

# Creating a Rural Community Display with Local Engagement

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## ABSTRACT

We present our experiences of using an iterative, prototype-driven approach to developing social systems with the participation of communities, inspired by probe-based methodologies. This approach is illustrated by our attempts to design and understand the role of situated display technologies in a rural community, which has led to the development of a photo display and digital notice board, guided by the community's involvement.

## Keywords

Community, rural, situated displays, prototyping, participatory design, action research, probes.

## ACM Classification Keywords

H.5.2 Information interfaces and presentation: Prototyping.

## INTRODUCTION

Digital situated displays are becoming an increasingly common sight in public spaces as the technologies required to create them become cheaper and more sophisticated. While the study of interaction with situated displays has long been an active area of research, they are typically only seen in urban environments and rural areas remain underexplored. In spite of this, rural areas are a particularly interesting environment for the study of technology because, although residents are quickly coming to recognise benefits that the Internet offers, their remote location means many rural areas are poorly connected broadband 'notspots', unable to take full advantage of the latest web applications.

As public displays of information, particularly noticeboards, have traditionally played a large role in community organisation (e.g. Figure 1), we are interested in the role that digital situated displays of information might play in rural villages. We hope to better explore the needs

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of this environment in relation to public displays and the role that technology might play there.

However, communities are complex structures based on local customs and practices that designers must understand if they wish to design relevant technologies. Even within the same country and region, the cultural differences between university researchers and rural residents can be significant, particularly considering the digital divide that exists between those with access to and experience with technologies and those without. Thus, our second goal is to explore how such displays might be designed with the assistance of communities to create a technology that is suited to their needs and sensitive to local cultural concerns.

Working with Wray, a small rural community in North West England, we deployed situated display prototypes that supported the community in a variety of ways [26,27]. But it is the outcome of the second goal that we present here: our experiences in utilising an iterative, participatory approach to design two successive systems, the Wray Photo Display and WrayDisplay, tailored to the community's individual needs. By deploying functional prototypes into this real-world environment, participants have gained a greater understanding of the issues surrounding the technology and have been able to provide increasingly meaningful input, while researchers were able to learn about the deployment environment and culture. Illustrated by our experiences in Wray, we discuss the strengths of this



Figure 1. Community noticeboards in Wray.

type of approach and the challenges we have faced.

## **BACKGROUND**

Our work takes place against a backdrop of ongoing changes to the way people socialise and interact, as these activities are increasingly mediated by technology. We believe that public displays can play a positive role in these changes, provided that they are carefully designed. This section introduces how we believe situated displays can support communities and the existing methodologies that might be appropriate in designing them.

### **Communities and Situated Displays**

As telecommunication technologies create a ‘global village’ in which communicating with a distant country is as effortless as communicating with your neighbour, there has been some debate about their impact on local communities. Some have perceived ‘decline’ in community engagement, most famously illustrated by Putnam [24], but others instead suggest an evolution as technologies supplement rather than replace existing community activities [30].

A number of studies have demonstrated ways in which this augmenting of communities might take place. The Blacksburg Electronic Village [4], a community portal, aimed to increase participation in community life and resulted in reports of increased membership in community groups and communication between members. Typically, such portals have been web-based, but this may pose accessibility problems for those without the skills or resources to take advantage of them, such as the elderly or financially disadvantaged, or those in rural areas with limited connectivity. For this reason, we believe publically situated digital displays of information may prove to be advantageous in this domain, by providing access to community information through a simple user interface in a central community space.

Situated displays have long been part of the ubiquitous computing vision [29] and are now a common sight in urban environments. With the technical challenges of deploying a simple display now trivial, research has instead focused on interactions with displays, design considerations and the social implications of public deployments. As it emerged from CSCW research, much of the defining research around situated displays is based in the workplace [6,12,20], but a growing body of work is interested in the use of situated displays in public social spaces and community hubs [7] and the developing world [9,19].

Central to situated displays is the notion of ‘space’ and ‘place’: that a physical space becomes a ‘place’ when it is “invested with understandings of behavioural appropriateness, cultural expectations, and so forth” [13], which are in turn inherited by technologies situated in that place. For this reason we feel it is particularly important to gain an insight into these understandings and expectations through observations of the deployment environment and the participation of those who will use it.

### **Participation and Iteration**

It has long been recognised that usability extends beyond interface design, encompassing cultural issues and the way a system fits within existing working practices and social structures. In response to this need, user-centred design emerged as a philosophy that requires designers to “start with the users, and to work from there” [22]. Although the term is not strictly defined [16], participation of the users themselves and iterative approaches are often advised [11], as is the use of multiple prototypes to allow for better comparison by users [28].

This involvement of the user has much in common with participatory design techniques that emerged from a desire for workplace democracy, in which those “destined to *use* the system play a critical role in *designing* it” [25]. Beyond this, the degree of participation varies greatly [17], ranging from consultation meetings through to the involvement of participants as full co-designers. In addition to the benefits brought to the user by UCD, this participation in the design process can help to placate any fear that may surround the introduction of a new system.

The second common feature of these approaches is iteration, either through multiple designs or through prototype systems. This addresses issues with traditional waterfall approaches, including users who may not know what they want or what is available, designers who may not fully comprehend requirements and requirements that may not become apparent until implementation begins [23]. Iteration is also a feature of action research, an approach to research and problem solving often linked to PD [8] that cycles through problem diagnosis, action intervention and reflective learning, often closely involving the user as a co-researcher [1]. Each cycle introduces a change into the environment that is aimed at both improving the studied situation and allowing the generation of theory.

### **Probes and Prototyping**

Our work has also drawn upon probes, a set of related methodologies based around materials left in an environment to inspire interesting and unexpected ideas. Beginning with the original cultural probe [10], the use of probes has been embraced rapidly and enthusiastically by the HCI community, prompting much debate and a number of variations [3].

Cultural probes were developed as a means of provoking inspirational responses from participants, to inform designs that are sensitive to cultural concerns without constraining designs within the participants’ own perceptions of their needs. Materials given to participants included cameras, questions on postcards, maps and photo albums: abstract tasks that could be completed and returned piecemeal. Rather than seeking firm requirements or statistics, the probe materials help designers gain an insight into the culture of their participants that allows them to design appropriate technologies.

One variant of this methodology, the technology probe [15], instead centres on the deployment of a technology ‘seed’, an abstract, exploratory prototype that the user is free to engage with and appropriate as they please. This has the joint aims of field testing the technology in question, inspiring ideas from participants and researchers alike, and learning about the needs of users in the environment. Like the probe pack, a technology seed is an abstract artefact, which is simple, flexible and employed early in the design process to provide inspiration. Heyer and Brereton [14] have developed a similar approach, Reflective Agile Iterative Design (RAID), which exposes a prototype to real-world usage and iterates through a number of designs based on this experience.

### APPROACH

We initially approached Wray with the intention of using cultural probes for initial fieldwork, followed by a technology probe deployment informed by our findings. However, it quickly became apparent that our participants expected to see the results of their efforts and have input on the functionality of the prototype. Residents were disappointed when they were not presented with or given an opportunity to comment on direct results from our probe pack, particularly given that they had invested time and effort into their submissions. Likewise, after our first deployment, a fairly ambiguous system for displaying photos, residents began to request alterations almost immediately. At the very least, it would appear unwise not to take heed of design suggestions from the community—these participants are our experts on their way of life.

The approach that was adopted in response to these needs is an iterative process centred on an increasingly robust prototype system, which cycles through observation, discussion, design and deployment phases (Figure 2), using the contributions of community members and observations of a real-world usage to guide future development. Like action research, this approach generates rewards for both researchers, in the form of knowledge, and participants, who gain a system that is tailored to their requirements and continues to evolve in response to their feedback.

#### Observations and Discussion

The first two phases are fieldwork-based, in which researchers make observations of the environment, particularly existing practices surrounding the aspects of social interaction that the system is expected to support. These observations are then discussed with participants, with the aim of refining the researchers’ understanding. At this stage, we were not expecting develop a thorough understanding of the environment, but basic insights that would be refined through subsequent iterations. This is intended to allow us to ground our discussions and designs in observed features of the environment.

We did not limit ourselves to any particular methods during these phases, lending us a degree of flexibility and allowing adaptation for different environments. Indeed, the selection

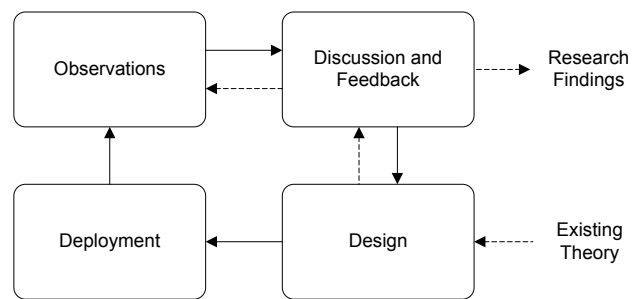


Figure 2. An iterative, participatory approach.

of techniques utilised was altered between iterations based on our experiences and growing understanding of the setting. Generally, the techniques utilised were broadly ethnographic in nature, including probe packs, questionnaires, interviews, focus groups and attendance at community events.

These stages were facilitated by a member of the community who understands both local needs and technology, referred to by Marsden *et al.* [18] as a “human access point”. Our contact provided a means of accessing others within the community and mediating our interactions with them, as well as encouraging feedback and championing the deployment.

#### Design and Deployment

Following the first round of observations and discussion, the insights gained into the environment were used to rapidly design and develop a simple prototype system that was deployed into the wild. Like a technology probe, the initial prototype was flexible and implemented only core functionality, lacking many features that the participants might have expected, with the aim of stimulating ideas and discussion over a long period of deployment.

We emphasised speed during this phase, to maintain momentum and interest from participants, so the prototype, as the term suggests, was by no means be a polished product. However, it was important to ensure that deployed prototypes were robust and reliable to maintain the trust of users and avoid causing frustration that could harm the project.

Once deployed, we returned to the beginning of the cycle, this time using the system itself as the main observation tool and centrepiece for discussion. This was achieved through analysing logs of usage, examining content contributed to the system by users, observing interaction with the system and inviting feedback through a variety of mediums.

#### Evaluation and Iteration

Unlike exploratory prototypes that are discarded after use, it was intended that the insights gained throughout the process, through largely qualitative methods, would be used to evolve the initial prototype into a fully-functional system that met the needs of the users. Immediately following the initial deployment, we received large amounts of feedback, necessitating several rapid iterations as problems were

solved and small features were implemented, but it remained important that prototypes were flexible to allow usage and behaviours to emerge over time. As time went by, this feedback grew increasingly sophisticated as experience with the prototype exposed participants to complex issues that they might not have considered at earlier stages of the project.

We have continued to evaluate and iterate displays in Wray over a period of nearly four years, during which time the system has evolved from a very simple display of community photos into a fully-featured system with over 1,500 images and continues to evolve towards providing news content as dictated by the participants. The following sections describe the original Photo Display prototype and its successor, WrayDisplay, which illustrate the use of this type of approach in a rural environment.

### DISPLAYING COMMUNITY PHOTOS

Our work in Wray began following an earlier project from our university that explored the use of wireless mesh networks to provide broadband to rural areas. As a result of this project, Wray was an ideal location for situated display deployments in terms of contacts, goodwill and infrastructure. We had previously explored the use of situated displays in workplaces and residential settings, and took this opportunity to expand into another environment.

In March 2006, we were put in touch with a local farmer, technology enthusiast and rural broadband activist, who agreed to serve as our contact in the community for the project.

### Initial Observations and Discussion

Through April and May 2006, researchers made several trips to Wray to explore the community, particularly their existing use of noticeboards and other information displays, as well as attending their annual village fair. During these observations, we were particularly drawn to local historical photos that were displayed in public places such as the village hall (Figure 3), which seemed to promote a shared community history and identity—both elements of a “sense of community” identified by McMillan and Chavis [21].

Following this, we arranged two meetings with residents through our contact, to take place in the village pub. At the first of these we handed out cultural probe packs that invited participants to keep a scrapbook, with a number of suggested topics that they might write about or photograph. Our aim was not to inform design directly, but to further our understanding of the community such that our own design ideas would be well grounded in the deployment environment. At the second meeting, inspired by the number of photographs on display in the pub, we discussed the possibility of deploying a public photo display in the village. Although some participants did not initially believe that a display of photos could support the community, we drew attention to these existing displays of photos as an



Figure 3. Displays of historical photos and information in Wray.

example of how this might occur, which appeared to reassure participants of the role such a display might play.

At this stage, requirements elicited from the participants were minimal. One particular request from the group was the ability to see the current content of the display at any time from the web. Although the participants were unclear on their motivations for this requirement, it seemed to be driven by a security-related desire to monitor the contents of the display remotely. This highlights one of the difficulties in communicating the users’ needs that we hoped to alleviate by providing a concrete prototype to which they can relate comments.

### Design and Deployment

With the agreement of participants, we chose to deploy a modified version of our existing Hermes Photo Display [5], which consisted of ten thumbnails arranged around the edge of the screen, with controls in the centre to progress forward and backwards through the image collection and a button to initiate a Bluetooth download (Figure 4). Once the user selected a thumbnail by touching it, they could touch the download button and select their mobile device from a list of detected devices. Bluetooth could also be used to upload photos and we intended that this would be the primary method of transferring content to the display, but also provided a private web interface for our contact to allow her to upload larger collections of images.

This was deployed in August 2006 in a room at the village hall, which was identified by residents as a key social space in the community. The room itself housed the weekly Computer Club and also served as a waiting room for a visiting doctor’s surgery. Existing situated display research indicated that such waiting spaces are far more likely to encourage interaction than spaces where potential users typically pass by without stopping [6]. The display was seeded with our own photos of that year’s village fair to provide initial content that would be of interest of residents, but further content was left entirely up to the users.

### Rapid Iterations

Observations, discussion and feedback based on the prototype system began almost immediately upon



Figure 4. The original Wray Photo Display (left) and final version, showing thumbnail (center) and single image views (right).

deployment, as members of the community were on hand to assist with the installation and give their first impressions. One of the authors attended the village’s produce show in the hall later that month to collect feedback and a paper comments book was also left with the display to allow feedback to be gathered when no researcher was present. From the outset, the prototype system also logged all interaction with the on-screen controls.

This very early feedback led to a number of small changes that were rolled out quickly during the first month. For example, while our demonstrations of Bluetooth functionality seemed to impress, it quickly became clear that the feature was not being used and that those uploading content would prefer to use a web interface, leading to the original administration panel being expanded to allow other users to register. Another significant change was made when one elderly resident struggled to see the small thumbnails well enough to identify herself; this led to the display being modified to open a full sized version of the image when a thumbnail was touched.

Much of the early feedback received related not just to functionality, but to content. Requests for historical photographs of the village were fulfilled by other community members, who uploaded large numbers of photographs and newspaper clippings that had been held in private collections but not previously shared with the community. This increasing variety and quantity of content also led us to add categorisation to the display to improve

the ability to browse the images.

After a month of rapid development, the system had evolved to satisfy most of the feedback received. As the display was designed to continue collecting data about its use, it was left in place for residents to adopt and amassed a large collection of images showcasing village life. The following month, the display was moved from the village hall into the local post office (Figure 5) by our contact, due to maintenance work in the hall, where it received far greater exposure.

### Long-Term Development

In May 2007, after nine months of deployment, researchers returned to the village with the intention of analysing logged interactions and conducting further discussions with residents to inform continued work on the display. This began with our attendance at the annual village fair, where a duplicate display was showcased in the fair’s craft tent. The display’s relocation to the post office had greatly increased awareness and usage of the system and this event allowed us to meet some of those who had used the display or contributed content. We were also able to observe interactions first hand and identify usability problems.

This was followed by a public meeting held in the village hall later in the month. Although we had intended to give a brief presentation about the project so far and lead a design session for an updated display, the group was immediately sidetracked by discussion of problems with the web interface for uploading photos, which became the main focus of the meeting.

Based on log analysis, discussion with residents and our in-situ observations, we deployed a major revision of the display in August 2007. The display’s user interface was revised in light of usability problems we had observed, such as introducing a more familiar scrolling paradigm, and added the ability to post comments on photos in response to a popular request. The web interface was expanded considerably based on feedback from the meeting, which indicated a strong desire to be able to browse photos using the website rather than just uploading content.

### DISPLAYING COMMUNITY NEWS

Throughout the Photo Display deployment, feedback was received that fell outside the scope of a photo system. Many residents had asked for local advertisements, upcoming

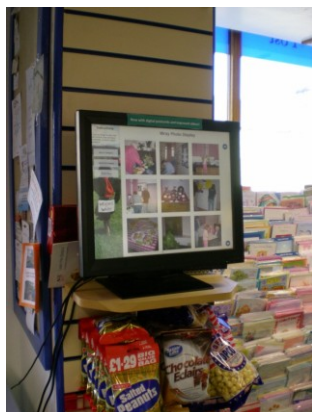


Figure 5. The Wray Photo Display in the village Post Office.

events or other content that was not catered for by the display. Although some of these uses, particularly advertising, might have been achieved by appropriating the existing functionality, this did not occur spontaneously and we did not want to influence usage by suggesting it. With this feedback in mind, we began to explore how the display might be extended to offer a wider variety of content.

### **Initial Discussions**

Our first step towards expanding the display was to organise interviews in February 2008 with our contact and a small number of other residents. However, our contact interpreted this as meaning another meeting and invited a many residents, leading us to proceed with our prepared questions as a group discussion. From this meeting, we generated a large number of potential content ideas, including advertising, news, local information for tourists and publicity for community groups. It was also the first discussion surrounding the Wrayly Mail, a local monthly newsletter that had been mentioned frequently in comment book entries as a possible display feature. Despite this, one participant felt that “there’s no point putting it on the noticeboard because you can pick up a copy anyway” and “you wouldn’t stop to read it”. Following this, another member of the group stated that “latest news would be really nice”, explaining that notices needed to be submitted to the newsletter up to a month in advance.

Following this, we began to use various methods to further our understanding of how news and advertising were currently served, including observations of existing noticeboards, a second cultural probe and an online ‘diary’ system. However, at this late stage in the project, our participants seemed to have less patience for our more abstract methods, although remained happy to express their views to us in person. As our contact noted: “They don’t seem to like surveys. They like talking to you.”

This became even more evident in our latest workshop in July 2009, in which we intended to use scenarios to inform user interface sketches, which had been successful in past projects. It quickly became clear that the attendees were not comfortable with these exercises, although they were keen to share their thoughts about the system and talk around the issues surrounding possible improvements. After discussing the possibility of posting advertisements, it again became clear that the most pressing need in the community was access to local news of a more immediate nature than the newsletter could provide. This discussion was aided greatly by two events that had occurred that day: an unknown trader in the village who had reportedly sold £1,000 of fish to an elderly resident and a consultation on wind farm proposals which was advertised but forgotten. In both cases, a method of distributing news that was more immediate than the newsletter and more effective than word of mouth would have been beneficial to the community.

### **News Ticker Trial**

At the end of the meeting it was decided to progress in “small steps” towards a system that might display breaking news, such as warnings about the dubious fish trader, and reminders of upcoming events, such as the wind farm consultation. Initially, this would take the form of a news ticker along the bottom of the existing display, which it was hoped would be a familiar sight to residents due to their prominence on television news. Although we had discussed adding a website feature to allow any member of the community to submit news for approval, we later decided to begin with a very simple system to gauge reactions, which would allow only our contact to add news. This prototype was deployed in the village post office in August 2009.

Over the first month of deployment, our contact added seven news items, six of which were for upcoming events, including the annual produce show, while a single item advertised a new batch of historical photos that had been uploaded. We also inserted two items soliciting feedback on the new feature and telling users how they could submit news. Following a mail-out from our contact to a village mailing list, there was also interest from several parties interested in advertising their business or items for sale.

As with past prototypes, a duplicate display was demonstrated at a village event shortly after deployment, in this case the annual produce show two weeks after the addition of the news ticker, and we were able to speak to most of the participants from the previous meeting to gather feedback. Although this was generally positive and several residents called the news ticker “noticeable”, few of them seemed to have actually noticed the addition prior to the event and expressed an interest in having more space on the screen dedicated to important news items.

### **Designing a New Display**

Following the partial success of the news ticker, a further meeting was held to determine how news might be better presented. We were particularly interested in how much space for photos our users would be willing to sacrifice in favour of notices, but given the lacklustre response to our attempts at initiating a design exercise, we chose instead to return to the village with several hand-drawn mock-ups of possible display interfaces, exploring different screen sizes and means of navigating between news to photos (Figure 6). Due to the placement of the display limiting horizontal size and the success of poster-format displays in related research [6], one of our options included a portrait-oriented display, which was received with considerable enthusiasm.

Contrary to our expectations, several participants stated that they would prefer news to take precedence on the display rather than photos. After several years of deployment, it appeared that many residents had already seen most of the photos which cycled across the display. One member of the group said, “I don’t look at that thing anymore, because I walk past and I can see, oh, it’s a picture of people walking down the street in 1840. I’ve seen that. I know what that



**Figure 6. WrayDisplay sketch shown to participants (left) and deployed prototype (right).**

looks like.” Instead, it was agreed that a new display should show only the most recent photos, with the emphasis on news notices.

Based on these comments, a final design emerged utilising a portrait display showing only a third of the photos and concentrating on the most recent additions, with the remaining space taken up by notices and the news ticker remaining in place (Figure 6). Users could still navigate to a page displaying only photos or a page showing only news, where they could choose to view current news items, or archived items by month. This was deployed in early February 2010, seeded with notices based on existing news submitted to the previous ticker prototype. We intend to continue observing and evaluating use to determine the role that digital news displays can play in a rural community.

## DISCUSSION

Based on our experiences during the process of designing and deploying these displays, we believe that the approach utilised has been successful in accessing Wray and developing a display that caters for the community’s needs and benefits the residents. But we have also been able to reflect on a number of obstacles that must be carefully navigated when working with a community in this way, as well as the relative success of individual methods used at different stages within the process. In this section, we discuss our findings and advice to any project utilising a similar approach.

### Key Strengths

The main strength of this approach lies in the longitudinal deployment of a prototype system into the real world, where actual usage can be observed over an extended period of time, while providing participants with a concrete example of a novel technology being used in their community. This was best illustrated by the increasing quality of feedback and requirements as the project progressed. In our earliest meetings, residents were uncertain of the role a situated

display might play in the community, and while it was not our goal to change this belief, this opinion did seem to reverse once a display was installed, as residents embraced it enthusiastically and comment book entries and other feedback suggested it was a useful resource for “those who are new to the village” and “recording a living history” of the community, again evoking elements of sense of community [21] (as further discussed by Taylor *et al.* [26]). As the participants began to gain experience in using the system, they became more capable of foreseeing issues that might surround any changes we made; by the second round of meetings and updates, we were able to engage in meaningful discussions about complex issues such as privacy and moderation.

Likewise, as the participants began to learn about the technology and its implications, we continued to learn about the community and build relationships with the participants through display content, usage logs, meetings and visits to community events that allowed us to build a more complete picture of the community. We became a familiar sight in the village over time and while participants previously seemed hesitant in making suggestions (one contributor worried about “hoots of laughter”), they grew increasingly confident—and candid—as the project progressed.

The longitudinal logging of interaction also allowed us to gather a more realistic representation of usage over time without the need for continuous observations. For example, interaction with the display took several months to settle to a regular level following the initial novelty period and both interaction and uploads could also be seen to peak during major annual events, a trend that only becomes apparent after a longer period of deployment.

### Finding Participation

As our approach relies heavily on the participation of community members and their feedback and usage of the prototype system, one of the first tasks is acquiring willing participants. In Wray, the existence of a group campaigning for broadband in the village with links to the university aided considerably. However, equivalent parties might reasonably be found in any community: a local council, the proprietor of a local website or a well-known ‘techie’ who assists with computer problems, for example.

One of our main concerns in Wray has been the danger of working with one particular group, namely the Computer Club. This was alleviated to some extent by our presence at community events, where we were able to reach a wider range of participants who had not attended meetings and by the comments book. This might have been coupled with better advertisement of public meetings, rather than relying on our contact to gather participants.

We have also been concerned by the consistently positive feedback received. While this is obviously gratifying, we suspect that the lack of negative feedback owes more to the participants’ unwillingness to offend or appear negative.

This tendency appeared to be reduced by presenting multiple designs in our most recent meeting, as suggested by Tohid *et al.* [28].

### **Selection of Methods**

As noted previously, the selection of techniques used in making observations, gathering feedback and designing with participants remained flexible. Naturally, suitable techniques vary between settings and participants, and thus the choice of techniques is a matter of past experience, expert knowledge and a certain amount of trial and error made possible by the iterative nature of the approach.

We have had varied success with the individual methods used in Wray. While high levels of enthusiasm meant that early probe packs produced good results, later attempts at such abstract methods were not as well-received, particularly as the project progressed and their opinions regarding the display solidified. Feedback via our contact showed that some residents had found the intentionally vague questions too confusing. Often, they would quite naturally seek to understand what we “wanted” from a particular question, when it was the participant’s own interpretation of the question that interested us most, or felt that the effort they put into these tasks went into a “black hole” when they did not see a tangible result.

It was often the most simple of approaches that yielded the most success, including largely unstructured group discussions and the use of public events and brief trials to gather on-the-spot feedback from casual conversation rather than structured investigation, where residents seemed less comfortable and vocal.

### **Expecting the Unexpected**

Throughout the project, flexibility has been a necessity; rarely has an arranged meeting proceeded in the way we had planned. At various meetings, we have found that the purpose of the session may have been miscommunicated, participants may have had more pressing issues to discuss, or may simply have been uncomfortable with the material we had prepared. In each of these cases, rather than enforcing our original plans, we chose instead to adapt them and focus on the participants’ concerns, while gently guiding them towards any particular questions that we had hoped to address during the session.

Although occasionally frustrating, each of these sessions has proved fruitful despite the change in plans. Indeed, residents seemed most vocal when sessions had been steered in a direction they felt was interesting or important, whereas they often fell silent when presented with a task with which they were not comfortable, such as the unsuccessful attempt at group user interface sketching.

### **Tension Between Research Goals and Participants**

We have approached Wray as researchers rather than designers and thus have our own research goals that must be met, which may differ from the goals of participants. Our funding was explicitly linked to the study of situated

displays as a means of supporting communities, yet there was significant interest in how websites might be used, or how public displays might be used for other purposes, such as telehealth. While these subjects are certainly valid areas of research and do merit discussion, it was often a challenge to ‘reign in’ requests that fell beyond the scope of the project yet threatened to dominate discussion.

Although we had recognised the importance of managing expectations during the early stages of the project, to ensure that participants were aware that our earliest prototypes would be functionally limited, it later became apparent that we might have made our own goals and limitations on the form of the system clearer from the outset.

### **Influence of the Human Access Point**

We cannot overstate the importance of the role our local contact played in the project. Her help was vital in communicating with the community, organising meetings, securing participants and gathering feedback, as well as offering technical support to the system while it was in place. Without her input, it is unlikely that we could have maintained our prosperous relationship with the village.

That said, we often felt that her strong views in relation to technology in the village and assertive personality distorted the feedback we received from the community and directed the flow of discussion groups in directions that were not always helpful and often confused matters somewhat. Often, she would pressure for integration with the latest technology she had taken a personal interest in, although it was clear that other participants were not interested.

This may be a trade-off that must be accepted and negotiated in exchange for the benefits brought by the access point, as it was these very same characteristics that made her an ideal contact and spread word of the project around the community. However, it remains important to be aware of this influence and avoid relying too heavily on one person for opinions and feedback.

### **Influence of Researchers**

Our access point was certainly not alone in attempting to influence the direction of the system. As a researcher, it is difficult, particularly when involved deeply in a project for a long period of time, to remain free of your own preconceived ideas and wishes for the development of the system. Certainly, it is expected that researchers will bring their own expertise to the process and guide participation, but they must be aware of this influence and willing to embrace alternate ideas in response to feedback received from participants.

Early in our project, it became apparent that Bluetooth interaction was not as suitable for the rural environment as it had been in previous settings, necessitating a change of direction towards a web interface, despite a research interest in mobile phone interaction. Likewise, while we had come to expect, based on earlier feedback, that there would be a desire for advertisements on the display and

aimed our research towards this goal, later meetings revealed that advertising was already well-served by existing noticeboards and that the community had a greater need for a way of disseminating news on short notice and reminding residents of events as they become pertinent.

### **Reliability**

From a more technical perspective, it has been important to ensure that prototypes remained reliable, despite being developed and deployed rapidly—our contact once stated that “unless something works it doesn’t get another chance”. The use of off-the-shelf displays and compact PCs to build prototypes rather than a bespoke solution helped to ensure the reliability of the hardware, while the relative simplicity of the system limited software problems. The weak link in our system proved to be the display’s Internet connection, which would occasionally drop for long periods of time, leaving the web application inaccessible.

This requirement also extends to the system’s usability. No matter how rapidly developed or abstract the system might be, it should not frustrate or baffle users. We faced this problem with the first version of the Photo Display’s web application, which was developed quickly as a later addition to the system and was not given the same level of consideration as the display interface itself, as well as assuming more familiarity with web applications than a typical resident possessed, leading to various comments that it was too difficult to use.

### **Exit Strategy**

Obviously, no research project can continue indefinitely. As the end of the project approaches, we find ourselves faced with questions about the future of the display hardware, software and content. In terms of hardware, it seems likely in our case that this equipment will be donated to the community and left in place. Obviously this may not be feasible in all cases and it may be advisable to make the participants aware of this in advance.

However, of greater interest is the content of the display, which is of significant value to the community and the result of much effort by residents. Although personal copies of all the images exist, our contact was concerned that “to gather it all together again would be a lot of work”. We see an ethical responsibility to make sure this content is, at the very least, safely preserved and handed over to the community at the project’s end.

### **Generalisation**

Finally, we must consider the ability to generalise any research conducted using this approach. Since we are positioning our work as a means of learning about a community and its use of novel technologies, generalisation is certainly a concern. Baskerville and Wood-Harper [2] recognised this same issue in their analysis of action research, but also noted that it applies to much of social science research generally.

The longitudinal nature of our approach means that, at the very least, results reflect a far broader sample of usage than can be achieved in lab-based trials of prototypes, taking into account long-term rhythms of community life, but there remains an issue of determining to what extent the deployment site is representative of the target environment in general. We have treated our work in Wray as an exploratory venture into rural communities, which could be validated by subsequent studies in different settings utilising the same approach. On a practical level, our approach would also lend itself well to parallel deployments, as deployments do not require constant attention and it is entirely feasible to timeshare between a number of study sites.

### **CONCLUSIONS**

This paper has summarised three years of work in Wray, during which we have deployed various situated display prototypes into the village’s community spaces and reflected upon the iterative, participatory approach we have utilised to gain access to the community, foster participation and ultimately design displays that are of benefit to residents and support community interactions.

Our approach of utilising a long-term, functional prototype deployments as the focal point of an iterative cycle of observing, discussing, designing and deploying has proved successful in generating meaningful feedback from participants based on their real-world experience with the system, showing a considerable increase in the quality of feedback received and the depth of discussion possible as participants’ experience with the system increases. In addition to providing this experience for participants, researchers themselves are able to gain an understanding of the community both from their own interactions with participants and from data collected by the prototype.

Moreover, work in Wray has highlighted various considerations that should be taken into account when utilising this approach, many of which may equally apply more generally to iterative, participatory approaches. Our findings have included reflections on possible conflicts of interests between researchers, access points and other participants and the need for reliable prototypes and responsible exit strategies. Most importantly, we have witnessed repeatedly that agility and flexibility, both in terms of prototype systems deployed and our interactions with participants, have been key to maintaining the interest and enthusiasm of participants and being able to adapt rapidly to feedback. These have proven to be valuable lessons, which can be incorporated into future work in Wray and in other environments.

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