Understanding Sustained Community Engagement: A Case Study in Heritage Preservation in Rural Argentina

Mara Balestrini[1], Jon Bird[2], Paul Marshall[3], Alberto Zaro[4] and Yvonne Rogers[3]

[1]Intel ICRI Cities, University College London, UK, M.Balestrini@cs.ucl.ac.uk

[2]Department of Computer Science, City University London, UK, jon.bird@city.ac.uk

[3]UCL Interaction Centre, University College London, UK, {paul.marshall, y.rogers}@ucl.ac.uk

[4]Proyecto Intemperie, Arequito, Argentina, laiconosfera@gmail.com

ABSTRACT

HCI projects are increasingly evaluating technologies in the wild, which typically involves working with communities over extended periods, often with the goal of effecting sustainable change. However, there are few descriptions of projects that have been successful in the long-term. In this paper we investigate what factors are important for developing long lasting community ICT interventions. We do this by analysing a successful action research project and provide five recommendations for facilitating sustained community engagement. CrowdMemo aimed to preserve local heritage in a town in rural Argentina and the project was set up so that it could be continued by the community once researchers had left. Participants created videos about personal memories of the town and over 600 people attended the premiere where they were first screened. The impact has not just been short-term and there has been sustained engagement with the project by stakeholders in the town and wider region: the local school integrated digital storytelling into its curriculum; the approach has been adopted by two nearby towns; and the project has influenced regional government educational policy.

Author Keywords

Community engagement; research in the wild; action research; digital storytelling; HCI4D

ACM Classification Keywords

H.5.m. Information Interfaces and Presentation (e.g. HCI): Miscellaneous

INTRODUCTION

As HCI research moves out of the lab and into the wild [29, 11], there has been much discussion of the issues involved in engaging communities of users [8]; how to enable the appropriation of technologies by stakeholders [10]; and the difficulties that can arise after community projects finish and researchers leave the field [16, 33]. In particular, Taylor et al.

Figure 1. School children interview an older member of the community.

[33] have discussed a number of challenges that researchers face as they collaborate with communities, in particular: the need to manage expectations and the challenge of maintaining and supporting novel technologies.

A recent TOCHI special issue on 'The Turn to The Wild in HCI' has raised issues regarding the methodological and ethical challenges of working with communities in situ [11], the tensions between innovation and scalability in technology interventions [1], and the benefits of sustained (years, not just a few weeks) large-scale engagement with whole communities [7, 24, 3]. However, apart from valuable examples such as the Blacksburg Electronic Village, which studied community engagement for more than two decades [7], there are very few descriptions of HCI projects that demonstrate long-term community engagement.

This paper extends previous work by investigating factors underlying sustained community engagement with ICT interventions. Our analysis focuses on CrowdMemo, an action research project where a group of researchers and members of a rural town in the Argentine Pampa designed and deployed a technology intervention to preserve local heritage: both tangible (buildings and public spaces) and intangible (personal memories of community members). Rapid development in the region due to expansion of soy bean production has led to significant changes in and around the town: for example, several old buildings have been replaced by modern ones. CrowdMemo uses digital storytelling as a vehicle to record and share community stories. The approach was to

Figure 2. QR codes installed on the facade of the sports club.

train local children in digital video production so they could interview and record the memories of older community members (Figure 1). These videos could be accessed by scanning QR codes (Figure 2) placed on buildings throughout the town and via Google Maps. As heritage preservation is a long-term goal, the project was set up so that the community could continue to contribute after the researcher had left. Significantly, 18 months after the intervention, the project has been successfully sustained by the local community as well as appropriated by other neighbouring communities; in addition, it has inspired public policy changes and further efforts towards heritage preservation.

By using CrowdMemo as a case study, we contribute to the understanding of how communities can harness the potential of technology to promote collective action and how such actions can be sustained after the initial technology deployment. We propose five recommendations for HCI researchers and practitioners who are conducting community technology projects. They are most applicable to action research projects but are also relevant considerations when designing and evaluating innovative technology prototypes in the wild.

RELATED WORK

A growing number of HCI researchers are collaborating with communities in the wild both to create novel technology interventions and/or to address social issues through ICT and effect sustainable change. In these studies, researchers usually adopt participatory approaches, such as action research [16], where the stakeholders engage in processes of design, deployment, iteration and observation to draw knowledge from their experience [9, 16, 17]. Taylor and Cheverst [32] collaborated with an English rural community to investigate how public displays may support social interactions at a local level. They adopted a set of user-centric and participatory methods, inspired by action research, to design and deploy the Wray Photo Display, a public situated display for community-generated photography. Crabtree et al. [10] used action research, ethnography and agile systems design to create PlaceBooks, a mobile toolkit aimed at enabling people in rural areas to create and share digital multimedia books. They found that participatory approaches, where the community is involved from the outset, are crucial to the development of innovative interventions in situ, that foster sustained community engagement and facilitate the use and appropriation of technologies. Following a similar approach, Chamberlain et

al. [8] worked with a rural community to design a web portal for a farmers market. They highlighted key factors for generating user engagement, such as: building trust; fitting in with the day-to-day life of the stakeholder and demonstrating understanding of the context; working with local community groups (even involving politicians); and using methods that focus on action. Other studies that have developed ICT interventions with communities have stressed the importance of creating skills to facilitate the uptake of the resulting technologies and foster the sustainability of the projects [25, 33].

A number of projects addressing heritage preservation have demonstrated how community engagement can contribute to their success. A notable example is the Cassiar project (http://www.cassiar.ca), where a community of Facebook users helped preserve the intangible heritage of an abandoned mining town in Canada by annotating photographs in a collection of over 4000 historical images.

Storytelling has also been used as a vehicle for heritage preservation. Digital storytelling usually refers to the creation of audio-visual narratives, normally by amateurs, who use digital technologies ranging from cameras to mobile phones. These stories tend to be distributed online, of a short duration and biographical [22]. Myriad projects have blended technology and storytelling to enable communities to reflect on their identity and preserve their heritage. Bidwell et al. [2] worked with a rural community in a Xhosa tribal region of South Africa's Eastern Cape to design a mobile storytelling tool. Their goal was to enable users without access to personal computers to preserve, reflect on and share their life experiences using digital media. They found that the Western approach to storytelling differs from practices in rural Africa and that a participatory design approach was beneficial to inform the development of digital storytelling technologies for that context. In Australia, Klaebe et al. [20] worked with a community in Brisbane to develop History Lines, a project where citizens used digital tools to create and geotag stories. They found that effectively mediated historical narratives can contribute to identity, authenticity and creating a sense of belonging among community members. In Voice of Kibera citizens of a slum in Nairobi used handheld portable devices and OpenStreetMap to map their neighbourhood and geolocate stories about their daily lives. Hagen concluded that these practices have the potential to represent community opinions and a collective version of truth [15].

Empowering stakeholders who have typically been underrepresented by mainstream media has also inspired the work of activists and artists. Since 2003, Tisselli and Abad have collaborated on a series of community memory projects (available at megafone.net) to work with groups of citizens to create and distribute online media representations of themselves. They have collaborated with taxi drivers in Mexico City, displaced people in Colombia, and young Saharawi refugees in the Algerian Sahara, among others. Their participants use a mobile application that allows them to publish pictures and audio files directly from the device to an online platform. They define this practice as *"a medium for recording and archiving information relevant to a commons that is*

managed by a community and for diffusing this information among members or communicating it to those threatening the commons and thus the community" [31, p. 23]. There are three main benefits of using community memories and digital storytelling in a community project: it empowers underrepresented groups by giving them a voice [30, 20]; it provides a medium for the preservation of memories [31]; and it has been successfully used as a teaching tool [5].

There is evidence that interactions between older and younger people can improve children's motivation for learning, and increase their awareness of personal and community culture [26]. Druin et al. [13] and Bonsignore et al. [3] have applied participatory design methods to design and develop mobile applications for intergenerational storytelling where community elders can play a role in educating the next generation of children. In formal learning settings like schools, digital storytelling has been adopted by many teachers because it combines interesting learning opportunities for students, including: learning how to operate digital tools; working creatively with others in the production of a story; and understanding how visual and textual content may blend to communicate a message. Some authors have referred to this set of knowledge as 'Media Literacy' or '21st Century Literacy' [18, 5].

An ultimate goal for action research is to achieve long-term change. This not only requires the community to engage with the project during its initial phases but also when the researchers have left: *"Once research facilitators leave, the community partners should be able to maintain the positive changes that have been made"* [16, p.13] . However, in HCI there have been few descriptions of ICT interventions that have successfully engaged communities over the long-term. The contribution of this paper is to reflect on CrowdMemo and highlight the factors that were important in sustaining (ongoing) community engagement in the hope that this analysis may benefit other HCI researchers and practitioners who are conducting technology projects with communities.

PROJECT CONTEXT
Rural communities in northeastern Argentina have experienced radical socioeconomic and cultural changes over the last three decades. In the Argentine Pampa, between 1985 and 2010, soybean production increased from 7.1 to 52.7 million tons per year and the cultivated area expanded roughly from 3 to 18 million hectares [6]. This expansion of soybean production was the result of an increase in the price of this commodity on the international market and the introduction of genetically modified seeds.

Arequito, a town of 6,000 inhabitants in the state of Santa Fe, is known as the 'Soybean Capital'. Like other towns in the Pampa, Arequito's landscape has changed dramatically in the last three decades. As a consequence, some members of the community have a growing concern that failure to document and preserve the architectural heritage of the town could weaken the sense of community and even threaten the preservation of the local identity. Furthermore, many adults worry about the legacy that they will pass on to the younger generation. A member of a local photography collective, working on a project documenting the architectural heritage of Arequito, contacted the first author and enquired about the possibility of her running a digital storytelling workshop to address these concerns.

CROWDMEMO
CrowdMemo is a growing collection of user generated microdocumentaries that present stories about places that are significant to the community in Arequito. These documentaries are created by school children and comprise interviews with elderly people who share their memories about those places. They are edited and uploaded to YouTube and can be seen both online and in situ: commemorative plaques containing QR codes associated with each documentary have been embedded on the facades of the places that they refer to (Figure 2). The project website includes a Google Map of all these geotags.

CrowdMemo was orchestrated collaboratively by the first author (who is also referred to as 'the researcher' in this paper) and two local stakeholders groups in Arequito. First, the elementary school of the town which has 260 students aged from 6 to 12 who are divided into 7 grades. There are 22 teachers, a headmaster and deputy headmaster, and at the time of the deployment three visiting ICT trainers from the Ministry of Education of the Province of Santa Fe who were invited by the school to document the project. The second stakeholder group was a photography collective who have been working on documenting the architectural heritage of Arequito for many years.

This paper presents the reflection stage of one action research cycle, which has consisted of planning action, taking action, evaluating and reflecting [9] and has an overall duration of 18 months. The planning phase was conducted over email and Skype and lasted four months. Within the first two months the stakeholders agreed that the main objective of the intervention was to engage the community and encourage it to reflect on and preserve its heritage using locally available technologies. In addition to this overarching goal, CrowdMemo had to meet the different objectives and expectations of the stakeholder groups and provide value for each of them: i. the school management's goal was to offer a learning experience to its teachers and students, mainly focused on digital literacy; ii. the teachers' goal was to learn how to use mobile phones and low cost cameras for the production of videos, as they thought it would motivate their students to take an active role in innovative educational activities; iii. the students' goal was to learn how to use handheld devices to produce short films at school; iv. the photography collective wanted to initiate a process for documenting the architectural heritage of the town, mainly driven by children; and v. as researchers, our goal was to understand the factors leading to sustained community engagement and how HCI research can foster long-term impact in a community through the use of off-the-shelf technologies and a range of engagement strategies.

It is important to emphasise the very active role that the stakeholder groups took in the project. Not only did they initiate the project, but representatives from the local school and the photography collective raised the funds to support CrowdMemo by persuading local enterprises, the town council and

individuals to finance it. This was not planned by the researcher but rather instigated by the stakeholders who voluntarily decided to pay for the intervention in the absence of external funding. Furthermore, even though a film premiere was planned within the first stage of the cycle to launch the project, stakeholder groups have been responsible for organising other public events associated with CrowdMemo: 'Cafe Literario' and 'Encuentro en la Llanura' (which we describe in more detail later).

In the next sections we give a detailed account of the CrowdMemo approach in three different phases: conception and initiation; deployment and piloting; and project launch.

Project conception and initial training
During the first four months of CrowdMemo, we followed the action research approach of involving stakeholders in conceiving the project by organising online and offline workshops [14]. First, we conducted a framing and design workshop on Skype where a representative from the photography collective, the teachers, the headmaster and deputy headmaster and the first author discussed the goals of the project and the deployment strategy. We defined a roadmap for the execution of the initial training phase of CrowdMemo.

In two workshops in Arequito, teachers explained the project to students and led discussions about the history of the town and the places that are important to the community. As homework students were asked to discuss with their parents what places are significant for the community and learn about their history.

In a third workshop, two representatives from the photography collective taught students the theory and practice of using low cost cameras. They also presented a slide show showing how Arequito had changed over the last century.

In a last workshop teachers worked with students to select the locations that each grade was going to document in their videos. For several weeks they conducted research about the history of those places and found out which members of the community could share memories and anecdotes about them. The output of this process was a selection of nine locations, a list of people to be interviewed and photos, songs, videos and other media related to those places. Students then created one script for each selected location.

Deployment
The first author visited Arequito for the week long deployment phase. Before each class filmed their script they received an additional half day workshop, conducted by the first author, where they learnt how to film documentaries using mobile phones and low cost digital cameras. Nine microdocumentaries were filmed following the scripts devised in the previous phase. The students from the first and second grades did not film documentaries but participated by creating their own videos. Below, we present the titles and descriptions of some of the documentaries produced by students, each of which involved interviewing elderly people in the town:

- **The Rossini theatre** (5th grade) The Cine Teatro Rossini was opened in 1932 and was considered one of the most important theaters in the province for its architecture, its dimensions and the wonderful acoustics. During the deployment of CrowdMemo the theatre was temporarily out of use.

- **The history of our riverside resort** (7th grade) The Balneario Arequito riverside resort used to hold social gatherings every summer. It has been abandoned for decades.

- **A wagon full of memories** (6th grade) The first train arrived in Arequito in 1887 but stopped being used by passengers many years ago. The documentary explains how the train changed people's lives.

- **The aquarium of Mr Marmol** (4th grade) Mr Marmol created an aquarium in his backyard and it now contains thousands of fish species from all over the world. In the documentary Mr Marmol explains how he started his aquarium and shows hundreds of species of fish that he takes care of.

Project launch and blog
CrowdMemo was launched at a public film premiere that was advertised in the media. Refreshments were served and all nine micro documentaries were shown on a big screen and over 600 people attended the event.

During the premiere we also displayed the QR codes which enabled the videos to be watched online. Because many people in the town did not have previous experience with this technology, a group of community members volunteered to train people in how to download QR code scanners on their phones and teach them how to use them to view the videos. Children were also very keen to teach adults how to access the documentaries by scanning the codes. Many elderly people were moved when their stories appeared on the screens.

We created a blog (CrowdMemo.org) that was regularly updated during the process of deployment. This online resource allowed the community to track the evolution of the intervention and see pictures of the interviews and documentary locations. It gave students and other stakeholders an opportunity to leave comments. Importantly, it also increased awareness of CrowdMemo outside of Arequito which led to the appropriation of the project by other communities. Because one of our objectives was to understand how HCI research can foster long-term impact in communities through the use of off-the-shelf technologies and engagement strategies, we encouraged the appropriation of CrowdMemo. In the blog we deliberately described the project as being 'open source' and 'a common' that could be freely replicated and modified by others. We also provided step-by-step instructions on how other communities could set up similar projects.

DATA GATHERING METHODS AND ANALYSIS
The process of evaluation was conducted in collaboration with the stakeholders. We adopted a qualitative approach, combining participatory observations, questionnaires with closed and open ended questions and interviews covering all the phases of the intervention. In addition, we carried out a debriefing session with the school teachers, headmaster and

deputy headmaster, representatives of the photography collective and two of the ICT trainers from the Ministry of Education of the Province of Santa Fe who had visited the school.

The questionnaires and interviews were designed to gather information about participants' experiences and opinions with regards to: i. the deployment of CrowdMemo, in particular the strengths and weaknesses of its different phases; ii. community engagement; iii. reflection and awareness about heritage preservation; and iv. sustainability of the project. They were answered by 22 participants from the school, the photography collective, the Ministry of Education and members of the community who took part in the project, 12 months after the researchers left the field. We also interviewed the coordinator of the first external appropriation of CrowdMemo, which took place in a neighbouring town, Pujato. We continued the evaluation through emails and discussed the results iteratively. All interviews where conducted in Spanish and quotes from the respondents have been translated to English.

We analysed participants' answers to the open ended questions by using thematic analysis [4]. Themes emerging from the analysis were discussed with stakeholders until reaching consensus. We identified two overarching themes: impact indicators and engagement. Quantitative data extracted from the field notes have been used to further validate the analysis.

RESULTS
In this section we present the findings from the thematic analysis following the two emergent themes introduced above. Speakers are identified by initials and role in the project.

Impact indicators
The community has kept the project going since the researchers left the field, renaming it 'Natives and immigrants at the 202 of Arequito' in reference to the cooperation between children (digital natives) and old people (digital immigrants) and the name of the school (202). We describe a number of other indicators that demonstrate the sustained impact of CrowdMemo.

Media coverage
The project launch received media coverage in the local newspaper, a radio station and on regional TV. A few months after the intervention, there was a local TV show about the story of the town and its characters building on the interviews created during CrowdMemo.

Attendance at public events
CrowdMemo was launched at a public premiere organised by the school, which over 600 people attended, a large proportion of the town, filling the venue to capacity: *"the day we organised the premiere everyone was there!"*[S.A.G., school teacher]. Many attendees found the event surprisingly moving: *"The emotion, the tears and other samples of appreciation were unexpected. We didn't imagine that this project would be so moving to people"* [M.J.G., school teacher].

After the intervention, the school and the photography collective organised two social gatherings around the problem of heritage preservation: the 'Cafe Literario' (seven months

after), attended by 400 people; and the 'Encuentro en la Llanura' (14 months later), attended by 250. In both cases, the community discussed CrowdMemo and its legacy: *"Participants continued to talk about the process and about the premiere at the Cafe Literario...about the huge number of people who came together that day!"* [M.M., school teacher].

External appropriation
CrowdMemo's impact extended beyond Arequito and the project's approach has been appropriated by other communities in the state of Santa Fe. An ICT facilitator from the Ministry of Education explained *"This project has been a real 'social mobiliser', as it not only captured the collective memory of the town but it also inspired other projects within the local school and other external institutions"*. For example, a few months after the deployment, Pujato, located 43 km away, launched 'Replay' (nuestroreplay.wordpress.com/) their own version of CrowdMemo. School 227 of Pujato was celebrating its 125 year anniversary and invited people to the school to be interviewed by the students following the Crowd-Memo approach. As well as capturing digital stories, they also created an ebook and a photography exhibition and organised a public event where the microdocumentaries were shared as well as showing them at different science fairs in the province. This appropriation was led by a member of the community who learnt about CrowdMemo through the project's website. Their initiative is also being sustained by the community with regular blog postings and creation of new microdocumentaries. In addition, in San Jose de la Esquina, a rural community 30 km away from Arequito, the local school is currently working on appropriating CrowdMemo to commemorate the 150th anniversary of the founding of their town.

Recognition by state government and impact on public policy
CrowdMemo was awarded 'project of interest' recognition by the Chamber of Deputies of the province of Santa Fe [12]. Furthermore, during the deployment, three ICT trainers from Santa Fe Ministry of Education visited the school to observe the project. They reported on the techniques used to train the school community in digital storytelling. As a result the Ministry of Education created a new training course called 'Make and narrate with ICT', which has so far been delivered to 1,500 teachers and students from 288 institutions across the state [23]. When interviewed, the coordinator for ICT in the Ministry of Education explained: *"It will be difficult to replicate the experience of CrowdMemo but we are trying to spread it in different ways"*.

Impact on architectural heritage preservation
Three of the locations captured in digital stories in Crowd-Memo have undergone, or are about to undergo, refurbishment as a result of the project. First, the Cine Teatro Rossini has been restored and is now open to the community. Second, the local council launched an initiative to collaborate with students at the Faculty of Architecture (National University of Rosario, Santa Fe) in order to redesign the Balneario Arequito riverside resort. The council has received five project proposals and is now carrying out a technical assessment to choose and develop one. Third, restoration works are being carried out at the train station. Finally, one of the members

of the photography collective is currently working on a research project named 'Conformation of the Historical Centre of Arequito'. The aim is to investigate whether Arequito can be recognised as having a historical centre in accordance with the UNESCO norms of Quito [27].

Integration into the school curriculum
Teachers and students have continued using mobile and low cost cameras phones to film new content: *"At school they use the short movies for reflective coursework and they still use the mobile phones"* [M.B., school teacher]; *"This year, 5th grade created a blog and students in 7th grade filmed interviews with mobile phones and little cameras for their language course"* [M.M., school teacher]; *"Fourth grade students continued with the project and we presented a short film with interviews honouring seamstresses from the town along with an exhibition that shows how fashions have evolved and a parade with bridal gowns made by dressmakers from different years"* [J.R., school teacher].

Engagement
One of the key factors leading to the sustained success of CrowdMemo was the strong engagement that it generated among the different groups involved in the project. One piece of evidence for this engagement is the positive emotions expressed by individuals from all of the stakeholder groups when they describe their experience of CrowdMemo [19]: *"To see the students, teachers and a lot of people from the town conversing, remembering worthy anecdotes about the town...their faces, voices, expressions and even silences denoted the strong emotional impact that the project generated"* [G.F., photography collective]; *"The excitement, tears and hugs of thanks [by members of the community] was something we did not expect. We did not think that it would affect people so much"* [J.R., school teacher]; *"...this project allowed for the participation of the community, which was full with emotion"* [deputy headmaster]; *"We had fun, we learnt and made really nice works"* [group comment by students on the project blog].

A second piece of evidence for engagement was the reflection CrowdMemo engendered about belonging to the community: *"I felt that the whole community was engaged with the project and that we were all working to transcend the walls of the school"* [A.M.C., school teacher]; *"The community's response was wonderful, all the people were talking about what the students were developing. The response was incredible, very positive! I learned a lot and the students have shown great interest, participation, emotion, habits, behaviours, vocabulary. It has been a wonderful project, an excellent motivator to get to know the history, architecture, and people in our town"* [C.B., school teacher]. A group of students commented: *"It was really nice to learn anecdotes about our town and those stories that are not written in any books"*.

We have identified three factors underlying the strong engagement of the stakeholders with CrowdMemo: recognition and pride; social encounters; and technology and skills.

Recognition and pride
A key factor in the community's engagement with the project was that they felt recognised and valued. This recognition came from both inside and outside the community.

Being interviewed engaged elderly members of the community in the project: *"People who were interviewed by the students expressed enthusiasm and excitement because they were being recognised again for what they had done"* [J.R., school teacher]. Having their stories recorded and shared led to their contributions being appreciated by the wider community: *"It allowed me to better value what we have and what our grandparents, mainly immigrants, built, their work ethic and perseverance"* [T.Z., member of the photography collective]. The community also valued the fact that their personal histories would persist as digital stories: *"Knowing that people I know are and will always be portrayed telling our story fills us up with pride!"* [M.A.V., school teacher].

Other respondents clearly expressed how seeing the digital stories led them to appreciate other members of the community: *"the community was surprised to know about the experience of neighbours. It was great to remember those events and learn about the places in our town from a different perspective"* [school deputy headmaster]. Memories are imbued with features of the local identity and publicly displaying them led to reflection on locations in the town and why they are relevant to the community's heritage: *"[CrowdMemo] made me reflect on the history of the local community but from a novel perspective. It's not only about our material achievements but through learning our ways of having fun, our achievements as a human group through our stories (...) It's not about some texts and paragraphs put together by a historian, it's about the testimony of those who gave life to many of the situations [in our heritage]."* [T.Z., member of the photography collective].

One source of outside recognition was the wide media coverage, which the community frequently discussed: *"In the town people are still talking about CrowdMemo, the local TV channel created a show telling the story of the town and its characters"* [C.B., school teacher]. Others were the award from the Chamber of Deputies of the State of Santa Fe and the creation of the course 'Narrate and make with ICT' by the Ministry of Education (mentioned in the 'Impact indicators' section): *"I think this novel experience gave a lot of prestige to our institution ... I feel very proud of my school and the school principals because they are always looking for positive innovation for our community...I am thankful to have been part of it"* [M.A.V., school teacher]; *"Those involved have been very excited and grateful to have contributed to the reconstruction of those stories. Everybody spoke about the impact of the project both here and in nearby towns"* [school deputy headmasterl]. Finally, the fact that the researcher came from Europe to Arequito to participate in the deployment was a source of community pride.

The main consequences for the community of these different forms of recognition were a sense of 'having their voice heard' and more generally feeling pride in the project, both of which resulted in sustained engagement. Another key factor

leading to engagement was the opportunity for social encounters engendered by CrowdMemo.

Social encounters

CrowdMemo generated social encounters in three ways, each of which strengthened community engagement with the project and contributed to the sustainability of the project: i. enabling interactions between children and the elderly; ii. organising public events that fostered shared experiences among members of the community; and iii. creating triggers for conversation in public spaces.

According to 90 per cent of the participants, enabling conversation between children and older people was one of the most valuable aspects of CrowdMemo: *"People interviewed were emotionally engaged because they could revisit and transmit their experiences to the youngsters"* [S.A.G., school teacher]; *"Seeing my father in law and my son together remembering the old days, in front of the church and next to the old family car. Emotion and pride at the same time!"* [A.M.C., school teacher].

The public events created opportunities for members of the community to have face-to-face social encounters: *"I think that CrowdMemo was useful because it enabled dialogue between different community members about the town's heritage. Each group of participants visited the places where their stories had taken place...At the premiere and the Cafe Literario people were very excited to converse and reveal their memories to others'* [school deputy headmaster].

Public events also enabled sustained reflection. When asked about what happened in the 12 months after the deployment, respondents explained: *"Participants continued to talk about the process and the premiere at the Cafe Literario: about the huge number of people who came together on the day of the premiere!"* [M.M., school teacher].

The QR code plaques on the building facades facilitated conversation in public spaces: *"People who come to the town ask about the QR codes"* [school deputy headmaster]; *"We use them as a tool for cultural promotion available at all times for locals and visitors. TV programs show those places and interview the people who have been related to them"* [T.Z., member of the photography collective]. We now describe how the other technologies deployed in the project facilitated engagement.

Technology and skills

The combination of mobile phones, digital storytelling and QR codes represent a novel assemblage of technologies, rarely used in Argentinian schools. Participants often referred to the novelty of the technological approach, which generated a positive attitude to the project: *"The community feels motivated by this type of activity as it contributes to an innovative education"* [M.N.M., school teacher].

The project also created opportunities for teachers and students to learn new technical skills, which they found to be valuable and engaging: 70 percent of the respondents agreed that one of the most important aspects of CrowdMemo was that students learnt how to produce content using mobile phones. Students commented on the blog that they had fun learning how to film with phones and were grateful for having acquired such skills.

However, lack of time for a more extensive training phase was seen by teachers as the main limitation of CrowdMemo. Half of them thought that the limited training time was a consequence of the education system: for example, *"I think this weakness is related to the times of the school, which does not allow us to do everything we plan."* [M.M., school teacher].

DISCUSSION

This paper has presented CrowdMemo, an action research project that aimed to preserve the heritage of a town in rural Argentina by training members of a community to create digital stories from their personal memories. Our goal was to create sustained community engagement to ensure long-term heritage preservation. The project has been successful in this regard: two locations in the town have already been refurbished (the theatre and the train station) and there are plans to do the same with the riverside resort. Since the deployment, there have been two public events independently organised by the community that have sustained interest in heritage preservation in Arequito. The novel ways of using mobile phones and low cost cameras, as well as the skills learnt during the deployment, have been integrated into the local school curriculum and students regularly use digital storytelling at school. Furthermore, CrowdMemo has had a wider impact: it has been appropriated by two neighbouring towns which were not initially involved in the project; it has been recognised by the regional government; and it has influenced regional educational policy. This level of sustained engagement with a technology-enabled community project has rarely been described in the HCI literature. We now abstract from our results in order to understand what contributed to this success and propose a set of five recommendations for HCI researchers and practitioners who are conducting community technology projects. We finish by considering some of the limitations of these recommendations: they are most applicable to action research projects but we argue that they are also relevant considerations when evaluating innovative technology prototypes in the wild.

i. facilitate valued ownership by following action research principles: involve community stakeholders in the conception and running of the intervention and ensure that the project provides value for each stakeholder

Taylor et al. have identified that a crucial part of sustainably integrating technologies into community life is encouraging the community to feel a sense of ownership of the project [33]. People in Arequito involved with CrowdMemo had a strong sense of ownership, which was a consequence of several factors: they instigated the project by contacting the first author with a request to collaborate; the stakeholders were involved from the outset in the organisation and logistics of the project and they not only set the goals of the intervention in collaboration with the researcher, but also organised interviews between children and old people, as well as public social events such as the premiere. The importance of a participatory approach for sustained engagement has been

recognised in the action research and HCI literature [16, 10]. Significantly, the community also raised all of the funds to support the project which enhanced their sense of ownership.

However, although necessary, ownership is not sufficient for sustained engagement. For example, many people own a technology that they do not use because it no longer has value for them, such as an old mobile phone left in a drawer or a forgotten gadget at the back of the kitchen cupboard. Importantly, CrowdMemo provided value for all of the stakeholder groups that were involved. Children were excited about using the technologies and curious about the stories they were told by the old people they interviewed. Elderly participants felt valued and useful and enjoyed sharing their memories with the children and having them preserved as digital stories. Members of the photography collective valued CrowdMemo because it encouraged the community to reflect about the architectural heritage of Arequito. Teachers valued learning new technology skills that enhanced their classroom practice. The school management found value in being able to play a significant role at the heart of the community.

ii. where possible use off-the-shelf technologies in novel ways rather than novel technologies

CrowdMemo facilitated a number of different technology encounters that deepened community engagement: students with mobile phones; teachers with digital storytelling tools; and townspeople and visitors with QR codes. Importantly, the technologies themselves were off-the-shelf rather than prototypes but the way they were used was novel. For example, in Argentina there were more than 50 million active mobile phones in 2012, among the highest rate in Latin America [28] and many students own a handset. However, they are usually banned from classrooms as they can be distracting. CrowdMemo legitimised mobile phone use at school by training students to use them, along with low cost cameras, to produce digital stories. Students were excited about this opportunity to use them in a new way. Kolb [21] highlights that a benefit of introducing mobile devices into the classroom is that most students not only know how to use them but enjoy using them. Furthermore, they enable teachers to plan technology-based activities that can take place outside the classroom. CrowdMemo introduced teachers to using mobile phones for digital storytelling. They learned new skills in order to create content using low cost devices, simple video editing software and QR codes. Using digital tools to produce pedagogical material allowed them to innovate their classroom practices.

We think it is significant that participants owned the technologies that were used in the project and were trained in the skills necessary to use them in novel ways, for example, making digital stories with mobile phones. These skills were embedded in the community through their incorporation in the school curriculum. As discussed by Taylor et al. [33], using off-the-shelf technologies bypasses many of the challenges associated with handovers of experimental technology prototypes to communities. Specifically, off-the-shelf technologies, such as mobile phones, and established infrastructures, such as 3G networks, are far more robust than research prototypes, generally require less maintenance, and if they do fail

can easily be fixed or replaced. Furthermore, many people in the community are familiar with, and have the basic skills to use, off-the-shelf technologies like mobile phones and low cost cameras. CrowdMemo built on these existing skills, for example, by training community members in how to install and use QR code readers. Merkel el al. have also identified the importance of developing participatory processes that take advantage of a community's skills in order to develop and sustain an intervention [25].

iii. facilitate a range of face-to-face social encounters which can lead to discussion and ongoing engagement with the project

A key reason underlying the community's sustained interest in CrowdMemo was that it facilitated a range of social encounters which led to face-to-face conversations between different community members and thereby increased their engagement with project. The encounter between children and the elderly members of the community was identified by interviewees as one of the most important aspects of the project. The digital stories produced by the children meant that the old people knew that their life stories were recognised and valued by the community. The children also benefited from finding out about their heritage and by playing an important role in a project that was widely valued by their community. Steels and Tisselli [33] argue that face-to-face meetings between community members are essential to the success of an intervention because they create the necessary trust and engagement for collective action.

A second type of social encounter was facilitated by the three public events: the premiere; 'Cafe Literario'; and the 'Encuentro en la Llanura'. At these gatherings community members could share experiences and discuss the digital stories, and more generally the heritage of the town, in a group context. Previous studies have highlighted the importance of celebrating milestones [16] and capitalizing on public events [7] to engage participants in a project.

iv. design for appropriation by: first, providing clear instructions on how to conduct the project; and second, using off-the-shelf technologies which are readily available to participants and which many will have the necessary skills to use

CrowdMemo was designed to be open source in the widest sense. Our approach was to use widely available and low cost off-the-shelf technologies, provide clear step-by-step instructions on the project website, and explicitly encourage appropriation. For these reasons, CrowdMemo provided an attractive opportunity for other schools striving for ICT training and learning activities using readily available technologies.

Furthermore, the openness and low cost were crucial factors in the Ministry of Education's decision to scale up the digital storytelling aspect and train large numbers of teachers in this technique.

v. aim for broad media coverage of the project as positive external recognition leads to community pride and engagement

Both local media coverage and the project blog raised awareness of the project outside of Arequito. For example, CrowdMemo was appropriated by schools in the towns of Pujato and San Jose de la Esquina, neither of whom were initially involved with the project. This external recognition, as well as the local government recognising CrowdMemo as a 'project of interest' generated community pride in the project which in turn facilitated sustained engagement.

Limitations
In recent years, the HCI community has increasingly explored new research domains outside the laboratory [16, 33]. In these in the wild projects, researchers face a number of challenges when working with communities in diverse environments, either to address community issues using existing technologies or to develop new technologies that can augment the everyday experience of people [29]. CrowdMemo differs from many of these projects in a number of ways and this may limit the applicability of our findings.

One of the primary reasons for the success of CrowdMemo is that it used locally available everyday technologies. However, many in the wild projects are concerned with developing and evaluating novel prototypes. This makes it challenging for these projects to achieve the long-term sustainability that we have described in this paper (cf. Taylor et al. [33]). If prototypes are used then there should be an emphasis on ensuring they are robust and that stakeholders are provided with training so that they are able to use and maintain the technologies. In order to engage stakeholders in this training, and more generally motivate their sustained engagement in the project, it is important that they can see value in using the technology.

CrowdMemo also differs from most research projects in that it was instigated by the community, rather than a researcher. This meant that the community had a strong sense of ownership from the outset. A sense of ownership can be facilitated in projects that are research- rather than community-led by following an action research approach that aims to involve the community in the conception and running of the project.

Another distinctive aspect of CrowdMemo was that it was funded by the community itself. This is unlikely to be the case in research-led projects. Unless a community has instigated a project then requesting them to contribute to the running costs is more likely to disengage the community than engage them.

CONCLUSION
In this paper we have described CrowdMemo, an action research project for heritage preservation in rural Argentina that not only had short term impact, but has successfully engaged the local and wider community over a prolonged period (18 months) and continues to do so. In this paper our goal was to investigate the factors that made this project a success. Previous studies had identified some of the challenges faced by researchers when collaborating with communities in the wild, such as: the need to manage expectations; the challenge of maintaining and supporting novel technologies [33]; and how to facilitate the appropriation of technologies by stakeholders [10].

We have proposed a set of five guidelines in the hope of helping researchers in the field to overcome some of these issues. We found that creating a sense of valued ownership in all of the project stakeholders, using off-the-shelf technologies owned by participants, facilitating a range of social encounters, designing for appropriation and aiming for broad media coverage were positively related to sustained long-term engagement in CrowdMemo.

We are not claiming that following these recommendations is a recipe for guaranteed sustained community engagement; currently, we can't say which of these factors are necessary and sufficient. However, CrowdMemo does demonstrate that if researchers adopt a participatory approach that aims to empower communities, then a project can be appropriated in unanticipated ways and result in positive long-term impact.

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