Fail Better: Lessons Learned from a Formative Evaluation of Social Object Labels

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ABSTRACT
This paper presents Social Object Labels as an in-gallery commenting platform and reports on a formative evaluation of the concept focusing on visitors' awareness and mental models of the developed prototype. Findings confirm many design assumptions underlying the evaluated prototype but also flag up serious problems resulting in low engagement levels. They suggest a need to de-emphasise optical markers in the user interface, to provide visitors with a clear idea about the potential rewards of engagement and to align the interaction design with users' expectations shaped by the wider interaction environment. The paper concludes with an tentative outlook on future design directions.

Author Keywords
Social Object Labels; User Generated Content; Pervasive Displays; Ubiquitous Annotation; Mobile Interaction.

ACM Classification Keywords
H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

INTRODUCTION

Social Object Labels (SOLs) are small interactive displays that can be attached to objects or places in order to collect user-generated comments and ratings about them [30,31]. They typically display information about current annotations for the object they are attached to, such as the number of comments or an average star rating, and support interaction via a user's mobile device. In addition to the display component, which is deployed in-situ, the system comprises a mobile web application for users to browse and create content, an admin application to register SOLs to physical objects and various backend services for content moderation, analysis and syndication.

SOLs are currently being developed mainly in a museums context to support visitors' social interpretation of exhibits. In contrast to other in-gallery annotation systems, which typically aim for deep integration with a museum's workflow and IT systems [e.g. 13,24], they provide a self-contained layer of infrastructure and functionality that can extend and complement existing technologies and engagement efforts in museums and galleries. This light-weight approach makes SOLs quick and easy to deploy, allowing for short-term trials in the target environment and reducing costs and risks for organisations transitioning to exhibit-based in-gallery commenting.

SOLs are designed to be peripheral and unobtrusive in order to not distract visitors' attention from an exhibit, but conspicuous enough to be noticed by visitors and encourage engagement. Getting this balance right is particularly relevant in gallery environments, where curators try to create a certain atmosphere and visitor engagement with exhibits often has contemplative undertones [26]. The SOL prototype discussed here (Figure 1) addresses this design tension in two ways. Firstly, it uses small, passive, monochrome e-ink displays that draw less attention than active colour screens. Secondly, it delegates interaction for creating, browsing and rating comments to the user's mobile device, where it can be carried out in a discreet and personal manner. In order to account for different device capabilities, personal preferences and varying degrees of digital literacy, the mobile interaction with SOLs can be initiated in various ways. The current design supports Near Field Communication (NFC), optical markers (QR codes) and manual input of a Web address (URL).

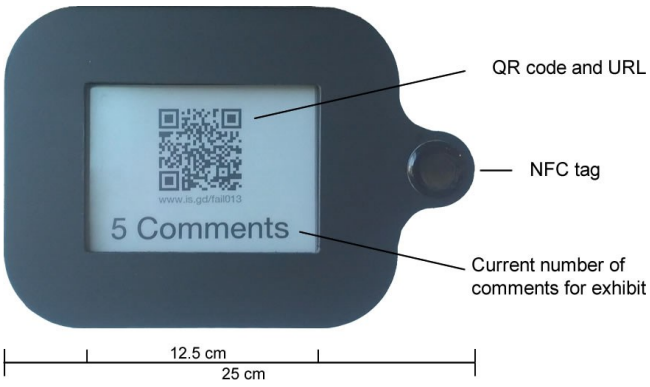

Figure 1. SOL prototype with e-ink display and NFC tag

There is a broad consensus in the literature about the need to evaluate ubiquitous computing technologies in the wild. Arguments include that important dimensions such as device, space, people and time requires real use of a system in authentic settings [1], that situated user behaviour is fundamentally different from user behaviour in a lab as it puts more emphasis on improvisation and less emphasis on following a-priori plans [2] and that research into awareness and acceptance in particular requires real world settings where users behave more naturally [12, 15].

This paper reports on the formative evaluation of SOLs at Science Gallery Dublin (SGD). It discusses the gallery environment into which SOLs were deployed, the methodology and findings of the formative evaluation and their design implications for SOLs and similar in-gallery commenting systems.

BACKGROUND

Hawkey [11] points out that the goal of many museums is participation, which can take many forms, including simple feedback, voting, collection of ideas and contributing to a museum's exhibits and interpretation. A key idea behind the drive for participatory museums experiences is that they provide visitors with opportunities to reflect and respond to exhibits. Several efforts in the past have developed mobile technologies to support visitors' social interpretation of exhibits while physically present in the gallery space.

Van Loon et al. [28] present research around ARCHIE, a handheld guide with functionality to stimulate interaction with other visitors and the museum. Citing previous research [29], which shows that the use of handheld devices in galleries can lead to isolated experiences and visitors paying less attention to the actual exhibits, they integrated communication, personalisation and localisation functionality into a collaborative game to be played on handheld devices in the gallery space. The game is anchored around exhibits, assigns players different roles and enables them to communicate via voice and other media, thereby promoting social interaction to support visitors' intellectual, social, and cultural development.

Seirafi and Seirafi [24] present FluxGuide, a commercial system for museums to present curated information on mobile devices and enable visitors to add their own commentary about exhibits. The system deeply integrates with a museum's IT backend to access digital materials about exhibits, and to support social commenting and rating of exhibits and related content by visitors. A key aspect discussed by the authors is that the system extends the traditional one-way communication from museum to visitor to a two-way model where information flows in both directions and between users, thereby enabling new forms of interpretation and learning.

Hsu and Liao [13] describe a prototype mobile application at the Exploratorium science gallery in San Francisco integrating self-guided exploration of an exhibition with social object annotation. The system uses RFID technology to provide visitors with digital information and to anchor user-generated comments to exhibits. Visitors have the option to additionally share posted comments on their preferred social network. In order to protect the museum and its visitors from inappropriate user-generated content, comments are pre-moderated, i.e. they are accessible to the public only after they have been approved by the museum.

The most recent research in this context relates to the QRator [9] and Social Interpretation (SI) [4] projects. Both projects used similar technologies to explore social object annotation in museums. They involved both, touch screens in the gallery space as a prominent way for curators to pose topical questions relating to the exhibition and collect visitors' responses via an on-screen keyboard, and QR codes printed on object labels as a more peripheral mechanism to collect visitors' comments about specific exhibits via a mobile application.

Engagement statistics from the SI project found that while a large proportion of visitors used the more prominent touch screens, only tiny minority scanned the OR codes next to exhibits. While in visitor interviews most respondents claimed to have noticed the QR codes, only two out of ten staff reported to ever have observed visitors scanning a QR code [4]. This lack of engagement is further confirmed in a separate SI project evaluation [8], which found that despite frequent iterations in the way QR codes were presented, they were ignored by a vast majority of visitors. The authors [8] identify several aspects contributing to the low engagement with QR codes, including unreliable WiFi connections, the requirement to install a proprietary mobile app and a lack of appropriate framing by the museum that would explain their use and purpose to visitors.

Literature from the field of Human Computer Interaction (HCI) suggests more fundamental problems. Research into users' perceptions, concerns and interaction with QR codes and RFID/NFC tags has revealed a wide range of problems, including users having weak mental models of tags and tag interaction [10,17,19], feeling not in control when interacting with tags [20] and being uncertain about the security [20], integrity [19] and currency [10] of markers. Furthermore, market research studies [3,22] have identified low expectations of the potential rewards of scanning QR codes as the main reason non-engagement.

Many of these problems can be traced back to a lack of information: markers with static signage cannot provide dynamic information that could motivate users' engagement and support their interaction. They require users to carry out several interaction steps with their mobile phone before disclosing dynamic information on the device screen. SOLs address this point by showing up-to-date information in-situ next to the exhibit, i.e. independent of the visitor's mobile device. The information is visible before interaction takes place and enables users to make a more informed decision about their engagement. SOLs also provide a more coherent

user experience after the interaction took place: while markers with static signage do not change appearance when a user submits content, SOLs dynamically update their display (e.g. increase the comment counter) and show a physical trace of the interaction in the environment.

An important aspect of the evaluation reported on is to assess how gallery visitors notice SOLs and interact with them. Of particular interest is whether the provided dynamic information about comments for an exhibit can help to address the usability problems experienced with static markers, support visitors to form a suitable mental model of the tag interaction and overcome low expectations of the potential rewards of engaging with markers.

GALLERY DEDPLOYMENT

Two SOL prototypes were deployed at Science Gallery Dublin (SGD) during the recent *Fail Better* exhibition, which explored the instructive role of failure in stimulating creativity in research and development. The exhibition ran for 12 weeks (7 February to 27 April 2014) and attracted 92,000 visitors during that time. The two displays were installed during the final two weeks of the exhibition.

Drawing on the idea of *social objects* [7,25], the prototypes were attached to exhibits that are likely to provoke a reaction from visitors. One display (SOL1) was installed on the ground floor next to *Superman's Wheelchair* (Figure 2) and a second display (SOL2) was installed on the first floor next to the *Apparatus for Facilitating the Birth of a Child by Centrifugal Force* (Figure 3). Both exhibits were key pieces of the exhibition and attracted much interest from visitors.

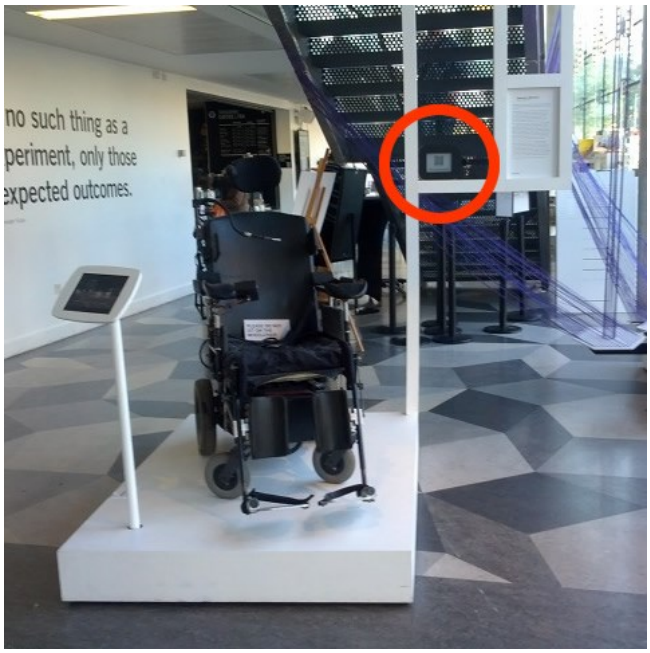

Figure 2. SOL (circled red) installed next to the exhibit *Superman's Wheelchair* on the ground-floor gallery space.

Figure 3. SOL (circled red) installed next to the exhibit *Apparatus for Facilitating the Birth of a Child by Centrifugal Force* on the first-floor gallery space.

Framing

While Giannachi and Tolmie [8] suggest that commenting mechanisms involving novel technologies such as QR codes need suitable framing in order to give visitors a clear reason why to scan the code and why to share their thoughts, no notices, instructions or calls to action were provided in the gallery space to explain the purpose or use of SOLs. Instead, it was hoped that the dynamic information shown on SOLs would provide enough clues for visitors to guess their purpose and at the same time promote engagement by piquing their interest. The deployment therefore relied on the participatory environment in SGD, which invites visitor engagement in many different ways, and on visitors being inquisitive and tech-savvy enough to try out the installed SOLs.

Physical integration

In accordance with Kules et al. [16], who suggest that interactive installations should be situated in locations with a sustained flow of people and sufficient space for interaction, both exhibits had enough space for visitors to walk around them and to approach the SOL (Figures 2, 3).

Considering that displays installed at eye height and close to other eye-catching objects receive more attention [14], SOL1 was installed at eye height next to the object label (Figure 4a) while SOL2 was installed close to eye height just below the object label (Figure 4b). Both displays were easy to read and to scan, taking into account that the height of physical markers directly impacts on the success and ease of interaction [10]

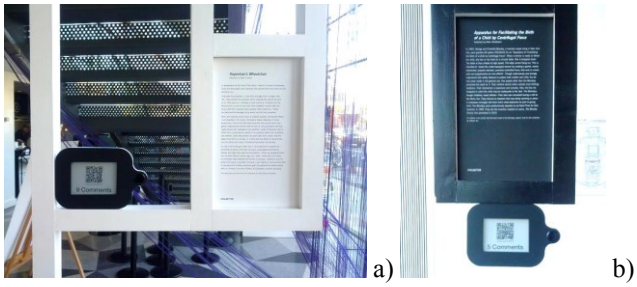

Figure 4. SOLs were installed close to eye-height a) next to the exhibits' object label or b) below the object label.

Technical integration

In parallel to the free public WiFi offered by SGD to all visitors, SOLs were connected to a separate staff network available in the gallery space. Reflecting variations in the WiFi signal strength, SOL1 on the ground floor had a very solid connection while SOL2 on the first floor sometimes had connection problems, e.g. when re-connecting after having been charged.

While it was initially planned to run SOLs on mains power to reduce maintenance, the actual deployment was battery operated and depended on gallery staff to periodically check and recharge the displays. Once flat, SOLs were taken from their casing, charged for 3 hours and then re-inserted into the casing, which occasionally left an empty casing in the exhibition space for several hours.

Information environment

Brewer [5] introduces the notion of an *information environment* as a way to describe how the information shown by an ambient display integrates with other information available at the site. While the evaluated SOL prototype is capable to display information about the exhibit it is attached to, such as a title, description or image, the installed units were configured to only show the number of comments for an exhibit, a QR code and an URL for visitors to connect their mobile phone (in addition to the NFC tag integrated into the casing). Consequently, there was no information overlap between SOL and object labels or other information available in the gallery space.

Interaction environment

A standard feature in all exhibitions at SGD are student mediators with knowledge of the relevant subject area, ready to answer questions about exhibits and involve visitors into discussions about related issues. Another common feature are opportunities for visitors to get involved in research studies by taking part in a short experiment or filling in a questionnaire. For instance, visitors to Fail Better had the opportunity to take part in an experiment run by the School of Psychology at Trinity College Dublin, which examined attitudes to failure and their impact on wellbeing.

In addition to these moderated engagement opportunities, where visitors could discuss exhibits and related issues with a student-mediator, *Fail Better* had various interactive installations that invited people to contribute their views and explore additional information.

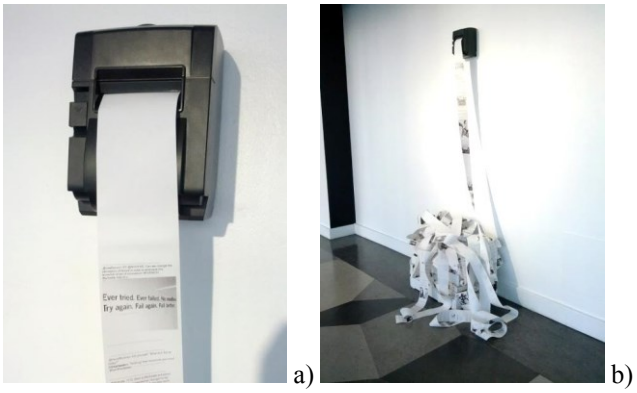

Figure 5. Twitter printer (a) in the ground floor gallery (b).

A *Twitter printer* (Figure 5) was installed in the ground floor exhibition space. Consisting of a small thermal transfer printer connected via Bluetooth to a hidden computer, the device uses the Twitter API to periodically search for Tweets containing the exhibition hashtag (*#failbetter*) and then prints them out. The resulting endless print roll spools down from the printer and is collected in a box on the floor below the printer.

Figure 6. Fail Wall in the first floor gallery.

A *Fail Wall* (Figure 6) was installed in the first-floor gallery space. The installation prompted visitors to write a personal failure on a plastic tile, photograph it for upload to an online photo stream and then put up the physical tile on the wall for other visitors to read. The installation involved a work area for writing on the plastic tiles, a camera area where the plastic tiles could be photographed and a display area where tiles could be put up on simple shelves. A separate second display area was used to feature a *Fail of the Day* selected and put up by gallery staff.

Figure 7. Touch screen with additional video footage.

Some exhibits had associated projections or interactive touch screens that offered additional information. For instance, *Superman's Wheelchair* had a small (10 inch) touch screen installed in front of the exhibit showing a selection of related video footage (Figure 7).

Together, these engagement opportunities offered analogue and digital routes to participation, spanning a wide range of modalities, capabilities and learning styles. Rounding off the open and participatory atmosphere, SGD offers free wireless internet access to visitors and has no restrictions on mobile phone use in the gallery space, enabling visitors to take pictures of exhibits and share their experience live on social networks.

EVALUATION

The formative evaluation focused primarily on qualitative aspects such as visitors' awareness and mental models of SOLs. It involved visitor observations and structured interviews carried out in the gallery space. The study employed convenience sampling that includes gallery visitors most easily observed and willing to take part in an interview. However, in order to maximise the range of views and insights, sampling was still informed by basic strategies from probability sampling to address potential biases. With respect to coverage, the study was carried out over a Friday (workday) and Saturday (weekend), which are likely to vary in audience volume and composition. With respect to visitor sampling, the researcher aimed for a balanced demographic and included people visiting on their own and in pairs or groups.

Visitor observations

Observations were carried out in the gallery space to find out whether visitors notice SOLs and how they interact with them. In order to not disturb people's natural behaviour, observations were carried out without prior notice or informed consent. The researcher's conduct during these observations was informed by the British Psychological Society's code of ethics and conduct, restricting observations "*[...] to those situations in which persons being studied would reasonably expect to be observed by strangers, with reference to local cultural values and to the privacy of persons who, even while in a public space, may believe they are unobserved.*" [6] (p.13).

Observations focused on "encounters" as a quantifiable unit. Encounters were conceptualised as situations where visitors had a clear chance to notice and engage with a SOL. At minimum, an encounter involves a visitor approaching and stopping at an exhibit. Visitors might then look at the exhibit, read the object label, look at the SOL, point others to the SOL or engage with the SOL in various ways. Observations were coded on the spot using a coding template supporting both quantitative and qualitative observations.

The observations were carried out over two days during the last week of the exhibition. Total observation time was 6 hours and 35 minutes, during which 212 encounters were observed. Of these, 90 involved *Superman's Wheelchair* and 122 the *Apparatus for Facilitating the Birth of a Child by Centrifugal Force*. The observations suggest that 62 (29%) visitors were on their own, 82 (39%) part of a couple and 68 (32%) part of a group of three or more.

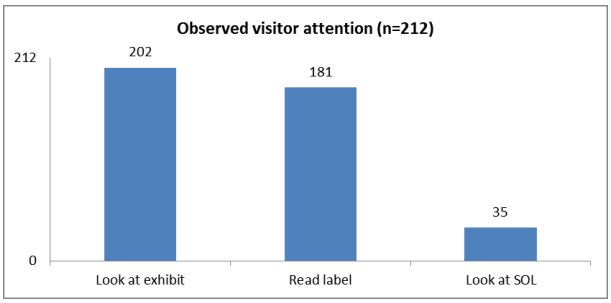

Figure 8. Observed visitor attention during encounters.

In the observed 212 encounters, 202 visitors (95%) looked at the exhibit (some only read the label), 181 visitors (85%) read part or all of the object label and 35 visitors (17%) visibly noticed the SOL (Figure 8).

Of the 35 visitors who looked the SOL, six (17%) touched the NFC tag in a manner one would press a button, four (11%) touched the screen to see if it was interactive, three (9%) scanned the QR code and two (3%) scanned the NFC tag with their mobile phone (Figure 9).

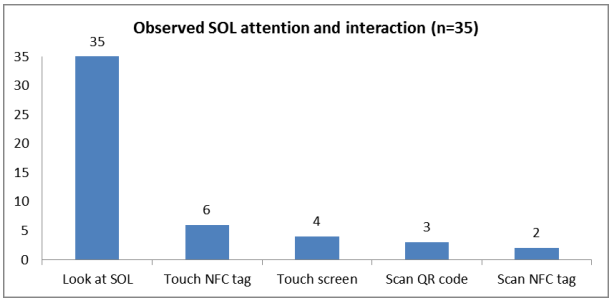

Figure 9. Observed SOL attention and interaction.

The observations suggest that of the 35 visitors who visibly noticed the SOL, many assumed that it was somehow interactive but were not sure how to actually interact with it. At least ten (28%) assumed a direct interaction model and tried to press the NFC tag or touch the display screen. When these actions had no effect, visitors did not further investigate but simply moved on.

With regard to group dynamics, two out of the three observed QR code scans were carried out by visitors who were part of a couple or group. In both cases the primary actor tried to get their partner or other group members involved, either by pointing out the SOL to them or by sharing their mobile screen after scanning to read submitted comments. In none of the observed interactions did visitors actually contribute a comment.

Visitor interviews

In addition to observations, which focused on visitors' awareness and interaction, structured interviews were carried out to understand visitors' mental models of SOLs and explore their motivations and barriers to engagement. The interviews also included questions to further qualify recorded observations.

Visitors were approached by the researcher after their encounter with the exhibit and possibly the SOL. Visitors were informed about the research context and asked to sign a consent form before the interview. Interviews lasted between 5-7 minutes and followed a fixed structure. The interviewer recorded answers in a coding template. A short section with demographic questions was filled in by participants themselves after the interview.

A total of 17 visitor interviews were carried out, involving ten female (59%) and seven male (41%) participants. The age range of interviewees reflects SGD's target audience with ten participants between 25-34 years of age (59%), three between 16-24 years (18%) and others falling in equal measure into older age brackets. All participants reported to own a smartphone (defined as a mobile phone with internet access and touch screen) and more than half of all interviewees (53%) indicated that they had scanned a QR code before. None had ever have scanned an NFC tag.

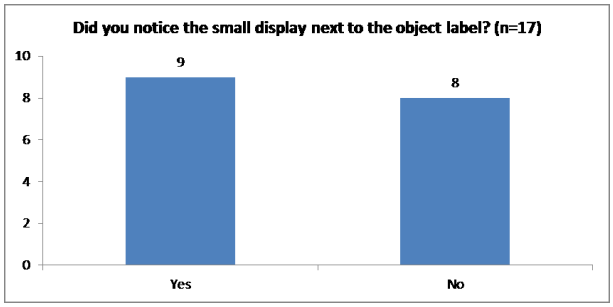

Figure 10. Interviewees' self-reported awareness of SOLs .

When asked whether they had noticed the SOL, referred to as "the small display next to the object label" and pointed out by the interviewer, nine visitors (53%) answered yes and eight visitors (47%) answered no (Figure 10).

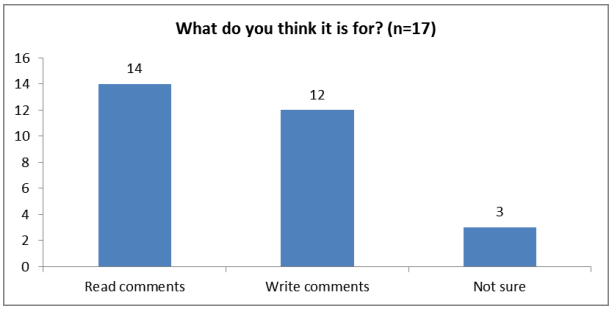

Figure 11. Interviewees' assumptions what SOLs are for

With regard to visitors' understanding of the purpose of SOLs, 14 visitors (82%) thought they were for reading comments, 12 visitors (71%) thought they would also allow submitting comments and three visitors (18%) were not sure (Figure 11). This suggests that the majority of visitors made correct assumptions about the purpose of SOLs in the gallery space once they were aware of them.

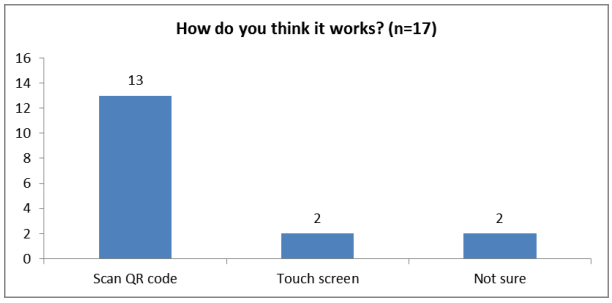

Figure 12. Interviewees' assumptions how SOLs work.

Asked about interactivity, 14 respondents (82%) thought that SOLs were interactive in some way while one visitor (6%) thought they were not interactive and two visitors (12%) were not sure. When asked how the interaction with SOLs might work, 13 visitors (76%) answered that one would scan the QR code, two visitors (12%) thought it was a touch screen and another two visitors (12%) were not sure (Figure 12). Contrary to observations, which suggest that many visitors assumed a direct interaction model, the interviews indicate that most visitors understood that scanning the QR code was the primary mode of interaction.

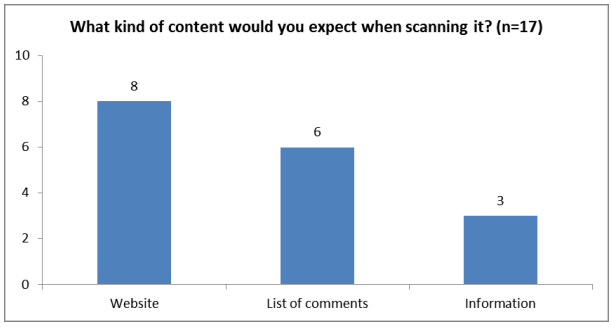

Figure 13. Interviewees' expectations of content.

When asked what kind of content they would expect when scanning the SOL, eight visitors (47%) answered they would expect to be directed to the gallery's website where they could read and submit comments, six visitors (35%) would expect a list of comments and three visitors (18%) would expect "information" but did not further specify what kind of information (Figure 13).

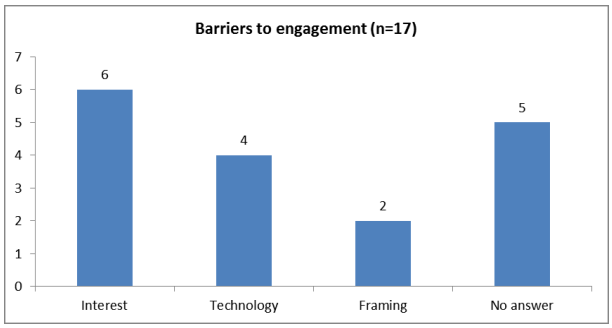

Figure 14. Interviewees' barriers to engagement.

Finally, when asked what it would take for them to engage with the SOL and what was holding them back, six visitors (35%) mentioned a lack of interest in comments or more generally in further engaging with the exhibit, four visitors (24%) mentioned technological barriers such as not having a QR code scanner installed on their phone or not being sure exactly how to scan a code, two visitors (12%) mentioned a lack of information in the gallery that would explain the purpose and use of SOLs while five visitors (29%) did not answer the question (Figure 14).

DISCUSSION

The primary focus of this formative evaluation has been on visitors' awareness and mental models of SOLs. It employed observations to find out whether visitors notice SOLs and how they engage with them, and visitor interviews to compare observed awareness with self-reported awareness and further probe visitors' understanding of the purpose and use of SOLs.

Visitors' awareness of SOLs directly relates to the inherent design tension between being peripheral and not distract from the exhibit but noticeable enough to encourage engagement. With observations suggesting that only 17% of visitors are aware of SOLs and self-reported awareness at 53%, the current SOL design is clearly not too obtrusive or distracting. In fact these numbers suggest that SOLs could be more conspicuous to reach higher levels of awareness without diverting too much attention from the exhibits.

The strong discrepancy between observed and self-reported awareness is remarkable. While some of this difference might be attributed to the Hawthorn Effect [27] or "good bunny effect" [21], where respondents try to give "the right" answer to a researcher's questions, another possible interpretation is that visitors automatically blank out QR codes when they see them, resulting in only a passing glance that is difficult to detect in observations. People's low expectations of QR codes are well documented [3,22], and ignoring them in this manner would be in line with the known phenomenon of "display blindness" [18], where people have such low expectations of displays in their environment that they automatically blank them out.

This interpretation is further supported by the low numbers of actual scans, and by visitor interviews suggesting a weary and sometimes negative attitude towards QR codes. While most visitors understood that they had to scan the QR code on the SOL with their mobile phone, they had no clear expectations what to expect in return. Many visitors reported that a lack of interest in the expected content was their main barrier to engagement. This suggests that the dynamic information provided by the current SOL prototype is not enough to give visitors a clear idea about the content they can expect and motivate engagement.

Possible ways to address these problems include de-emphasising the QR code in the user interface and providing more detailed information on the display. Current practice in museums (and elsewhere) is to use QR codes not only as an optical marker to be scanned by mobile devices, but also to advertise interaction opportunities to potential audiences. While the former is a robust, cheap and relatively well-known mechanism, the latter has come into disrepute due to the low quality of content often linked to. Displaying QR codes less prominently or relegating them to a secondary screen together with other connection options helps to split these two roles and make use of their qualities as robust and well-supported machine-readable markers while not misusing them to advertise interactivity to potential audiences. At the same time, users' lack of interest in the expected content can possibly be addressed by providing more engaging information on the SOL. This could involve "*bringing the data forward*" [23] by showing some actual comments on the display that can give visitors a better idea of potential rewards of engagement.

Another recurring theme in this evaluation is the need to support direct interaction on SOLs without a mobile device. Visitors' expectations of how to interact with SOLs are shaped by the wider interaction environment and their experience with other interactive installations, which often support hands-on direct interaction in the form of touch screens or buttons. Observations suggest that visitors build on this experience when trying to figure out how to interact with SOLs, e.g. by tentatively touching the display or trying to press the NFC tag like a button. Supporting direct interaction is also desirable from a curatorial perspective as it is more inclusive and enables visitors without smartphones and technical skills to participate.

Two common barriers to engagement mentioned in visitor interviews are a lack of information about SOLs and technological issues, such as not having a QR code scanner installed. With regard to the former, the results refute the notion of SOLs being self-explanatory and the displayed dynamic information being intriguing enough to encourage

engagement. Instead, future deployments should learn from others [8] and provide information that frames and explains their purpose and use to visitors. With regard to the latter, the results suggest that it is beneficial to support a wide range of mechanisms to connect a mobile device and thereby minimise the chances of technical issues or preferences becoming real barriers to engagement. In addition to the currently supported NFC tags, QR codes and manual URL input, this could, for instance, involve posting comments on SOLs via commonly used social platforms like Twitter, which at least a subset of visitors are familiar with and have already installed on their mobile device.

SUMMARY AND CONCLUSIONS

This paper has presented SOLs as a platform for the social interpretation of exhibits in the gallery space and reported on a formative evaluation in the field.

Drawing on literature from museum studies and HCI, it has discussed a range of problems relating to visitors' awareness, acceptance and engagement with in-gallery commenting systems using optical or radio-frequency markers for mobile interaction. The paper has linked these problems to a lack of dynamic information that could motivate and support user interaction, and discussed how SOLs aim to address this by providing current information about object annotations in-situ and independent from the mobile device screen.

Motivating the empirical evaluation of SOLs at SGD with the need to evaluate ubiquitous computing technologies in realistic contexts, the paper described in detail the gallery environment into which SOLs were deployed. It explained the (lack of) framing, the physical integration with the exhibition, the technical integration with regard to networking and power supply, the information environment and the interaction environment in the gallery space. The latter was described as rich in engagement opportunities, with analogue and digital routes to participation and addressing a wide range of modalities, capabilities and learning styles. While such an environment primes visitors for engagement it also is very competitive, requiring installations to provide an excellent user experience in order to attract visitors' attention and at the same time conform to a common set of interaction mechanisms as visitors' expectations are shaped by their experience with other interactive installations in the exhibition.

The formative evaluation was based on visitor observations and structured interviews to assess visitors' awareness and mental models of SOLs. While engagement numbers for the deployed SOLs were disappointing, the evaluation flagged up a number of problems with the current design and can therefore be seen as an instructive failure. The evaluation results suggest that the majority of visitors understands in principal that SOLs are for reading and writing comments and that they can be accessed by scanning a QR code. However, many visitors were unaware of the deployed SOLs, were unclear exactly what kind of content to expect and seemed to assume a direct interaction model in line with other interactive installations in the exhibition. Various opportunities were identified how the information presentation and overall design of SOLs could be improved.

One key finding relevant beyond the immediate context of SOLs is the observed QR code blindness. Visitors seem to blank out QR codes in their environment much in the same way as *display blindness* has been observed for people's attention to public displays [18]. In both cases low expectations based on previous poor experiences can be identified as the main reason. The paper suggests to decouple the technical utility of QR codes as markers for mobile interaction from their misguided use as a means to advertise interactivity. This can be achieved by making QR codes less prominent and showing them as one of many options for mobile interaction.

Overall the evaluation resulted in valuable insights how people perceive and understand SOLs in a gallery space, confirming that ubiquitous computing technologies should be evaluated in realistic settings. The findings will help to further develop the current prototype in order to improve the user experience. It is envisaged that the next design iteration will depart from a single-screen interaction model with sparse information upfront and instead move to a multi-screen model with direct interaction and more detailed information upfront. It is hoped that this change will raise awareness levels by avoiding the effects of QR code blindness, increase engagement by presenting more relevant content and better align with people's expectations shaped by the wider interaction environment.

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