Mobile Voices: Design as a method to explore the possibilities and limitations of community participation

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Abstract: Despite the growing significance of mobile devices, especially among marginalized communities, there are few explorations of how participatory design (PD) can be applied to mobile communication technologies. This case study of Mobile Voices (VozMob) explores a community-based approach to PD and its potential to promote the participation of groups typically marginalized from the design process and empower users. VozMob is a mobile platform that was co-designed with and for immigrant workers and organizers to facilitate the online publishing of multimedia stories about their lives and their social justice efforts. Through collective visualization methods, observation, and interviews, this study investigates the factors that enabled or hindered meaningful user participation in the VozMob design process. Significant differences emerged between participants' experiences of the design process, which allow for the exploration of themes related to technology appropriation, design ownership, and power sharing in collaborative processes. Our findings reveal that a community-based approach to PD can shed light on the degree to which—and how—collaborative design and equitable participation is possible through mobile media.

Key words: participatory design, appropriation, mobile communication, digital storytelling, collective analysis, popular communication, social justice

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Introduction

Contemporary communication research increasingly emphasizes inequities and barriers to participation, particularly for marginalized groups. It is clear that equity in media participation is not just a matter of digital access and media literacy; it is also determined by the values that are embedded in the very design of communication platforms (see for example López, 2008; Longford, 2005). Mobile ubiquity offers opportunities to broaden media participation within marginalized communities – including in the design of the mobile technologies and services used (Dearden & Rizvi, 2008; Spinuzzi, 2005). This seems particularly so with the proliferation of Free/Open Source Software (F/OSS) and app development. While corporate investment and commercial interests have historically dominated the design of mobile hardware and software (see Agar 2005), these developments promise expanded opportunities for community-based participation in technology design.

Among migrant communities, mobile devices are increasingly important for media and civic participation because their phones are often their primary communication and computing devices, and their Internet connectivity may be limited. What's more, their work frequently necessitates mobility and many have a need to communicate with friends and family across borders (Diminescu, 2008; Donner et al., 2011; Gonzalez & Katz, 2016; Tazanu, 2015). Yet there are still significant barriers to the participation of marginalized groups in mobile media and technology design, including limited resources and technology literacy, and security and privacy concerns. It is unclear how such users will fare in the evolving mediascape if they are absent from these design processes. Mobile communication researchers, civic designers, and community media advocates share an interest in understanding the barriers to implementing participatory design (PD) when creating contemporary community media systems (e.g., Asthana, 2010; Benston & Balka, 1993; Kensing & Greenbaum, 2013). However, participatory design of mobile technology remains rare and more research is needed into the barriers that limit its application. Mobile platforms raise unique challenges for participatory design due, for example, to the complex interaction of mobile phone hardware, competing carrier plans, and messaging protocols (Bar, Weber, & Pisani, 2016; Panchard et al., 2007; Tacchi & Watkins, 2007).

In contrast to more common studies of PD in large organizations (e.g., Könings et al., 2007), this article seeks to contribute to the growing literature on *community-based* PD in marginalized communities (e.g., see Dearden & Rizvi, 2008; Light & Luckin, 2008; DiSalvo, Clement, & Pipek, 2013). DiSalvo, Clement, and Pipek (2013) understand community-based PD as foregrounding the social constructions and relations of power in the design process. Yet there are few studies that consider the application of PD to mobile technologies (e.g., Svanaes & Seland, 2004), and fewer still

that consider the engagement of low-income or marginalized groups in the process (notable exceptions include Panchard et al., 2007; Tacchi & Watkins, 2007). Here, we analyze the case of Mobile Voices (VozMob) to investigate how methods of community-based participatory design can bring to light – and in some cases challenge – relations of power embedded within mobile technologies.

Several topics of broader relevance emerge in the analysis of the VozMob design process, including: whether participants experienced the development of the platform as technology '*appropriation*' or technology '*design*' and how each relate to the negotiation of power relations; differences in the types and degrees of power-sharing in collaborative processes; and the contrast between the relative ease of enabling participation in graphic design with the greater challenges of participation in hardware/software design. While the VozMob design process was not participatory at every point, participation—where it occurred and was experienced as such—led to a greater sense of influence and ownership over the resulting platform, and a critique of the power relationships embedded within its technology. This article illuminates some of the possibilities and limitations of community-based methods for PD with mobile media (especially for mobile media's layers of hardware and software), and how these address relations of power in the design of mobile technology.

A Mobile Platform for Popular Communication

The Vozmob project was a collaboration between the Annenberg School for Communication and Journalism at the University of Southern California (USC), the Institute of Popular Education of Southern California (IDEPSCA—an organization that pursues social justice through programs that serve immigrant day laborers and household workers across greater Los Angeles), software programmers, and a group of eight day laborers and household workers who were members of IDEPSCA.

Design and development of VozMob began in 2008.[1] The project sought to create a community media and digital storytelling platform for low-wage immigrant workers and organizers that would use basic mobile phones to support the group's social justice efforts (Mobile Voices, 2011) while being sensitive to the privacy and security issues that might arise when immigrant workers become active in the digital public sphere.

Leveraging the ability of mobile phones (even basic phones pre-dating smartphones) to send text messages to email addresses, the resulting platform allowed users to file short, digital stories using SMS or MMS to send combinations of text, audio, and images from their mobile phones to the VozMob website. A Drupal-based open source online platform

[1] For most of the design period (2008 to 2010) about 20 people were on the team including immigrant workers (8), community organizers (3), university researchers (7, including these authors), and professional open-source software programmers hired under the project (2).

then removed extraneous information from the message (date, time stamps, etc.) and posted the stories on the VozMob site, so that even those users without internet-enabled phones or data plans could publish online. In so doing, the platform allowed the immigrant workers to tell the stories of their own community, on their own terms.

The VozMob project was grounded in IDEPSCA's traditions of popular education and popular communication that, as participants described in a collective reflection, "involves the community documenting, analyzing and discussing its own struggles, demands, victories, and failures" (The VozMob Project, 2011, p. 180). This is especially important given that the immigrant worker community has very little influence over what are often negative portrayals of immigrants online and in other media in the United States, as well as the workers' expressed desire to challenge these negative representations by publishing their own portrayals. Many of their published stories focused on the daily experiences of immigrant workers, and their contributions to the communities where they live. Other stories focused on social issues facing the community, including commentary on discriminatory policing and coverage of local news, demonstrations or protests, celebrations or festivals.[2] As one VozMob participant wrote, by posting such stories of an otherwise underrepresented community, " I feel that I am representing my *compañeros* and *compañeras* from the day laborer centers and continue supporting the cause of their own existence and that of their families" (The VozMob Project, 2011, p.191).

As a pedagogical philosophy, popular education emphasizes horizontal dialogue and the co-production of knowledge as opposed to top-down decision making, as well as the importance of communities self-identifying their own needs and social justice goals (Friere, 1970). The VozMob project employed the related tradition of popular communication, which emphasizes community members acting as agents of change through the creation of their own media, often as counter-narratives to mass media (Barranquero, 2009). Indeed, the core group of workers involved in the project had been working together in the style of popular communication for several years already to publish a community newspaper. Given the dominance of online media and the possibilities for self-publishing expanded by Web 2.0, IDEPSCA and the workers were eager to appropriate digital and mobile technologies to expand their popular communication practices. VozMob team members and participants have reflected on the implications of the workers' participation in telling their own stories in other publications (VozMob, 2011; Marino, 2013; Costanza-Chock, 2014). This article, in contrast, explores the process of participation in co-constructing of the very technology that was used to create these stories.

We analyzed the process of co-designing the VozMob platform using a combination of collective analysis and

[2] For further description of VozMob story content and reflection from the workers themselves on the meaning and impact of these stories, see VozMob (2011) and Marino (2013).

participatory visualization methods, participant observation, and semi-structured interviews. Our methodological approach was in keeping with the tradition of Participatory Action Research (PAR). PAR encompasses a wide range of methods that share an epistemological orientation to join research with action (Reason & Bradbury, 2008) and to privilege collective inquiry and co-construction of knowledge to meet a community's self-identified needs. In this case, the needs identified by VozMob participants (particularly those of the immigrant workers who were the primary intended users of the mobile platform) included privacy, security, the ability to self-represent, and an approach compatible with their popular education style of learning. The research process itself was initiated with the intention of informing future design and programmatic decisions, and with the understanding that participants were not just co-creators of the platform but also co-creators of knowledge about its process and outcomes. In these ways, we view this approach to research and collective analysis as an integral element of our overall methodology of community-based PD for mobile systems.

Participatory Approaches to Design

Several decades of participatory design research suggest that mutual learning and collaboration among users and designers can bridge cultural and social gaps to influence how values are encoded in software (Béguin, 2003; DiSalvo, Clement, & Pipek, 2013; Farooq et al. 2007; Schön, 1983; Sengers et al., 2005). Yet fostering user empowerment in the design process is challenging, and too often PD is reduced to generalized, "politically correct" measures rather than meaningful participation (Ertner, Kragelund, & Malmborg, 2010). The field is marked by debates about whether PD maintains a central focus on equity, or whether it is shifting toward profit-driven goals such as increasing the usability of products for consumers (Asaro, 2000; Blom et al., 2005). When PD is overly focused on improving consumer products (e.g., Bruno & Muzzupappa, 2010), it is less likely to seriously critique the ethics and structures of power that underlie technology design (Byrne & Alexander, 2006; Robertson & Wagner, 2013).

PD in a community-based setting (see DiSalvo, Clement & Pipek, 2013) is in many ways more difficult because social relations in the community context are typically more fluid and ambiguous. In community-based PD, there is often a plurality of interests beyond the binary workers-manager power relationship with which early PD literature was chiefly concerned. As a result, we argue that community PD is especially important to analyze as a spectrum of participation. Olsson (2004), for example, argues that on the low end of the spectrum, designers simply try to think about products from a user's perspective, while on the high end lie projects that treat users as co-designers. The VozMob team saw value in facilitating dialogue and collaboration between users with low digital literacy and open-source programmers with high technology literacy, in an effort to move toward the high end of this spectrum of participation.

Overview of the VozMob Technology Design Process

VozMob's development process was iterative and informal enough to be able to respond to the needs of the workers and IDESPCA, rather than following a particular PD sequence (e.g., the Explore, Discovery and Prototyping sequence of Spinuzzi, 2005). While there was no strict ideal for participation determined from the outset, the intention of project organizers was to empower the workers to influence design decisions whenever possible, throughout every stage of development. This was largely driven by IDEPSCA's commitment to popular education, popular communication, and social justice, and their expectation that the VozMob project should reflect these values. The hope was that this design method would cultivate participants'—most importantly the workers'—sense of ownership over all or most of the platform and result in a more relevant and effective system that would be sensitive to their needs and values. Therefore, one of the goals of the design process was to address the power imbalance around code so that workers and researchers without elite programming skills could still guide software programmers to collaboratively design the mobile communication platform. We note that collaborative design—and PD in particular—is always a process of negotiation, one in which the degree of participation by different stakeholders in each design decision may itself become a productive tension that illuminates relations of power. So while it may not be necessary or possible for all participants to be involved in every minute decision of a design process, illuminating such moments of participation 'friction' is crucial to a critical understanding of the relations of power embedded in design.

Weekly workshops were the primary mechanism through which VozMob participants worked together on designing, researching, and implementing the project. The workshops included applied testing of features and bug identification as well as discussions in the dialogical style of popular education on topics such as mobile privacy, technology literacy, and the use of mobile phones for digital storytelling. The group decided on design parameters, including that the system should be very low-cost to use, and that the privacy and security concerns of the users be accounted for. After exploring commercially available options, the group decided to build a custom website based on the open-source Drupal platform that would allow other groups and organizations to appropriate and adapt the system. The first prototype launched in June 2008.

The software developers, largely located offsite, were unable to attend all but two of the weekly workshops. Technical work was carried out primarily by two USC researchers and the off-site programmers, with some involvement of IDEPSCA coordinators. Two code-sprints were held in Los Angeles and included extended meetings with the workers. Design decisions were organized into coding tasks, prioritized, and tracked online using Redmine. This process inadvertently provided a certain degree of decision-making power for the software developers and team members who knew how to use the tracking system.

Channels of communication with the developers were, in theory, open to participation by all team members. In practice, direct collaboration with the programmers was typically carried out by only two university researchers. Lack of computers at home, language, and technical barriers made communication with the programmers challenging for the workers. Since workers' direct participation in programming meetings was limited, researchers and IDEPSCA staff prioritized bridging communication between the workshops and the online technical deliberations. Thus, despite language, technical and geographical obstacles, VozMob invested considerable resources to position its users as what Olsson (2004) calls *co-designers* through hands-on testing, brainstorming, and participation in decision making. Nonetheless, lack of regular face-to-face interaction between the developers and the other project participants necessitated a secondary layer of deliberation that took place almost entirely online and posed a significant challenge to the participation of other stakeholders.

Research Questions

Based on VozMob's popular education orientation and the team's general optimism about the value of participatory approaches to design, project coordinators expected that the design process would be an empowering experience for participants – most importantly for the workers. Yet while it is often presumed that participation inherently leads to a sense of control (Asaro, 2000; Byrne & Alexander, 2006; Spinuzzi, 2005), the actual experiences of participation are interrogated less frequently. Because technology-intensive projects complicate participation, it is important to analyze whether all who take part see themselves as real contributors and perceive the process as participatory. Below we explore how VozMob participants experienced the design process, with emphasis on the participation of the immigrant workers (as the stakeholder group with the least 'technological capital' in terms of both resources and technological literacy at the start of the project). We specifically explore the following questions and themes:

- *How did the workers' experiences of participation (or lack thereof) affect their sense of* **influence and ownership** *over the platform?*
- *What* **factors enabled or limited** *participation in the design of the mobile platform?*
- *To what extent did the workers feel they had participated in the* **appropriation** *of technology rather than technology* **design***? What were the implications of this appropriation?*

Whether a certain technology is 'designed' or 'appropriated' by users is not always an either-or proposition. Bar et al. (2016) define appropriation as, "the process through which mobile phone users go beyond mere adoption to make the technology their own and embed it within their social, economic and political practices" (p. 617). The process of technological appropriation, like the process of technology

design itself, is a politically charged one—"a user-driven attempt to re-negotiate the power relationship embodied in a technological system" (Bar et al. 2016, p. 632). As users tweak mobile technologies, they participate in a renegotiation process that results in a more effective tool. In turn, the process of appropriation is influenced by political, economic and cultural factors that either limit or expand the possibilities for adoption, reconfiguration, and use. We elaborate on this below using Bar et al.'s (2016) typology of appropriation.

Collective Analysis Methods

Our collective analysis method was developed by these authors in collaboration with IDESPCA, and then conducted in a daylong workshop with project stakeholders in mid-2010. The approach extended PAR traditions, especially those of seeking to rectify the inherent power imbalance of top-down, expert driven, and often extractive research, and instead viewing community participation as enhancing the data's relevance and accuracy (see, for example, Chambers, 1997; Fals-Borda & Rahman, 1991; Jackson & Kassam, 1998; Parks et al., 2005).

Before the collective analysis, researchers gathered perspectives from all stakeholders – the workers, IDEPSCA coordinators, and the university researchers – through semi-structured interviews.[3] The interviews aimed to a) explore how each participant *perceived the development* of the VozMob platform; b) identify *differences* among participants experiences, especially in terms of perceived participation, empowerment, influence, and sense of control over the technology; and c) allow participants to *offer suggestions* for improvement. Interview data was organized by categories agreed upon by the researchers and IDEPSCA coordinators. For each category, recurring themes were identified from the interview transcripts by one researcher and verified by at least one additional researcher. Any discrepancies in theme identification between the researchers were discussed until mutual agreement was reached. The key themes were reviewed with the IDEPSCA coordinator and served as the starting points for the collective analysis workshop.

The collective analysis merged visualization methods with popular education-style discussions.[4] In brief, each stakeholder group created a diagram of VozMob's development process in which they visually represented the design process including 1) *key influencers* over the various stages of development; 2) the stages of the process during which each individual felt they had exerted *personal influence* over the design; and 3) moments of *appropriation or design*. Finally, participants worked in their stakeholder groups (i.e. workers, researchers, organizers) to match representative

[3] For five months beginning in late 2009, semi-structured, in-depth interviews were carried out by three of the authors with all project participants, including between researchers. It was hoped this would help to break down the researcher/subject divide.

[4] A more detailed discussion of our method including visual diagrams is included in the Appendix for future adaptation and use.

quotes from the interviews with important aspects of the design cycle as represented on their diagram, allowing the group to analyze participants' reported experiences of participation (including factors enabling and limiting it) in relation to the design process overall. This also gave each group an opportunity to reflect on some of the quotes and ideas that were raised in individual interviews and to co-construct an analysis of broader themes based on these. See Figure 1 for an example of the diagram produced by the workers stakeholder group.

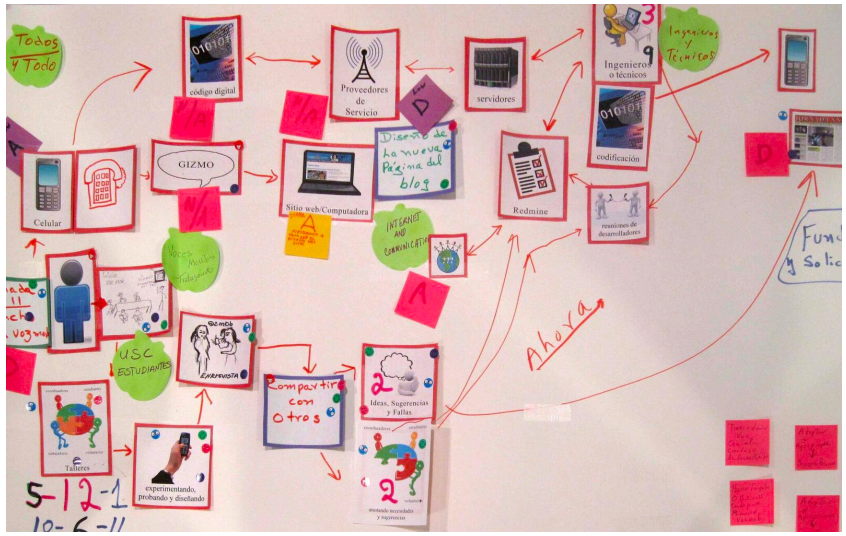

Figure 1. Diagram of VozMob's development process created by the workers stakeholder group.

Each stakeholder group presented their diagrams and analysis back to the full group. Further discussion and analysis followed, concluding with action points for the project and a summary of lessons learned that may be applicable to similar projects.[5] Because of the project's commitment to co-construction of knowledge, in this article we privilege key findings that arose out of the collective data analysis rather than the raw interview data. Workshop discussions took place primarily in Spanish. Care was taken to ensure appropriate translation and interpretation of interview data and collective analysis, including verification with project stakeholders. This article reflects these authors' attempts to synthesize the collective analysis findings.[6]

Findings

Participation, Influence, and Ownership

Participation was experienced differently in each element and stage of the project. It is helpful to think of the design process as a range of interrelated activities, with unique barriers at distinct stages, each affording different degrees of influence or control to the participants. These differences have broader implications for how future community-based PD projects may choose to structure or prioritize opportunities for participation.

All of the stakeholder group diagrams depicted the VozMob design process as not just iterative but cyclical. In the

[5] These lessons learned are available in the Appendix.
[6] We note that the application of Bar et al.'s (2016) typology of appropriation was added to this article to put our findings in conversation with relevant scholarship; these particular terms were not extensively discussed by the VozMob group in the collective analysis process.

interviews and the collective analysis, several participants emphasized a circular process of learning beginning in the weekly workshops, continuing with the communication of design priorities to the programmers (usually via IDEPSCA coordinators or university researchers) and then circling back to the workshops in which developments were tested. In the center of their diagram, workers placed an image of the globe with a group of stick figures around it to represent that, "in the middle of all of this learning that we have done… is our signal to the world."[7] The workers described themselves as learners in a cyclical rather than top-down process; this facilitated collective knowledge production and more equitable distribution of influence or power, in keeping with the social justice orientation of the project.

However, when asked in the collective analysis to identify the top three actors influencing the technology design process, the workers did not represent themselves among the top three, but rather as part of the larger group of "everyone" (all project participants) who had influenced the platform. The only channel for technical participation identified by the workers was to report system problems, ideas, or requests to the project coordinators or researchers, but many of them were not clear about what happened after they did so. This was in contrast with the findings from the interviews with other project stakeholders, particularly those working on the software development and other technical components of the project, who perceived that the workers greatly influenced the technical design outcomes. In the collective analysis, both the university researcher and IDEPSCA coordinator groups identified the workers as one of the primary influences on the development of the technological platform, with their influence occurring primarily through the workshops.

Although the workers' perceived their influence to be less than the researchers perceived it to be, they expressed a degree of control and even ownership over outcomes of the design process:

> This has been a long process, where we've tried to inform that the blog doesn't function at times, the photos don't arrive there, the cell phones are broken, they don't send the photos. So, we've been part of identifying problems and telling the person closest by [e.g. IDEPSCA coordinators] what is occurring... we continued in the process and we arrived at what is now our technology.[8]

This sense of ownership, albeit somewhat limited, was in part cultivated through the popular communication approaches implemented in multiple phases of the design process. Horizontal communication and critical conversations about power and access helped provide various entry points for participants to meaningfully engage with and influence the project.

[7] Transcripts from Mobile Voices Collective Analysis Workshop (June 2010). Authors' translation of Spanish transcript.

[8] Authors' translation of workshop transcript. Unless otherwise noted, quotes from workers are similarly translated.

Moments of empowerment and self-efficacy varied by participant and by project phases. When asked to locate the stages over which they personally had influence as individuals, various workers did not include the actual technological feature development. Instead, they pointed to influence in the workshops; testing and experimenting with the technical tools; sharing the tools with new users; offering feature suggestions and identifying bugs; the community newspaper *La Jornada XXII*; and the graphic design. However, we note that the workers' description of the development process did reflect learning about the technological elements of the project; as one said, "we've become informed about what digital code is, the service providers, the servers, and the technical engineers."

The IDEPSCA coordinators did not identify themselves as having influence over the coding either, but interestingly, they reported influence over the cellular service providers – citing the fact that they were able to successfully work around limited features in the phones and high service costs, frequently changing service configurations. This was pushback against external corporations they saw as otherwise having great influence over the project. Akin to appropriation, such perceptions illustrate some of the ways in which the development of the project entailed a struggle for control over the existing technology and services, a struggle through which some degree of agency was experienced. IDEPSCA coordinators viewed this pushback as an extension of their broader social justice advocacy work.

While the workers expressed a certain lack of control over the design of the technological features, this was not the case for the *graphic* design stages. In discussions of design, workers most often pointed to their direct roles in the graphic design of VozMob's website and the re-design of the community newspaper *La Jornada XXII* to include content produced through VozMob's mobile platform. The graphic design activities, which spanned multiple workshops over several months, were some of the most participatory in the development of the platform. In the collective analysis a representative of the workers' stakeholder group explained, "the design of the new web page... this is also where we have been an important part. We [the VozMob team] have all been committed but …[the workers have] been fundamental to the development of our webpage."[9] Perhaps not surprisingly, direct participation in the development of the site's graphic identity helped promote a sense of ownership over the entire platform. The cultivation of agency in the graphic design process was an intentional priority for the project. The webpage was the platform through which marginalized voices would self-publish, and the team wanted to ensure that the design of this most public-facing component of the project reflected the initial impetus of workers' self-representation.

Across the three stakeholder groups, the relative lack of perceived influence over the programmers and of control over

[9] Authors' translation of workshop transcript.

the coding stood out.[10] For the workers, IDEPSCA coordinators, and researcher stakeholder groups, influence over the design of technological features was primarily experienced as occurring in the workshops and through testing – not direct engagement in coding. The exception, as might be expected, was the two researchers who acted as the primary liaisons with the programmers.

Overall, however, the diagrams and discussions in the analysis workshop suggested that the VozMob process was democratic in many places, as all participants perceived they had personal influence over multiple stages and outcomes. A broader finding of the project was that enabling participation in the design of the 'front end' of a site is far easier than enabling participation in the design of the 'back end,' which requires a different set of tools and capacities. Inherently, co-designing site layout is simpler and poses fewer barriers to participation than relatively abstract and highly technical decision-making about feature development and code design; and in the VozMob experience, it seemed to increase participants' sense of influence and ownership over the platform as a whole. This finding has implications for how future community-based PD projects might structure opportunities for participation. In particular, it may be useful to determine through an upfront participatory process whether participation in front end design or back end design (or both) is of higher priority to the community, and to ensure that the appropriate level of resources, expertise, and mentoring needed to support it are in place.

[10] The software developers did not participate in the collective analysis, but in their individual interviews they expressed a perception that the workers were one of the primary influences on the design.

Factors Enabling and Limiting Participation

Perceived lack of technological literacy & varying skill levels. Perceived lack of technological understanding was a key barrier to participation identified by the workers. "I feel that my influence is limited," stated one participant, "because I don't have much technological understanding; often the fact of not being a technology expert may mean that some people avoid making comments related to the technology."[11] (We note here that this was a *perceived* rather than a measured degree of technical understanding.) Similarly, the workers' stakeholder group reported that they did not have a good understanding of Redmine, the online project management tool that VozMob used. This was not surprising given that it is an English language online tool, which poses obstacles to the workers' participation. Further, while this tool was demonstrated and discussed in some of the weekly workshops, the workers' direct use of it was not at first considered a priority for the project, as they generally preferred to use their limited time to focus on aspects of the technology that more directly enabled their content creation. Learning to adequately report bugs and feature requests is its own skill set (made more difficult by language barriers), so the group discussed ways of simplifying

[11] Authors' translation of workshop transcript.

and improving the reporting process including establishing an email address on the VozMob website with instructions for detailed reporting and requests.

Another significant finding (identified in particular by the worker and IDEPSCA coordinator groups) was that users developed their digital storytelling skills at different paces due to time and ability to attend weekly workshops, computer literacy, and comfort with mobile phones. The workers perceived that the varying skill levels within their group slowed the pace of progress because it was often necessary to repeat training in the workshops. Further, varying skill levels posed a challenge to the group's effectiveness as trainers of new users, slowing plans to expand the project and recruit new users. Significant one-on-one time had been dedicated to bringing the core group up to the same skill level in preparation for the project's expansion.

Communication and time constraints. Sustained, direct interaction between off-site programmers and the workers was not possible and was identified in the collective analysis as one of the greatest challenges for the project. On-site, bilingual programmers would have been ideal.

Time was also a constraint. In the collective analysis workshop it was decided that more time was needed for participatory decision-making beyond the weekly workshops. However, participants' time was scarce, and often over-allocated to volunteer tasks elsewhere on the project already. Such time constraints are common phenomena in participatory processes (Guijt et al., 1998; Byrne & Alexander, 2006; Light & Luckin, 2008).

In the context of the proliferation of open source software it is tempting to assume that developing software in a participatory manner is inherently more resonant with community media, popular communication, and social justice goals. At a basic level there is resonance, but the technical complexity and the time required to participate directly pose real obstacles and raise the question of what *kinds* of participation in *which design activities* yield the greatest benefit to participants. The project did try to demystify the general process of software development during the weekly workshop discussions. It remained up for debate, however, whether the benefits of more direct participation in technical design (e.g., coding) would have outweighed the significant time costs for participants to learn sufficient technical skills to participate in ways they would find meaningful.

In addition to these various barriers to participation, some factors were identified as enabling participation. One was one-on-one support, i.e. one IDEPSCA coordinator or researcher working directly with one worker to troubleshoot, experiment, and become comfortable using the mobile phones and website in new ways. Another key enabler of participation was the ability to create mock-ups and look at the layout and design of other websites to generate ideas for the graphic design; visual representations were more readily available and easily incorporated into the graphic design process than into the technical design. Both of these findings may be applicable

to other community-based PD projects (regarding visualizations, see also Dearden & Rizvi, 2008).

Appropriation

Those with more technological literacy tended to identify VozMob's process as one of *design*, in which stakeholders had significant control over how the system operates, while those with less technological literacy who felt less control over the technology tended to identify their experience as one of *appropriation* of the tools. Implicit in some articulations of these concepts was a hierarchy, where appropriation (the adoption and modification of existing artifacts) was somehow less than design (the invention or development of new artifacts). Sometimes this appropriation was seen as sufficient, such as when the IDEPSCA coordinators saw the continued appropriation of the project by the workers as fundamental to its sustainability. At other times IDEPSCA members felt that more than mere appropriation was needed and pushed programmers to design new software (e.g. new Drupal modules) to overcome specific issues. Of course, in many instances, such "design" involves building on someone else's code, appropriating it to a new end. In that sense, conceptualizing the relationship of appropriation and design as hierarchical, with appropriation being less than design, is misleading. Importantly in our case, it directly reflected participants perceived control: what they could adopt and change, they often saw as appropriation; what they needed more technically skilled others to do, they tended to articulate as design.

Throughout the project, the team engaged in a variety of appropriation practices which can usefully be conceptualized according to the typology laid out in Bar et al. (2016)—*baroquization*, *creolization*, and *cannibalism*—representing progressively greater struggle for control and antagonism between users (the VozMob team) and technology providers (phone makers, service providers, software platforms, etc.). Through "baroquization", technology is adopted and appropriated as intended by its providers, and users take advantage of built-in features to make tools their own. Examples include the use of the phones' MMS features to create multimedia stories combining images, video, text, and sound, or the use of Drupal's many features allowing such things as the control of publishing permissions. "Creolization" goes further, recombining technology elements to create something unanticipated by providers, but not necessarily antagonistic to their interests. VozMob's core reliance on phone carriers' MMS gateways to post multimedia stories on Drupal represents such an instance. "Cannibalism" is the most extreme practice, involving creative destruction that challenges providers' control and runs counter to their interests. One such example was the elaboration of Drupal filters that stripped carriers' advertisements from incoming MMS messages. These acts of appropriation were often accompanied by a sense of triumph over the limitations of existing configurations and costs of technology. Several members of the group felt proud

that they had devised a way for the workers to use inexpensive, relatively basic mobile phones to send multimedia digital stories that otherwise would require access to then-costly smartphones and data subscriptions.

The workers stressed the fact that, in their view, several technologies were simply *adopted* (i.e. taken up, but neither designed or appropriated). For some workers this distinction was important because through usage and experimentation, the technology's fundamental constraints became apparent, sometimes prompting further appropriation. For example, the pre-existing functions on the cell phones included certain limitations such as short audio recording time and advertising embedded in MMS messages. Yet transcending these limitations (e.g. by telling stories via multiple recordings and filtering ads) and finding ways to tell mobile stories without using data connections was sometimes seen as successful appropriation, and even a political act of overcoming the commercial intent of the mobile service providers.[12] Foregrounding this contradiction by simultaneously acknowledging the limitations and possibilities of appropriation fueled the group's ongoing conversation about the political and economic dynamics that surrounded the project.

The IDEPSCA coordinators were not in agreement with using the term *participatory design* for all stages of the process. They felt that tools like the Drupal backend already existed, "so we are appropriating the design of Drupal, [and] creating other code to appropriate it to what we need."[13] Such framing allows the team to celebrate the control they seized in extending open source code, while still acknowledging the rigidity and inherent limits of its underlying structures. Such nuance is a useful counterweight to the frequent celebration of open source as continuous and fully accessible.

Given all of these nuances, however, it seems that for VozMob appropriation of technology was just as politically potent an act as technology design, and the lines between the two were often blurred. Interestingly, through the participatory analysis we learned how several team members understood appropriation as an empowering process, and perhaps more descriptive than the term "participatory design" of the role the workers played in the project. It is thus important to consider appropriation *as a design practice*, arguably an inherent part of *any* design process. It is possible that labeling practices as "appropriation" may also make them more approachable for people who do not perceive they possess sufficient technical skill for design. Yet maintaining the tensions between these concepts in order to explore their analytical utility, and the ways in which they can be experienced differently from

[12] Of course, if the Mobile Voices platform were to be widely adopted it could also increase profit to service providers for the delivery of MMS messages. At the time of this research, however, the accomplishment of finding a way to publish multi-media stories from low-end mobile phones to a website, without the use of costly smartphones with wireless data plans and without the embedded advertising, was seen as a noteworthy accomplishment. It was arguably a form of resistance to the predominant mobile/wireless market, or "cannibalism".

[13] Authors' translation of workshop transcript.

particular political or social justice standpoints, proved to be a productive catalyst for broader discussions of technology and power. We therefore recommend exploring the interrelations and boundaries between these concepts in future technology design projects, and perhaps intentionally incorporating acts of appropriation as a mode of participating in technology design. It may also be useful to explicitly explore how different forms of appropriation (e.g. following the baroquization/creolization/cannibalism typology) allow the expression of different degrees of control and pushback.

Conclusion

In this paper we have detailed key findings of the VozMob project as a case of community-based participatory design and technology appropriation. As an action research project, this study has been equally concerned with theoretical inquiry as with methods and practical application. Here we provide a brief overview of several theoretical and methodological implications for community-based PD of mobile media; we encourage readers to refer to the Appendix for additional findings regarding practical application.

Consistent with the community-based approach to PD (DiSalvo, Clement, & Pipek 2013), a central goal for VozMob was to enable participants to be co-designers of the technology to the greatest extent possible. The collective analysis suggests that degrees of participation varied across aspects of the project, with all stakeholders agreeing that the workers' hands-on involvement in the graphic design process enabled them to be direct co-designers of the graphic interface. However, in terms of the technological feature design process, participation took the form of extensive user feedback sessions and collaboration rather than direct co-construction, placing this in the middle of Olsson's spectrum of user participation. Nonetheless, there was consensus that VozMob's platform reflected the participation of all stakeholders (if to varying degrees) and that the design outcomes would have been significantly different had this participation not taken place.

One reason for the difference in degrees of participation experienced in the graphic and technical design may be that the front end of the system was more conducive to direct user participation than the back end; coding—not as easily visualized as the graphic design of a website—requires a specialized technical skill set in order to directly participate. Mobile media, which necessitates that designers consider multiple screen sizes and diverse operating systems, aggravates this problem. However, we found that visualizations (which VozMob used particularly in the graphic design and collective analysis processes) can help to bridge differences in technical skills and language, thereby facilitating certain modes of participation. Developing more accessible visual or physical examples to illustrate coding decisions and their implications is a particularly important task for future action research.[14]

[14] See also Lyndsay Grant's "The Case for Design and Social Justice as 21st Century Literacies" at http://dmlcentral.net/blog/lyndsay-grant/case-design-and-social-justice-21st-century-literacies.

'Influence' (i.e. perceived influence or control over design decisions) proved a useful analytical theme to identify and reflect on stages of the process where users may or may not have had an empowering experience. This necessitated consideration of how much influence or control a user may have over the forms of technology; how much control they have over prioritizing new feature development and bug fixes (including understanding the budget trade-offs entailed in this prioritization); and the extent to which they are equipped to weigh pros and cons of different technological solutions. While in theory anyone can write code, doing so requires a higher level of technological literacy than most users have and is often perceived as an intimidating terrain. It remains largely the playground of a highly educated techno-elite (Longford, 2005), although VozMob and many other projects have made important inroads. Increasing the involvement of users without such technological skills requires intentional efforts to make design processes accessible; we have analyzed some of the barriers to and enablers of this here.

Rather than celebrating empowerment as a singular notion, our findings reveal why PD may need to sustain nuanced expectations about mobile media and the extent to which design (and thus participation) is even possible. Of course, the direct participation of all stakeholders at every step of the process is not always possible or ideal, given that participants may have other priorities for scarce time and resources. As this case illustrates, influence and a sense of ownership over the resulting designs may be attained through a variety of modes and degrees of participation – including technology appropriation – even if direct involvement in programming is deemed impossible or is not desired or prioritized by participants. We found that exploring acts of appropriation—which we analyzed here using Bar et al.'s (2016) typology—was a potent way to surface the nuances of control, influence, and power in technology design. Particularly with mobile media, where the layers of hardware and software are increasingly imbricated in everyday life, ongoing work to improve our methods of addressing imbalances in and through the design process is paramount.

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