent decades has worked its way into the complexity of digital media and devices.

Nowadays, as digital displays become pervasive and the underlying technology becomes ubiquitous, these displays present both opportunities and challenges as a new storytelling medium and means of bringing a sense of wonder to public spaces. This profusion of digital interactive displays within public spaces is of rising importance for the field of Human-Computer Interaction (HCI), as designers are faced with new challenges such as attracting glances of passersby towards public displays or installations, enticing interaction, and obtaining user-generated content. However, this shift from consumer culture to the culture of participation is not without its challenges [21]. Multiple studies have shown that designers are often plagued with lower than expected acceptance and attention towards pervasive displays [36]. This difference in participation may be compared to its counterpart in online communities: participation inequality. As defined by Nielsen [38], his 90-9-1 principle (also known as the power law distribution) describes the broad discrepancy between those who contribute and create, and those who view and consume content (or information). Two other common user reactions towards public displays are *display blindness* [35], when people have a preconceived expectation of uninteresting content and hence ignore the display, and *display avoidance* [28], where passersby notice the display but then quickly look away, actively avoiding the display in order to escape information overload.

When tailoring situated experiences, place plays a particularly crucial role. In the example of transportation terminals, these "supermodern" globalized spaces have been theorized as existing outside normal definitions of history, identity, and relations, and thus labeled "non-places" [5]. These so-called non-places may nevertheless instill feelings of nostalgia—arriving in a new country, starting a new experience or adventure, or watching loved ones arrive or depart. On the other hand, terminal spaces (especially airport terminals) are notoriously complex ecosystems that are known to stress, frustrate, and confuse consumers of their services [6]. These anonymous, fast-paced, high-anxiety spaces present an interesting challenge in engaging passersby.

This paper goes beyond a traditional technology-centered approach to examine the relationship between individual, object and space. Building on this premise, we explored the use of an obsolete, mechanical split-flap display—traditionally used in airports and other transportation terminals to convey flight information—as our storytelling medium and attempted to create a culture of story generation and participation in different environments.

In the following sections, we start by reviewing location-based storytelling, public displays and situated engagement, and cultures of participation. Next we introduce a series of deployments and lessons learnt leading to MStoryG, an interactive storytelling installation deployed at the baggage claim area of the Madeira International Airport as an "in-the-wild" study. We then present our synthesis of 26 hours of observations and 49 semi-structured interviews, collected over a two-week period. Finally, we discuss the experiences the system provided in engaging serendipitous storytelling, or chance-based storytelling encounters, and our experience deploying an interactive installation inside an airport terminal.

2   Related Work

With large-scale electronic displays increasingly found in public spaces such as subway stations, airport terminals, and shopping centers, public spaces are experiencing a shift from traditional analogue to digital displays, enabling interaction and dynamic multimedia presentation [36]. This has led researchers to examine topics such as participation and engagement [19]. However, designing pervasive interactive public displays comes with a particular set of challenges that must be acknowledged. Designers may be overconfident, leading to lower than expected levels of user interaction, for example by creating embarrassing situations for users [7, 20].

In the following sub-sections we begin by reviewing prior work within the scope of public displays and public installations, focusing on situated engagement and location-based narrative and storytelling.

2.1   Public Displays

Public participation in public spaces has been a topic of considerable interest in the HCI community. Memarovic et al. [33] argue that public displays may stimulate essential human needs within public spaces. Müller and colleagues present a taxonomy for public displays and argue that interaction with public displays actually begins as early as the moment of passing by or glancing [36]. A significant amount of work has been performed to aid designers and researchers in designing and evaluating public displays, such as: analytical frameworks that evaluate public interaction [32, 34], public display design guidelines [20], guidelines for locating screens within public spaces [44], and techniques for enticing interaction [7, 14, 28].

People often resist interacting with displays in public spaces due to feelings of social embarrassment and awkwardness [7], or to maintain a social role [36]. Furthermore, people may avoid interaction due to the unclear immediate purpose (or benefit) of interacting with the display or simply avoid interaction because they assume the content is irrelevant or uninteresting [28]. When passing through public spaces, interacting with public displays is not our primary objective. Rather, a person will pass by a public display and become motivated or persuaded to interact by certain external factors. If the display fails to attract users it may not be used at all; catching the attention of passersby, alongside engagement and motivation, is therefore a central design issue [36]. In sum, Huang found that glancing at pervasive public displays is complex and depends on many factors [20].

2.2   User-Generated Content

Online communities such as blogs, forums, and wiki-sites rely heavily on user-generated content. Nielsen identified that a minority of users (as low as 0.003% in Wikipedia's case) contribute the majority of content, while the majority of users ("lurkers") never contribute at all. This participation inequality, also coined the "90-9-1 principle" [38], is further explored by Muller et al. [37], who compiled some extensive literature on lurkers ("non-public participants") for online communities and or-

ganizations. Muller identifies lurkers as the modal class of users. However, Muller also notes that "active lurkers" might decide not to actively contribute, preferring not to clutter information areas, or feeling that they lack the standing or authority to make relevant contributions, but they still contribute by disseminating ideas within their communities. "Active lurkers" have been described as an important asset, adding to the effectiveness and "reach" of the content created by the main contributors [46].

The rise of social computing has facilitated a shift from consumer cultures to cultures of participation [12]. However, displaying user-generated content in public spaces raises an issue of moderation. Others could perceive content as explicit or troublesome, or inappropriate for a particular location. Miriam Greis et al. [17], chose to explore the use of pre-moderation of content for public spaces, and discovered how moderation delay would decrease the number of user-generated posts. The authors found 10 minutes to be an acceptable delay for over 70% of users. However, the authors also noted that even delays of 90 seconds were enough to confuse some users.

Claude Fortin et al. [13] explored community bulletin boards as participatory non-digital display (as acts such as posting). Their results revealed how cultures of participation are dependent on type of context and how tangibility, flexibility, access and control play an important role in enabling posting.

2.3 Community-based Storytelling and Location-Centric Narratives

Story diffusion has come a long way since its early oral and written forms. With the arrival of the Internet and blogs, webcasts, and social networks it has become increasingly possible to reach a broad, diverse audience. Projects such as Tim Burton's Exquisite Corpse and The Novel Iowa City Project [29, 49], for example, have employed Twitter for community-based writing projects, to gather or "crowdsource" story segments from public contributions in order to collectively author a story.

Storytelling innovation depends both on the medium and the story being told [24], as well as the cues embedded in physical surroundings [27]. In an attempt to increase immersion and utilize the inherent personality of physical spaces, research has looked into location-aware media stories [39], location-based pervasive games [18, 43], augmented stories and narratives linked to physical locations through digital devices [10, 26], immersive storytelling rooms [1, 8], and other innovations, which in turn has led to a closer rapport between storytelling and the HCI field.

3 Design Space

Studies show that airlines rank lowest in the American Customer Satisfaction Index in terms of accommodation and food services and the transportation sector [3]. Airport authorities recognize the issues that lead customers to rate their experiences as less than optimal. For example, one report stated that 72% of passengers "cited inefficient streamlining of the core passenger journey from check-in to boarding" as a source of "stress and unhappiness", and suggested streamlining services to mitigate waiting times and increase task efficiency [2]. Takakuwa [47] found that passengers spent an

average of 25% of their time waiting during their airport experience. The Amadeus report [2] presented a "leisure timeline" foreseeing that pioneers should be adopting interactive artistic installations and immersive experiences by 2015.

Meanwhile, HCI research is looking at improving passenger experience by using mobile services to ease navigation and journey time through airport terminals, for example with smartphone applications that use social media to better connect travelers and enhance air travel experiences [6], as well as mobile pervasive games that passengers play while waiting in security lines [30]. Art installations are increasingly deployed at airport terminals with the goal of improving customer experience [15]. Moreover, artists such as Jenny Holzer have specifically chosen airport terminals to deploy their exhibitions. In 2004, Holzer repurposed LED departures screens in the disused TWA Flight Center at New York's JFK as part of the exhibition *Terminal 5*.

Furthermore, in their studies Fortin et al [13] reveal how transportation terminals are without any sort of bulletin boards or other posting areas, and postulated that the deficit of cultures of participation in these spaces may be related to the postmodern theory describing how such globalized, anonymous, futuristic spaces, often described as "non-places", lack any sense of normal human relations or identity [5]. The renowned designer David Rockwell, who recently redesigned Newark Airport's United Airlines terminal, summed up the disorienting anonymity of most airport terminals. "The way airports are, it's like a Kubrick movie," Rockwell stated, referring to the horror film *The Shining*: "every hall you turn down looks the same." He worked specifically against this dynamic to create a less disconnected, more "grounded" environment with a greater sense of time and place: the terminal appearance changes from day to night, for example, and the food court includes "a cluster of clam shacks" to create the illusion of place, in this case the Jersey Shore [48].

3.1   Motivation

Storytelling is pervasive and ubiquitous in society [31] and inherent to our daily activities. However, we postulate that "non-places", such as airport terminals, may not support this medium for expression. MStoryG was ideated as a platform for telling stories in public spaces. The installation concept was driven by people's creativity and inspiration, and the hypothesis was whether, given the opportunity, users would draw cues from the surrounding physical space to produce fictitious stories, and whether they would feel compelled to share their stories with the public.
Initial exploration for a medium to support storytelling in public spaces steered us away from digital screens or video projectors. These were judged as too common and thus likely to be ignored by passersby, or they might also suffer from issues such as lighting conditions [28, 35]. Gaver et al [14] suggest using ambiguity as something intriguing, mysterious, and delightful. This led to the exploration of traditional, subverted displays, such as large mechanical split-flap display (mainly seen in transportation terminals). Its characteristic sound should attract peoples' attention to updated information. We were able to secure one such display through a donation from the local airport. This large Solari Udine display (3.5m by 2m and 800kg) had been in use

for nearly 30 years and was highly recognizable to the local population. We aimed to use it as a medium to share stories and build upon its inherent history and nostalgia.

4   Concept Validation

In order to rapidly prototype, deploy, and test storytelling techniques and the mechanical display layout, a high fidelity software replica of the physical Solari Udine display was built in Adobe Flash and iterated during two deployments.

The deployments were non-concurrent and ran independently within semi-public spaces. Each deployment was built upon the results, observations, findings and user comments of the previous installment. In an attempt to maintain a higher degree of consistency, each deployment followed a similar evaluation protocol (defined in the MStoryG/Evaluation Protocol and Methodology section).

Our objective with the initial deployments was to discover a feasible and interesting storytelling technique and to help us understand how the installation was perceived by the public; providing some indication of the most adequate public space contexts that would best suite a storytelling installation resorting to and old mechanical airport flight information display.

4.1   Deployment one: The Exquisite Corpse Installation

User feedback from an initial pilot study performed within the researchers' office space led to the identification of the Surrealist parlor game Exquisite Corpse (Cadavre Exquis (Breton et al. 1925)) as a possible collaborative storytelling technique to drive the installation. In this game participants build upon the last story shared, while remaining blind to either the earlier contributions or the overall story.

The installation consisted of a retro-projection of a high fidelity software prototype of the physical Solari display, set up in the entrance of a science facility over four afternoons (1-5pm). Sixty passersby were observed lurking (peripheral and focal awareness threshold [c.f. 6]), while 35 passersby interacted directly and contributed to the story. Passersby could interact through an adjacent laptop with dedicated web interface or through the Twitter social network by mentioning "@mstoryg".

During our case studies we found no evidence of the "honey pot" [7] effect and attributed it to the sporadic public flow within the public space. A collocated researcher was required to entice passerby interaction with the installation and to explain its purpose. We noted a difficulty for the majority of users in contributing with a story, even if only to continue a previous sentence (or a very short story segment). For an installation that relies heavily on user-generated content, location and public flow were also found to be key to the uptake of the installation and a constant feed of contributions.

We found that the repurposing of the display attracted glances and generated curiosity. People immediately recognized the display as "the one from the airport" and the ambiguity of its usage was beneficial in generating curiosity. However, the lack of a clear purpose could have intimidated users' exploration, thus hindering interaction.

In sum, the Exquisite Corpse storytelling concept was well received but was found to be too dependent on public interaction to be a sustainable source of content.

4.2   Deployment two: The FNC0313 Installation

A second design iteration was performed targeting two previously identified key issues: installation location and public flow, and user-generated content sustainability.

Previously, we observed that a sustainable (user-generated) storytelling installation would be better suited to a high public flow space, in order to engage as many passersby as possible. The location chosen to deploy the second case study was at the local university's main entrance due to its combination of high people flow and a leisure space (student bar). We noted that initial story contributions revolved around travelling, and that soon afterward they began to include meta-references to real events (such as the approaching holidays). This led to the adoption of a travel theme to help guide contributors and strengthen the rapport between medium and content.

Experienced authors were invited to contribute travel-related stories to the installation, rather than relying solely on user-generated content. This provided quality stories displayed randomly during times of inactivity in order to maintain fresh content. The FNC0313 installation was a five-week deployment at the main entrance of the university and involved approximately 15 hours of observation and 119 interviewed passersby. The software prototype was used for rapid prototyping and easy deployment. Our attempt to reduce embarrassment by replacing the collocated interface with remote contributions via Twitter may in fact have hindered interaction by limiting opportunities for socializing [7]. Passersby did not see others interact and may therefore have perceived the installation as not being directed at them or without relevance. However, the waiting time afforded by the waiting line for the university bar provided an optimal viewing position of the installation and allowed enough time for passersby to discover, read, post and comment (amongst themselves) on the story or installation.

Overall, our invited authors produced compelling "micro-stories" and felt challenged by the new storytelling media. One author described the experiment as "a fascinating intersection between technology and the humanities".

4.3   Deployment three: MStoryG

During our research we found that the vast majority of passersby recognized the display as "the one from the airport". This generated curiosity and the repurposed and re-contextualized display did attract attention. We noted that passerby contributions accounted for a minimal percentage of the overall stories created, with the larger body of content produced by our invited experienced authors. When feeding a storytelling installation we found it is best to rely on users who are confident in providing story content, while still leaving open the possibility of user interaction and contribution.

The objective for this study was to deploy MStoryG on the (physical) Solari Udine split-flap airport display, and to explore how receptive the public was to serendipitous storytelling activity and whether or not it was possible to create a culture of participation within high anxiety "non-places" such as airport terminals.

Fig. 1. The MStoryG installation deployed at the airport's baggage claim area.

In the next sections we describe MStoryG's final case study at the regional (international) airport (see Figure 1), including the installation, design process, and implementation.

4.4   A Space Within a Place

Earlier results [22, 23] introduced the idea of an airport terminal as a possible location for deployment of the MStoryG installation. We envisioned a stronger relationship between travel-themed storytelling, the airport display, and the airport environment. The latter affords long waiting times and a variety of leisure spaces available for discretionary activities [42]—also noted in deployment two. We built upon this premise to explore airport (transportation) terminals and storytelling installations.

MStoryG was deployed at an international airport. According to the airport's statistics [4], in May 2013 the airport handled 1,688 flights (domestic and international) accounting for a total of 181,413 passengers. International airports are large and complex ecosystems. Elaborate social interactions, complicated navigation, strict security procedures, long wait times, anxiety, stress, frustration and confusion are common pitfalls of the airport experience for many travellers. At the same time, these are spaces tightly governed by security and thus access to these spaces is limited and highly controlled.

MStoryG's target audiences were passengers (visiting tourists), which could share a story about their stay at the island. Initially, the installation was going to be deployed near the boarding gates. Here passengers generally have the greatest amount of free time, and we hypothesized more availability and openness to explore the space and interact with installations. Unfortunately, this is a high security area and given the short time frame another location had to be chosen.
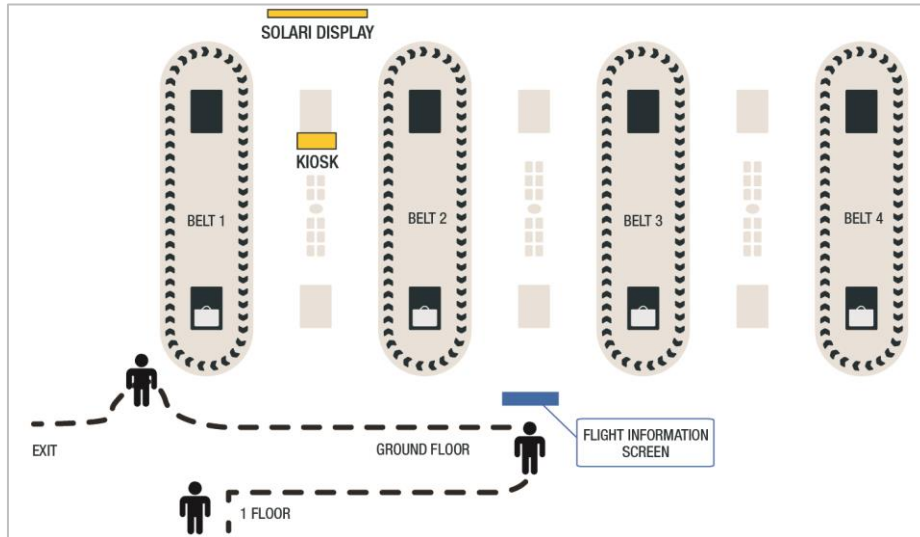
Fig. 2. Placement of the Solari display and kiosk within the baggage claim area.

The Arrivals terminal, and more specifically the baggage claim area, seemed like the most interesting (available) option due with similar conditions to the boarding gates, with wait times that would allow passengers to contribute. Their flight, possibly the most anxious part of the travel experience, would be over, and the experience of their journey could provide material and motivation for a story. The target audience was maintained, while the installation's "voice" took on a more greeting role rather than the initially ideated.

The Design Space. Free space is limited within baggage claim areas. Moreover, the best locations to deploy a public display or installation are occupied by paying advertisements. In terms of identifying the optimal position for MStoryG, initial observations of passenger flow led us to choose the back wall of the baggage claim area (see Figure 2), between baggage carousels one and two (out of four). The proximity to the baggage carousels guaranteed a supply of stationary passengers (people waiting for their bags) with enough time to lurk and possibly contribute. A support pillar near the display was repurposed as a canvas to display information about MStoryG and information on how to interact through social networks, SMS, and using the kiosk (standard airport kiosk with a touchscreen and with full size keyboard). The kiosk was located in front of the pillar, allowing passengers access to project information, the interface, and a view of the display (see Figure 1).

Competing for Passenger Attention. The baggage claim area represents one of the first contacts passengers may have with the airport and/or a city or country. It is overloaded with information and this required MStoryG to compete for passengers' attention with a profusion of publicity panels, airport information signage and tourist in-

formation, customer desks and information kiosks. While some travellers might search for information kiosks at an airport, looking for public displays to interact with is probably not their primary focus or goal. Normal tasks within the Arrivals terminal (baggage claim area) would be to locate the baggage belt that matches the flight number and then wait for and collect the baggage. Secondary tasks could be finding car rental or tourist information, currency exchange, customs, or simply to locate the exit.

In previous studies we found that employing a virtual replica of the display attracted glances, and furthermore, passersby recognized the display and were curious about its purpose. We hypothesized a significantly stronger connection to the physical display based on its impressive physical presence. The characteristically slow information update of the display could mitigate change blindness [36] and the characteristic sound would trigger nostalgia and even Proustian reminiscence, while alerting passengers that a new story was being generated.

4.5 Feeding the Installation

The display received content from a laptop, which communicated with the airport's Intranet. Web proxies and specific ports were defined in order to comply with airport Internet security policies and measures. The web server was implemented in Python using the CherryPy framework that employed a long-polling mechanism to keep all connected clients synchronized. Contributions are stored in a MySQL database and are pulled and served by the webserver as individual XML files.

Stories could be sent to the installation through SMS, Twitter and Facebook—allowing for our invited international writers, remote contributors, or passersby that prefer this more private interaction through mobile phones—or through an authoring platform developed in Adobe Flash. This interface was created to deploy on an airport touch-screen kiosk (also available online) and functions as an attempt to lower the entry interaction barrier that would otherwise arise from complicated airport Wi-Fi connections and international mobile data plans. The application emulated the look and feel of the physical Solari Udine display. Here users could control all modules available on the physical Solari display (including lights) through direct interaction, choosing precisely where and how to display their story.

The airport management required that all content displayed on the installation be pre-monitored and filtered. Twitter (and SMS) contributions were filtered by "favorite" or "retweeting" through the Twitter MStoryG account. Only favorited or retweeted tweets were stored in the database and displayed. Facebook posts followed a similar process by "liking" posts through the MStoryG account. Contributions from the kiosk were filtered through a webpage. This human-filtering method seemed the most reliable due to the ability of users to write horizontally, vertically and obliquely (through the kiosk interface). Moreover, the airport required filtering of content for offensive comments, prank messages, and negative passenger experiences.

While pre-monitoring content introduced delays of several minutes between interaction and viewing the story on the display, research has shown that the majority (70%) of users display a tolerance of up to 10 minutes [17].

5 Evaluation Protocol and Methodology

People perceive art installations differently than they would more task-specific or unequivocal installations. Evaluating these installations through traditional HCI models, such as stressed quantitative methods, tells us little about the relationship resulting from the interaction between users and the installation [11, 16]. In order to measure passerby engagement with MStoryG we built upon work by Mathew et al, Brignull and Rogers, and Müller et al [7, 32, 36]. The work performed by these authors employs the notion of engagement trajectories, defined by interaction phases, activities and thresholds, to evaluate the level of user engagement and curiosity.

The evaluation protocol was performed as follows: in-field observations and semi-structured interviews with passengers and passersby (performed by a single researcher), focusing on evaluation during two key phases, and textual analysis of the user-generated content.

- Perception Phase: At this phase it is possible to understand how users perceive and react to MStoryG upon first contact (glance). Using Brignull's "thresholds of activity" [7] we should be able to measure social engagement with MStoryG by measuring the peripheral awareness threshold (people are peripherally aware of the installation but at the time do not intend to interact with it), the focal awareness threshold (people in this activity zone are engaged in social activities relating to the installation), and direct interaction (here users are in direct interaction with the installation and formulate a deeper understanding of the installation). Finally, we should be able to evaluate the level of social apprehension.
- Interaction/Engagement Phase: Our objective during this phase is to observe the spectator experience and the "honey pot" effect [7]. Semi-structured interviews should allow us to identify if there is any social buzz around the installation and to ascertain whether bystanders are engaged with the installation.

Categorization and a textual analysis of the content created at the airport kiosk for the installation was performed in order to understand how users approached the storytelling concept and if they repurposed and subverted the airport display in other ways.

6 Findings

In this section we present 26 hours of observations covering the arrival of 86 (domestic and international) flights distributed over four weeks. All stories were displayed in English. We conducted 49 short semi-structured interviews (97 people) to complement the observations. Due to passengers' anxiety in retrieving their bags, interviews were usually short, allowing on average two to three questions.

The number of passengers present at the baggage claim area varied from an estimate of 90 for a single flight, up to three concurrent flights resulting in an estimate of over 300 passengers—all of whom take the same route to the baggage claim area. Upon arrival the primary task for the majority of passengers is to search the space for digital screens containing their flight information that tells them which baggage car-

ousel their bags will be delivered on. Passengers then search the area for the correct carousel, place themselves nearby, and wait. The baggage carousel rotates clockwise, thus passengers normally locate themselves to the front left side of the carousel. Average wait time for baggage was relatively short, between 5 and 10 minutes.

The airport distributes use of the baggage carousels. For flights with baggage at belts three and four (the furthest), passengers were largely unaware of the installation.

Even at belts one and two, MStoryG was often overlooked by passengers due to their location to the front left of the carousel, where they were out of sight of the installation—blocked by pillars and the belt carousel mechanism—or were too far away to hear the sound of the display's mechanical flaps. Passengers moving through the area, i.e., walking straight out of the baggage claim area, would rarely notice the installation on the back wall (to their right side) between the two baggage carousels.

6.1 Attracting Passerby Glances Using Sound

One of the most noticeable benefits of the mechanical display was the sound it produced when refreshing content and how recognizable that sound was to travellers. We observed 157 travellers waiting for their bags at belts one and two that turned their attention toward the display while it changed stories (producing the characteristic mechanical flaps sound). Three travellers standing on the right side of belt two heard the sound of the display and looked around to find the source. Due to the awkward placement of the board, however, they could not discover where the sound was coming from, so they did not glance at or move toward the board.

On the other hand, nine of the 157 travellers, as well as reacting to the noise by glancing back and reading the content, actually left the belt carousel to approach and explore the installation by observing and reading the kiosk and adjacent information.

6.2 Passerby Perception: Installation and Stories

A family of three standing near belt two did notice the display due to the sound. They glanced back and read the story. When asked about what they perceived the installation to be, one of the travellers commented: "This is about famous authors, quotes and stories", while another said: "I think it's for small stories." A family of four looked at the display while passing by, commenting and laughing together. One said: "When I heard the noise I knew it was an old fashioned display. I haven't seen one of those in a long time. Then I looked and saw no information but a story I really liked." Another traveller who was observed reading the stories responded: "Well, I looked first because I'm not doing anything while I wait for my bags and the noise is attractive. When I read the story it was unexpected and I thought it was a great idea. I liked to watch because the stories are funny and a good way to kill the waiting time for bags."

Overall, 23 (of 97) of the travellers approached commented positively on how "unexpected", "funny", and "great" the stories were, and how surprised they were to discover the installation. Certain expectations relating to the purpose of the display were also found, relating to its original use in displaying flight information.

6.3 Traveller Focus, Goals and Objectives

Fifty-two, of 96 travellers interviewed, commented on how they were solely interested in their baggage and were not able to pay attention to the installation. ("I am only worried about getting my bags. Nothing else.") Other travellers said they preferred to focus on subsequent activities ("I want to get the bags quickly so I can go to the car rental desk"). Travellers intent on retrieving bags would glance at the display apparently in the hope of finding relevant information but quickly lost interest when they saw it did not.

6.4 Reading Stories and Authoring Stories

Twenty-six, of the 157 observed travellers, were noted reading more than one story on the display. Thirteen travellers were observed engaging in discussions about the installation and the stories being presented. Three travellers were observed taking photos of the display and kiosk. A 60-year-old female traveller heard the noise of the Solari display changing and went to find its origin and read the story, immediately returning to belt three once it started rotating. Expectedly, children were among the most curious often approaching the display to examine its mechanics.

Three travellers were observed interacting with the kiosk (the authoring interface). All three approached the kiosk, read the information, and then typed and submitted their messages. They waited near the kiosk for their story to appear, and when it was not immediately displayed, they returned to their belt. One of the three was observed repeatedly checking the display every time new content was displayed.

Content Created. Over a four-week period, 88 "micro-fiction" stories were authored and displayed at MStoryG. Collaborators and invited authors contributed with 60 tweets and 28 Facebook posts. These users took on the storytelling role easily and were self-motivated to continue authoring stories during the initial weeks.

A total of 87 unique interactions with the authoring platform were received at the kiosk adjacent to the Solari display. After filtering out empty submissions, 64 individual submissions remained. A frequency analysis was performed with mean, standard deviation and a 95% confidence. Three gibberish messages were received from children playing with the kiosk keyboard. The majority of contributions through the kiosk interface were categorized as "messages" (e.g. "We are waiting for our luggage") representing nearly 43.8%. Greeting messages such as "Happy holidays the Browns" represented 15.6% of all contributions. Stories accounted for 6.3% while flight references, e.g. "22.30 TAP", accounted for 7.8%.

7 Discussion

The interviews led us to acknowledge an improvement in traveller experience through the serendipitous discovery of "funny" stories, as some users described them. Additional comments supported the initiative, declaring that reading stories from others

was a good way to pass the time. This reaction was most noticeable among those who were perceived, through observations and interviews, as being less anxious—about retrieving baggage or what to do after retrieving their bags—and thus free to explore and consume (or contribute to) the installation. Those who were mainly focused on their primary task (baggage retrieval), or were anxious, lost, or in a hurry, avoided or ignored the installation and displayed little or no interest in MStoryG, or in anything else that did not actively contribute toward their task.

Repurposing the mechanical airport display succeeded in attracting travellers' attention mainly due to its recognizable and distinguishable sound. This led travellers to expect specific information (baggage or flight information), but at the same time it also helped to emphasize the serendipitous story discovery. Playing with the nostalgia and familiarity of the display in its original context surprised travellers with an unexpected new media channel for storytelling. On the other hand, a certain type of traveller expected relevant, airport-related information to be displayed, and when they perceived the content as stories, they lost interest in the installation.

Location is key within these spaces, especially because in most cases users will not go out of their way to interact with or explore displays or installations that do not seem to offer airport specific information. The chosen location, between belts 1 and 2, did not expose the installation to the majority of passersby within the space; rather it focused on a small subset of specifically placed passengers. We argue that the characteristics of this location—an affordance of spare time to indulge in exploration even if still focused on their primary goal—justify its use in the installation, in comparison for example with the main foot path on the way to the exit. We found no noticeable "honey pot" effect, and would argue that this is due to passengers being primarily concerned with their baggage. Even with up to 15 minutes of waiting time, passengers were found to remain static at or near the baggage retrieval belt. As indicated by Brignull et al [7], public displays and installations should be located near to leisure spaces in order to nurture this type of social behavior.

In terms of subverting the authoritative voice of the traditional airport display we observed passengers writing their names for display to the public. This was more noticeable than in the previous case studies. In previous studies we found a stronger connection to flight and travel topics, and meta-references to real events, while at the airport terminal (with the physical display) a stronger, more personal connection was observed: greeting messages, writing messages to loved ones, or writing one's own name were more prevalent. It might seem that the physical space would not influence the type of content being displayed, but the context where the installation is located (e.g. being located at the Arrivals terminal) might influence the display in favor of taking on more of a welcoming or greeting role.

We found that users had strong preconceived notions about the airport display: that it is regulated by an authority, is non-interactive, or displays only airport-related information. This could have hindered interaction by raising doubts that it would be possible to write on the "airport's board". Moreover, because of spatial constraints the kiosk and the installation information were located at some distance from the display. The connection was visible for those passengers that viewed the display from the front (right side of belt 1 and left side of belt 2), where the kiosk and information are

located to the front of the display between the belts. For those passengers that viewed the display from an angle, however, the kiosk and information were not in their field of view and thus did not perceive the display as interactive. We attempted to guide people towards the installation through signage on the floor and overhead, but without observable success. It is crucial to keep the information and interaction together, as most passengers will not go far in exploring the space to search for it.

Local contributors (through the kiosk) expected the content they introduced to appear immediately on the display. This occurred despite our efforts to mitigate the assumption by indicating that the stories would be moderated. For asynchronous interaction clear feedback should be provided to the user in terms of an estimate of how long it might take to view their story. The kiosk was the preferred method for collocated interaction. Airports are notoriously difficult places to get Internet access, limiting the reach of Facebook and Twitter. SMS interaction was mainly targeted to locals, being unattractive for those with restrictive overseas cellular data plans.

The airport terminal provided a broad spectrum of travellers from a wide variety of backgrounds and demographics. The continuous supply of new passengers allowed smaller amounts of content to remain fresh for longer periods of time. However, limited exposure and competing goals and activities set limitations on user interaction and thus did not afford a culture of participation.

7.1 Viability of the Evaluation Protocol

We encountered a number of difficulties in employing the frameworks of Mathew et al., Brignull and Rogers, and Müller et al. [7, 32, 36] in this space due to the large number of individuals rushing toward the baggage carousels. Furthermore, the majority of individuals only discovered the installation after placing themselves near the baggage carousel, and at that point they were already waiting for their bags. Moreover, due to the distance between the installation and the baggage carousel, it was difficult to understand whether individuals were engaged with the installation or their baggage-retrieving task. Interviews were essential in disambiguating these cases.

8 Conclusion

This paper presented MStoryG, an "in-the-wild" public display based storytelling installation located inside an international airport's baggage claim area. The iterative design and deployment process allowed for continuous refinement of the concept and installation up to the final deployment. This unique installation surprised travellers by repurposing an old-fashioned mechanical airport display as a storytelling medium where travellers could share stories. However, the very nature of so-called "non-places" such as airport terminals limits the culture of participation, not only due to their alienating effect and lack of a normal sense of place and time but due to being such distracting, fast-paced, anxiety-filled spaces. As in previous studies, we did find a strong connection between individual, object (the airport display) and space (airport terminal), with curiosity triggered by the display's distinctive sound, and users seem-

ing pleased to learn that a project was repurposing such a familiar, nostalgic object. We hypothesize that such a connection could not have been achieved, for example, with an ordinary television screen.

Nevertheless, our objective was to actively engage passers by and create a storytelling community around a physical space, and in this experiment we found minimal evidence of the participation of passersby in authoring coherent stories. On the other hand the experienced authors who participated in our project were intrigued and felt challenged by this new medium for storytelling. The restricted number of characters permitted and the connection between social networks and analogue displays within public spaces seemed compelling on both sides, with readers responding positively to the stories provided.

9   References

1. Alborzi, H. et al.: Designing StoryRooms: interactive storytelling spaces for children. Proceedings of the conference on Designing interactive systems processes, practices, methods, and techniques - DIS '00. pp. 95–104 ACM Press, New York, New York, USA (2000).
2. Amadeus: Reinventing the Airport Ecosystem. (2012).
3. American Customer Satisfaction Index, A.: June 2013 and Historical ACSI Benchmarks, http://www.theacsi.org/?option=com_content&view=article&id=213&catid=14&Itemid=2 62&q=M06&sort=Y2013.
4. ANAM: Indicadores de Tráfego - Traffic Indicators, http://www.anam.pt/Media/Default/DocGalleries/AM PT Indicadores 2013/IG_TrafegoPT_2013-03_Fnc.pdf.
5. Augé, M.: Non-Places: Introduction to an Anthropology of Supermodernity. , London (1995).
6. Awori, K. et al.: Flytalk: social media to meet the needs of air travelers. Proceedings of the 2012 ACM annual conference extended abstracts on Human Factors in Computing Systems Extended Abstracts - CHI EA '12. p. 1769 ACM Press, New York, New York, USA (2012).
7. Brignull, H., Rogers, Y.: Enticing people to interact with large public displays in public spaces. Proceedings of INTERACT. (2003).
8. Cavazza, M. et al.: Madame Bovary on the Holodeck : Immersive Interactive Storytelling. Proceedings of the 15th international conference on Multimedia - MULTIMEDIA '07. p. 651 ACM Press, New York, New York, USA (2007).
9. Cohen, S., Janicki-Deverts, D.: Who's Stressed? Distributions of Psychological Stress in the United States in Probability Samples from 1983, 2006, and 2009. J. Appl. Soc. Psychol. 42, 6, 1320–1334 (2012).
10. Dow, S. et al.: Exploring spatial narratives and mixed reality experiences in Oakland Cemetery. Proceedings of the 2005 ACM SIGCHI International Conference on Advances in computer entertainment technology - ACE '05. pp. 51–60 ACM Press, New York, New York, USA (2005).
11. England, D. et al.: Digital art: evaluation, appreciation, critique (invited SIG). Proceedings of the 2012 ACM annual conference extended abstracts on Human Factors in Computing Systems Extended Abstracts - CHI EA '12. p. 1213 ACM Press, New York, New York, USA (2012).

12. Fischer, G.: Understanding, fostering, and supporting cultures of participation. Interactions. 18, 3, 42 (2011).
13. Fortin, C. et al.: Posting for community and culture: considerations for the design of interactive digital bulletin boards. Proceedings of the 32nd annual ACM conference on Human factors in computing systems - CHI '14. pp. 1425–1434 ACM Press, New York, New York, USA (2014).
14. Gaver, W.W. et al.: Ambiguity as a resource for design. Proceedings of the conference on Human factors in computing systems - CHI '03. p. 233 ACM Press, New York, New York, USA (2003).
15. Gorbet, M. et al.: Collaboration with the future: an infrastructure for Art+ Technology at the San José International Airport. Leonardo. 44, 4, 334–345 (2011).
16. Greenberg, S., Buxton, B.: Usability evaluation considered harmful (some of the time). Proceeding of the twenty-sixth annual CHI conference on Human factors in computing systems - CHI '08. p. 111 ACM Press, New York, New York, USA (2008).
17. Greis, M. et al.: I can wait a minute: uncovering the optimal delay time for pre-moderated user-generated content on public displays. Proceedings of the 32nd annual ACM conference on Human factors in computing systems - CHI '14. pp. 1435–1438 ACM Press, New York, New York, USA (2014).
18. Gustafsson, A. et al.: Believable environments – Generating interactive storytelling in vast location-based pervasive games. Proceedings of the 2006 ACM SIGCHI international conference on Advances in computer entertainment technology - ACE '06. p. 24 ACM Press, New York, New York, USA (2006).
19. Hinrichs, U. et al.: Interactive Public Displays. IEEE Comput. Graph. Appl. 33, 2, 25–27 (2013).
20. Huang, E. et al.: Overcoming assumptions and uncovering practices: When does the public really look at public displays? Pervasive Comput. 228–243 (2008).
21. Jenkins, H.: Confronting the challenges of participatory culture: Media education for the 21st century. Mit Press (2009).
22. Jorge, C. et al.: Fostering ambiguity: Decontextualizing and Repurposing a Familiar Public Display. Proceedings of the Biannual Conference of the Italian Chapter of SIGCHI on - CHItaly '13. pp. 1–10 ACM Press, New York, New York, USA (2013).
23. Jorge, C. et al.: Storytelling and the Use of Social Media in Digital Art Installations. Interactive Storytelling: 6th International Conference, ICIDS 2013, Istanbul, Turkey, November 6-9, 2013, Proceedings. pp. 233–244 Springer International Publishing (2013).
24. Kearney, R.: On Stories. Routledge, London/NY. 156 (2002).
25. Kelliher, A., Slaney, M.: Tell Me a Story. IEEE Multimed. 19, 1, 4–4 (2012).
26. Khaled, R. et al.: StoryTrek : Experiencing Stories in the Real World. Proceedings of the 15th International Academic MindTrek Conference on Envisioning Future Media Environments - MindTrek '11. p. 125 ACM Press, New York, New York, USA (2011).
27. Kjeldskov, J., Paay, J.: Public pervasive computing: making the invisible visible. Computer (Long. Beach. Calif). 60–65 (2006).
28. Kukka, H. et al.: What makes you click: exploring visual signals to entice interaction on public displays. Proceedings of the SIGCHI Conference on Human Factors in Computing Systems - CHI '13. p. 1699 ACM Press, New York, New York, USA (2013).
29. Likarish, P., Winet, J.: Exquisite Corpse 2.0. Proceedings of the Designing Interactive Systems Conference on - DIS '12. p. 564 ACM Press, New York, New York, USA (2012).
30. Linehan, C. et al.: Blowtooth: Pervasive Gaming in Unique and Challenging Environments. Proceedings of the 28th of the international conference extended abstracts

on Human factors in computing systems - CHI EA '10. p. 2695 ACM Press, New York, New York, USA (2010).

31. Madej, K.: Towards digital narrative for children: from education to entertainment, a historical perspective. Comput. Entertain. 1, 1, 1–17 (2003).

32. Mathew, A. et al.: Post-it note art. Proceedings of the 8th ACM conference on Creativity and cognition - C&C '11. p. 61 ACM Press, New York, New York, USA (2011).

33. Memarovic, N. et al.: Using public displays to stimulate passive engagement, active engagement, and discovery in public spaces. Proceedings of the 4th Media Architecture Biennale Conference on Participation - MAB '12. pp. 55–64 ACM Press, New York, New York, USA (2012).

34. Michelis, D., Müller, J.: The Audience Funnel: Observations of Gesture Based Interaction With Multiple Large Displays in a City Center. Int. J. Hum. Comput. Interact. 27, 6, 562–579 (2011).

35. Müller, J. et al.: Display blindness: The effect of expectations on attention towards digital signage. Pervasive '09 Proc. 7th Int. Conf. Pervasive Comput. 1–8 (2009).

36. Müller, J. et al.: Requirements and design space for interactive public displays. Proceedings of the international conference on Multimedia - MM '10. p. 1285 ACM Press, New York, New York, USA (2010).

37. Muller, M. et al.: We are all lurkers: consuming behaviors among authors and readers in an enterprise file-sharing service. Proceedings of the 16th ACM international conference on Supporting group work - GROUP '10. p. 201 ACM Press, New York, New York, USA (2010).

38. Nielsen, J.: Participation Inequality: Encouraging More User to Contribute, http://www.nngroup.com/articles/participation-inequality/.

39. Nisi, V. et al.: Location-aware multimedia stories: turning spaces into places. Univ. Cátolica Port. (2008).

40. Paay, J. et al.: Location-based storytelling in the urban environment. Proceedings of the 20th Australasian Conference on Computer-Human Interaction Designing for Habitus and Habitat - OZCHI '08. p. 122 ACM Press, New York, New York, USA (2008).

41. Paulos, E., Beckmann, C.: Sashay: Designing for Wonderment. Proceedings of the SIGCHI conference on Human Factors in computing systems - CHI '06. p. 881 ACM Press, New York, New York, USA (2006).

42. Popovic, V. et al.: Passenger experience in an airport : an activity-centred approach. IASDR 2009 Proc. September, 18–22 (2009).

43. Rashid, O. et al.: Extending cyberspace: location based games using cellular phones. Comput. Entertain. 4, 1, 4 (2006).

44. Schroeter, R. et al.: People, content, location: sweet spotting urban screens for situated engagement. Proceedings of the Designing Interactive Systems Conference on - DIS '12. p. 146 ACM Press, New York, New York, USA (2012).

45. Smith, J.: GrandChair: conversational collection of grandparents' stories. (2000).

46. Takahashi, M. et al.: The active lurker: influence of an in-house online community on its outside environment. … 2003 Int. ACM …. 1–10 (2003).

47. Takakuwa, S., Oyama, T.: Simulation analysis of international-departure passenger flows in an airport terminal. Proc. 2003 Int. Conf. Mach. Learn. Cybern. (IEEE Cat. No.03EX693). 1627–1634 (2003).

48. Weiner, S.: Newark Airport's New United Terminal Looks Like A Foodie Theme Park, http://www.fastcodesign.com/3038636/newark-airports-new-united-terminal-looks-like-a-foodie-theme-park.

49. Tim Burton's Cadavre Exquis, http://burtonstory.com/connect.php.