
Bridging the Gap: Implementing Interaction Through Multi-user Design

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Abstract

We describe an interactive museum installation designed to extend visitor participation through personal reflection and contribution. The case study describes design approaches, which focused on multiple individual simultaneous use, which we describe as multi-user design. These approaches were deployed to support the visitor moving from viewer to contributor in a temporary museum exhibition. We present the anticipated use and early analysis of some of the data from actual use of the system. We outline our initial findings for the opportunities and limits in designing for personalised user-generated content through such approaches within museums and suggest areas of future work on qualities of participation and visitor contribution.

Keywords

Museum, participation, user-generated content, personalised, contribution, experience

ACM Classification Keywords

H5.2. User-centred design

General Terms

Design

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Introduction

Wright and McCarthy highlight 'any designed technology embodies assumptions (made by designers)' about how a 'system will be used' [11:6]. People do not, however, always understand and react to a new system in ways that designers anticipate. As Suchman illustrates, understanding what to do with an 'unfamiliar artifact' is an 'inherently problematic activity' requiring 'active-sense making' [10:9]. In this sense, any design of a new system, which is outside of their anticipated experience requires building opportunities for people to learn how to use it.

We describe a case study in which a new interactive museum installation was designed as part of an exhibition, **In the Long Run: Thirty years of the Great North Run**, at the Great North Museum, Newcastle Upon Tyne, UK, between July and October 2010. The installation proposed to extend participation through personally meaningful contribution by using multi-user design approaches. We refer to multi-user design here as an approach we employed for multiple individual simultaneous use of a singular system. We describe decisions, which supported social and collaborative learning of the system to take place, outlining how we designed the system to bridge the interaction gap, so the visitor could easily move from viewing to contributing. We present the anticipated and actual use of the system illustrated through early analysis of people's experiences, which outline tensions between personal contribution, the social and anticipated museum experience. The study highlights opportunities and limits for supporting personalised user-generated content in museums through multi-user design approaches and outlines our future work on qualities of participation and visitor contribution.

The Design Brief

The design brief was to create an installation that a) highlighted different forms of participation in the Great North Run over the past thirty years, b) extended notions of what it means to take part in the event and c) supported personal reflection and contribution to a collective shared experience and user-generated archive. The physical installation had to be in place for three months as part of a visiting exhibition and withstand mass interaction from potentially 100-150,000 families, and runners and therefore had to be robust. The brief was developed between the museum curators at the Great North Museum: Hancock and interaction design researchers at Culture Lab, School of Computing Science, Newcastle University.

The Museum Context

In recent years, new systems have been developed in museums to increase capacity for 'visitor participation and direct involvement' [3:356]. This interest in supporting such engagement has led to an extension of the physical boundaries of the museum through online participation and distributed personalised experiences within and beyond the immediate institution [1]. This, however, does not come without institutional negotiation between curatorial control and inclusive design to support wider participation. These tensions can be partly aided by sensitive technological design that helps build on the effective 'involvement strategies' which draw from traditional sensibilities of educators within the institution [3:356], framing participation so it is situated within the parameters of the institution, how it functions and how the visitor experience is designed [4]. Designing technology for museums, therefore not only requires a sensitivity to active learning opportunities [6] within a social,

personal and physical context, but also requires a consideration of what people expect to happen as part of their visit [5]. Designing for these parameters, the situated context and the anticipation of those considerations, help to frame design decisions for any new interactive system within the museum context.

Bridging the Gap

In approaching the brief we recognised that by creating opportunities for personal contribution within the museum there were two challenges: a) how to encourage visitors to commit to a contribution, and b) how to ensure the contribution is personally meaningful for them and others within the wider context of the exhibition. Brignall and Rogers [2] have identified that the main issues preventing people from moving from focal awareness to direct interaction and contribution with technology in social contexts are embarrassment and lack of familiarity. In order to address these issues, they recommend creating opportunities for vicarious learning and a system which has 'strong physical and social affordances' with highly visible means of conveying an unambiguous purpose [2:24]. We therefore focused on deploying familiar technology, which could support interaction and contribution, and could also support multiple use and greater opportunities for social learning of the system to take place. This included the use of single touch touch-screens, digital pen (Anoto) technology (see Fig 1.), large display screens and a website. These systems were chosen due to their existing deployment within museums. The design brought these together to provide opportunities to view, browse and add content.



Figure 1. Anoto pens, work like ordinary pens, however they use video technology embedded in the pen, combined with specially designed paper to allow both a digital and ink-based record of what people write or draw.

Implementation Through Multi-user Design

Limiting ourselves to familiar technology does not present any intrinsic research challenges, but our aim was to use multiple touch screens and supporting devices for multiple single use, to facilitate a sense of personal space, but also a social connection between users. Little research has been done on how the design and implementation of such systems should be tackled. We addressed these challenges by using multi-user design approaches, treating the system as one large collaborative interactive rather than many replicated single units. By placing screens at alternating orientations along the length of the nine metre space, users could approach from any direction, interacting simultaneously; in this way we split the entire interaction space up into more personalised spaces [9]. We chose to use horizontally mounted displays because, as Rogers et al describe [8], they offer an opportunity for users to engage with others. By treating the interactive as loosely collaborative, users could observe each other to provide learning through copying the action. We can describe the way in which users connect around the space in terms of loose distributed cognition [7], which would allow for users to influence each other across the interactive without them being forced to collaborate or share.

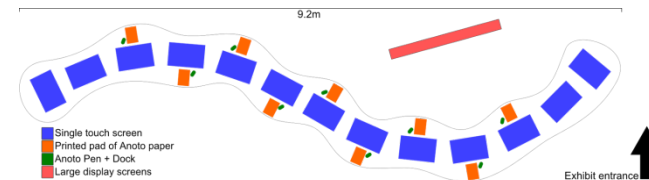


Figure 2. Layout of the system design



Figure 3. The interactive installation in the Great North Museum: Hancock. It consisted of thirteen single touch touch-screens placed along the length of a long table. Nine of the screens had associated Anoto digital pens and pads. The screens displayed stories and photographs from runners and visitors plus an invitation for people to write or draw on the pads. On returning the pen to a docking station their contributions were uploaded onto the associated screen and to a live server and connected website. This produced a number, which visitors could write down on the pad. This number could then be used to recall the entry via numerical key pads linked to two large display screens located on a wall next to the table. In addition to the systems deployed in the museum, visitors could also view and submit their own contribution at home from the website.

It was an important decision on such a large-scale design that whilst we provided intuitive interaction for a wide demographic, we also maintained a robust system to support high usage. To this end we built both the hardware and software in a modular fashion allowing for quick and efficient hardware and network repair.

Anticipated Visitor Use Cases

The following scenarios highlight how we anticipated the target family and running audience might interact.

The family: *Fiona and Mark have taken their children, Phoebe (6) and Alex (1) to the museum for the day in the summer holidays. When they arrive, the children see the interactive and want to play on it. Phoebe grabs the pen and looks around for what she can draw and talks to Fiona about this. Fiona helps Phoebe, she sees the funny runners' costumes display in front of her and suggests she draws one on the pad. Mark sees Phoebe using the pen and decides to draw something of his own. They take their drawings and type in their drawing number on the large display screens to share.*

The runner: *John has completed the Great North Run several times. In the exhibition he has looked around the traditional exhibits and found some interesting facts about the Run's history. It makes him feel proud that he has been part of it. He arrives at the installation and sees photographs and stories on the large display screens about the Run from people like him. He sees other people touching the screens on the table and approaches a free screen. The screen shows a story of someone talking about how hard it is going up the hills. John can relate to that, and remembers how he felt last year. He notices that other people have hand written a story on his screen. He notices other people writing and*

decides to write his own. When finished he rips his story page off and puts it in his pocket. He will show his wife on the website when he gets home.

Initial Findings

Over an installation period of 93 days (July 2010 – October 2010), the exhibition received approximately 100,000 visitors, 60,000 of which viewed or browsed the interactive, and 13,000 submissions of writing, drawing and web content were made. The high number of submissions suggested that for many visitors we had potentially bridged the interaction and contribution gap within this context. However, in our analysis, we recognised we had rejected 92% of these submissions on the basis that they were either irrelevant to the theme of the exhibition or illegible; in short they failed to represent what the researchers and museum staff felt were personally meaningful representations of the Run [see Fig 4.]. Of the 1100 remaining submissions, 95% of these were created within the museum, with 5% submitted online, suggesting that the contribution gap had not been as successfully bridged via the website. All of the online submissions were considered relevant, and the detailed, individual and personal nature of the stories suggested they were personally meaningful for those who had contributed online.

Actual Visitor Use Cases

In looking more specifically at how people were contributing within the museum, we collected qualitative data including written contributions, observations, semi-structured interviews conducted as visitors left the exhibition and in-depth interviews with runners. We present here two examples of observed visitor use, alongside early analysis and themes.

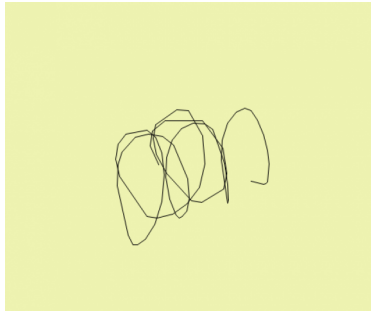


Figure 4. Example of rejected submission

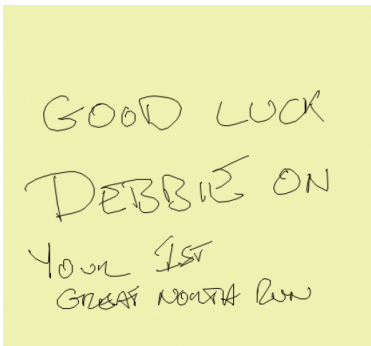


Figure 5. Example of accepted submission of someone sending a message to their friend in the museum.

The family: Tracy has brought her son and niece to the exhibition. She usually watches the Run on television and is looking forward to seeing her friend running this year. The group approach the interactive together and Tracy's son and niece pick up pens and draw on different screens. They talk to each other about why this doesn't work. Tracy goes to another screen, reads the instructions and draws on the pad. Her niece sees this and draws on the pad next to her. Tracy draws a funny costume on a runner and her niece writes a thank you message to Tracy and a good luck message to Tracy's running friend. The niece shows Tracy her message on the pad and they talk and laugh.

Social & Collaborative: Most of the overall content was made by family groups, as described above. Whilst some of these contributions reflected personal experience, people also used the system as a way of writing to one another. Others reflected on personal connections to the Run through extended family and friends. The multiple single screen system in this instance worked well, because family groups could watch and learn from each other's actions whilst using it simultaneously to share their content. This further helped to alleviate unanticipated confusion as to how the pen and screen system worked together.

Content & Context: Some of the runner visitors described how the hand drawn content, visible on the large display screens and touch screens, helped them understand how to contribute. They described this content as more '*personal*', which in turn encouraged them to write '*because you've got your own personal story as well*'. Whilst this content was meaningful for some, other adult runners thought the interactive was full of '*kids stuff*'. This was further exacerbated by the

location of the interactive next to other children's activities in the exhibition. Furthermore, some of these visitors also described their expectations of museums as '*scholarly*' where valuable objects were displayed, and touching wasn't encouraged. Consequently, they reported feeling self-conscious, unsure how to behave in response to the interactive and so did not contribute. For other runners, however, the pen and the context of the exhibition triggered their desire to contribute.

The runner: Les (68), a runner and rock climber, enjoys the exhibition and it makes him feel proud. He approaches the interactive table first by looking at a screen, and then picking up a pen on the opposite side of the table. He tries to write on the screen. A museum assistant comes to help. They both talk and walk over to the other side of the table. Les chooses to write about how he started the Great North Run in an attempt to stop smoking in 1982.

Part of the Club: In describing his experience of using the interactive Les explained how he initially felt '*embarrassed*' and '*stupid*'. This soon subsided when he understood how to use the pen. He felt compelled to write something because he described feeling privileged to be acknowledged as part of the history of the Run and part of the '*club*'. However he also felt '*exposed*', because he was in a public space and didn't know what to write. He overcame this because he'd been shown how to use the pen, which gave him some control.

Discussion and Future Work

The multi-user design approach in this instance created opportunities for both multiple single use but also social and collective use of the system. Deploying such designs to assist contribution therefore appeared to

bridge the interaction gap for many visitors as we anticipated. This was achieved through a combination of familiar tools and technologies deployed in ways, which supported social connection between visitors and museum staff. Our analysis revealed this approach encouraged many more families than runners to contribute. Some of these contributions highlighted personal reflections of the Run, which other visitors responded to by contributing themselves. However, others perceived this content and therefore the invitation to contribute, not relevant for them, and was in part due to the museum context and their expectation of what a museum visit entails. In summary, the context of the museum, the content of the exhibition and the interactive plus the social connections taking place with visitors had subtle, complex and immediate effects on personal reflective processes, on the individual and collective experience of contribution and in ways that were unexpected.

Multi-user design to support contribution within this study, highlighted the significance of museum expectation and social connection when creating spaces for personally meaningful contribution. Our future work is to characterise, in more detail, what this might mean for both the museum institution and potential visitors through user involvement in the design stage. This has the potential to highlight further opportunities to understand the potential of multi-user design to improve understanding on the specific qualities of participation and contribution that digital technologies can support within museum spaces.

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