Knowing by Doing: Action Research as an Approach to HCI

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What Is Action Research?

Action research (AR) is an approach to research that involves engaging with a community to address some problem or challenge and through this problem solving to develop scholarly knowledge. AR is method agnostic, which is to say action researchers make use of a large variety of qualitative and quantitative methods to understand the change they are undertaking in communities. In HCI, AR often also uses design, development, and deployment of technologies as methods of knowing and of enacting change. The cornerstone of AR is that these two cannot be disentangled: the doing and the knowing, the intervention and the learning.

AR is explicitly democratic, collaborative, and interdisciplinary. The focus when conducting AR is to create research efforts "with" people experiencing real problems in their everyday lives not "for," "about," or "focused on" them. Thus, AR research focuses on highly contextualized, localized solutions with a greater emphasis on transferability than generalizability. That is to say, the knowledge generated in an AR project should be contextualized enough to enable someone else to use this information to create their own change—which may or may not be similar—in another environment—which again may or may not be similar.

AR offers a systematic collaborative approach to conducting research in HCI that satisfies both the need for scientific rigor and promotion of sustainable social change and has been taken up by a variety of researchers in HCI (e.g., Foth & Axup, 2006; Palen, 2010) and information systems (e.g., Baskerville & Pries-Heje, 1999) research. AR "aims to contribute both to the practical concerns of people" in problematic situations and to the academic goals of science "by joint collaboration within a mutually acceptable ethical framework" (Rapoport, 1970, p. 499). AR includes "systemic inquiry that is collective, collaborative, self-reflective,

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critical and undertaken by participants in the inquiry" (McCutcheon & Jung, 1990, p. 148). Procedurally, AR is "comparative research on the conditions and effects of various forms of social action, and research leading to social action" that uses "a spiral of steps, each of which is composed of a circle of planning, action, and fact-finding about the result of the action" (Lewin, 1946, 1948). AR necessitates that researchers become "facilitators" of the intervention and research process, enabling collaborators from the community to step up into the researcher role alongside the rest of the team. Researchers in this model must become conscious of their own positions and allow for the prioritization of different values than they might typically. This transformation from leader, with expertise that is prioritized above participant knowledge, to coach, who draws out participant ideas and places them centrally within the project, allows space for all viewpoints. This approach privileges the local knowledge contributed by community insiders as much as the academic knowledge contributed by community outsiders.

History and Intellectual Tradition of AR

Although there is some debate about exactly when and how AR emerged (Masters, 1995), most scholars credit Kurt Lewin, a psychologist who escaped Nazi Germany for the USA in the 1930s, with first defining a theory of action research in 1944 while a professor at MIT. He published "Action research and minority problems" (Lewin, 1946) shortly thereafter, creating the first published piece of scholarship explicitly describing AR. By arguing that knowledge could best be constructed by real-world tests and that "nothing is as practical as a good theory" Lewin began to make AR and intervene in research settings acceptable as a means for scholarly inquiry. To make this kind of progress, however, Lewin relied on an emergent scientific culture led by the pragmatists, perhaps most notably John Dewey and William James, that saw science as relevant and available to everyone, not just the ivory tower elites interested in "esoteric knowledge" (Dewey, 1976; Greenwood & Levin, 2007; James, 1948). Particularly relevant to the ideas that would form the basis for AR, Dewey saw the process of generating knowledge as the product of cycles of action and reflection (Dewey, 1991/1927). He advanced the idea that thought and action cannot be separated, a cornerstone of Lewin's approach to research and of AR more generally.[1]

What Can Action Research Do for You?

There are numerous resources on AR, including books that will walk you through the history or the application of AR as well as works critically reconstructing AR and its tenants. In one such book, "The Action Research Reader," Grundy breaks

[1] Interested readers are referred to the chapter on Grounded Theory Method in this same volume, which also engages the concerns and ideas of the pragmatists.

AR projects into a taxonomy that includes technical, practical, and emancipatory (Grundy, 1988). Likewise, McKernan describes three views on problem solving prevalent in AR: scientific-technical, practical-deliberative, and critical-emancipatory (McKernan, 1991).

The first type (technical or scientific-technical) is traditionally most relevant to the natural and computational sciences in which truth and reality are generally thought to be knowable and measurable, and knowledge produced may be predictive and generalizable. In this case, the facilitator engages with collaborators to test an intervention based on a predefined scientific theory. This intervention is designed to create some change in the setting, which can include new practices and approaches, different power structures or group dynamics, altered patterns of action, or simply the incorporation of a new piece of technology into daily practice. This approach may then result in change less likely to be carried on by the community partners after completion of the project, depending on how "bought in" to this theory and intervention the community collaborators are (or can be given the resources they have available). Indeed, in my own research, when I have used this approach to AR, I am left with results that are very comfortable to an HCI audience and which could be useful in creating long-term sustained change, but the specific projects themselves did not succeed in making those changes. For example, in one school-based research effort, I developed a system that fit well with established educational theory around behavior management for children with severe disabilities. However, in practice, the teachers and administrators did not have the resources available to them to continue to use the system after the end of the research project. This system has since experienced commercial success with other schools, in which resources are not as constrained and practices are more closely aligned with those theoretically recommended.

The other two approaches (practical-deliberative and critical-emancipatory), which are more familiar to a humanities or a critical theory research team, focus more on unknowable, social realities with research problems that are constantly evolving and defined in the situation by a variety of stakeholders with dynamic and mixed values. The relationships in these models are based on a move towards mutual understanding and shared solution development as opposed to a model in which the researchers, while working in democratic partnership with community members, are still ultimately interested in technical design, validation, and refinement. These latter AR approaches tend to produce sustainable change more reliably but may not produce innovative solutions that would warrant additional interest from the computing research community. Both approaches rely heavily on interpretivist data analysis and the development of shared understanding among all participants. The primary difference in these two approaches lies in the degree to which the research facilitators seek to identify problems in collaboration with partner participants. Practical AR is largely about understanding local practices and solving locally identified problems, whereas emancipatory AR promotes a kind of consciousness raising and criticality that seeks to empower partners to identify and rise up against problems they may not have identified initially on their own.

AR is essentially method agnostic. Ultimately, researchers interested in AR must decide what they hope to understand: an underlying technical reality that will produce generalizable results (*technical*), a local problem and its (potentially technological) solutions (*practical*), or how to change practices towards those that enhance or produce equity amongst underrepresented and mistreated communities (*emancipatory*). AR can support researchers in any of these goals, but the approaches may be different depending upon what is in focus. Regardless of what type of AR one undertakes, there are common underlying tenets, as described in the following section.

Doing Action Research (and Doing It Well)

Good AR is fundamentally empirical and cyclical, which is to say the actions undertaken are responsive to emergent evidence. This responsiveness is required of research settings in which the goal is to achieve both intervention and understanding. Furthermore, this understanding must unpack both the setting itself and the outcome of the intervention—whether successful or not. Thus, the research questions and methods must continually evolve alongside the context of the setting, which allows researchers to capitalize on the knowledge developed in earlier stages of the project with the involvement and engagement of those most affected by the intervention. Additionally, good AR must be critical, which of course is easier in a cyclic process, in which action always follows planning and is followed by reflection and review. Schon (1983) references this kind of criticality as "reflection in action," a process by which the research team unpack both the outcomes of the intervention(s) and the means by which they were accomplished interdependently. Given the limited separation of research and practice in AR, this kind of reflection must consider not only the specific research questions initially posed and those that have evolved from the work but also questions of practice. The research team then must ask the following: What happened? Did the intervention work (as planned)? What do we know about the site, our theories, and the empirical data that can explain why or why not? Now what?

The emphasis on incorporating multiple stakeholder viewpoints[2] alongside literature reviews and empirical evidence can enable researchers to engage more critically with the field site, as described here. This must include critical reflection on the interests and values of the community. For example, as noted in other chapters, particularly those focused on qualitative research methods, researchers engaged deeply in field sites must recognize their own taken-for-granted positions and beliefs. The same is true for AR. One cannot go into an AR project with a mind completely clear of our own cultural and personal beliefs. Instead, AR requires us to uncover our own prejudices alongside those of the field site. Thus, good action

[2] Interested readers should also explore value-sensitive design, values in design, and participatory design as design-oriented approaches that focus on multiple-stakeholder viewpoints.

researchers use a multitude of methods to gather evidence about complex situations and varied viewpoints while critiquing their own practices and knowledge production. AR then requires careful discrimination among the data, summaries of those data, and interpretations or judgment based on the data and theory. The inherent flexibility of AR allows these researchers to balance critical reflection and scientific rigor, as defined by an eye towards trustworthiness (Lincoln & Guba, 1985). Likewise, by examining transferability rather than generalizability, researchers can ensure that even in the face of multifaceted and complicated projects and field sites enough information about the projects is documented to allow other researchers to take up the results.

Trustworthiness stems from four distinct but related concepts: credibility, transferability, dependability, and confirmability (Lincoln & Guba, 1985; Stringer, 2007). The notion of trustworthiness as a measure of scientific rigor can be—and often is—applied to other related approaches to research (e.g., ethnographic methods, collaborative inquiry). AR is particularly well suited to address issues of credibility and integrity of studies. First, the prolonged engagement common to AR projects ensures that the kinds of deep-seated emotional responses or hidden tacit knowledge that are nearly impossible to retrieve in a single interview or focus group will emerge. Second, AR projects typically include persistent and explicit observation over this extended period of engagement enabling researchers to gather data directly in the field while it is happening as well as from informant accounts. Furthermore, both in interviews and observations, AR places an emphasis on participant language and perspectives as opposed to the layering of scientific language from the literature on participant concepts. To this end, Stringer advocates the use of the *verbatim principle*, in which researchers use terms and concepts "drawn from the words of the participants themselves" to "minimize the propensity to conceptualize events through their own interpretive lenses" [Stringer, 2007, p. 99]. Third, AR ensures credibility of data through the inclusion of multiple perspectives which can allow conflict, disagreement, and therefore data triangulation to occur (Lincoln & Guba, 1985) followed by member checking—in which informants verify data collected about them—and debriefing—in which participants are encouraged to voice concerns and comment on the science itself. Furthermore, through an emphasis on standpoint analysis, by which researchers are encouraged to understand and to describe both their own perspectives and those of the participants with whom they are working (Denzin, 1997; Smith, 1989; Stringer, 2007), AR reminds us that no singular account with one voice can describe the myriad complex viewpoints in any research setting. Finally, the credibility and validity of AR knowledge are measured to a large degree by the "workability" of solutions—that is, their ability to address real problems in the lives of the participants (Greenwood & Levin, 2007, p. 63). The workability requirement of solutions enforces the tight link between theory and practice by ensuring that theoretical knowledge generated in and from the field is returned to the field in the form of some sort of action that can be evaluated.

AR intentionally de-emphasizes the notion that research results can or should be made generalizable to some larger population beyond the one present. Researchers engaged directly and closely with communities, as in AR, recognize the inherent

contextualization and localization of any developed solution. Thus, the goal is instead transferability. To accomplish this goal, data must be collected, analyzed, and described as transparently as possible (dependability). Furthermore, enough evidence must be presented to confirm that the events transpired as described (confirmability).

This transparency in the development of solutions, collection of data about them, and analysis in results enables other researchers—or community members and other stakeholders in related situations—to trust the results enough to examine what is similar and what is different about their setting in an attempt to replicate parts of the solution while changing others. Thus, AR does not say that no solution can ever be successful outside of the local context for which it was developed. Instead, AR provides a rigorous framework for generating and sharing sufficient knowledge about a solution that it may potentially be transferred to other contexts.

AR shares many methods and issues familiar to HCI researchers: working with community partners, engaging in fieldwork, and designing and developing solutions iteratively. However, an AR approach alters these processes in significant ways. First, the researcher in an AR project takes on the role of a "friendly outsider" (Greenwood & Levin, 2007, p. 124–128). The researcher as friendly outsider is an approach that explicitly rejects the idea that researchers should distance themselves from the "subjects" of their research in the name of objectivity. Instead, AR requires researchers to become "coaches" who are skilled at opening up lines of communication and facilitating research activities *with* community partners rather than designing and implementing research *about* them. Likewise, the research facilitator co-designs interventions and change *with* community partners, not *for* them. In this model, researchers may support community collaborators in critical thinking and academic reasoning, but this view privileges local knowledge as being as important as scientific or scholarly knowledge. Thus, all involved are co-investigators of, co-participants in, and co-subjects of both the change and evaluation activities of the project. Importantly, as Light et al. note, finding and working with community partners are not as simple as identifying someone in need (or someone representative of a group in need) and placing them in the collaborative relationship of the research team. Rather, there is a process by which these individuals are made participants—and a parallel process by which the researchers are also made participants—resulting in the entire team being together rather than from the university or from the community (Light, Egglestone, Wakeford & Rogers, 2011), a process that bears some similarity to the notion of collaborative ethnography (Lassiter, 2005). In this section, I describe some of the considerations and procedures relevant to taking an AR approach in HCI with examples from my own work when appropriate.

Establishing a Relationship with a Community Partner

The first step in many scientific research projects is to formulate a problem statement or collection of research questions. In AR, these research questions should be

developed collaboratively in partnership with members of the community you wish to engage and thus tend to be inherently interdisciplinary in nature. Thus, the first step in an AR project is often to engage with a community partner. Community partners can be people with whom one has a long-standing relationship or they may emerge once a researcher has decided to address a particular problem or a set of problems. For example, one action researcher might choose to work with the school where he or she teaches or his or her daughter attends, while another may hold a workshop for local teachers and attempt to identify someone sympathetic to the research problem being addressed. Likewise, community partners may be recruited by or may recruit researchers. For example, one researcher may be called upon by a nonprofit familiar with their work and interested in what technology can do for their organization while others may have to call a set of nonprofits working in their areas of interest.

Regardless of the means by which community partners are identified, it is incumbent upon the research team in an AR project to grow those relationships and establish trust among all parties before work can begin. Typical relationship-building approaches can include researchers presenting some of their work to the potential partners, partners presenting some of their challenges to the research team as well as any ideas they have of how they might work together, and less formal approaches like just "hanging out" together. Even after an initial relationship is established, it can take a long time to develop into a workable partnership for an AR project. Signs that the relationship is established to that point include indicators that all team members trust each other, they have a shared commitment to working together, and there is general amiable casual communication.

Research Questions and Problem Statements

Once a relationship has been established, the AR project team—including researchers and community partners—can begin to develop shared research questions and problem statements. AR inherently includes the development of some action, often a technological intervention in HCI research. Before such an intervention can be designed, vision and operational statements should be crafted collaboratively [Stringer, p. 151]. Vision statements enable the AR team to work together to decide what the issues are and to develop methods for accounting for all of the concerns of the varied people involved. They provide the means by which all voices are heard and all concerns are included and often include a list of goals or a "vision" for the outcomes of the project. Vision statements often arise from substantial fieldwork, surveys, focus groups, and interviews, activities that are described in other chapters of this book and in other reference materials.

As one example, in working with an afterschool program that supported teaching children about technology in inner-city Atlanta, I struggled to craft a vision with the local leaders of the program for successful change in their efforts.

The dominant issue in our struggles was whether the program, which appeared successful in the literature and thus was being replicated in Atlanta, would in fact translate from the program in which it originated in a larger city in the Northeast United States. I was inclined to follow the literature and thus viewed our project as focusing on developing action to support getting their program "back on track" with the national efforts. The local leaders, however, believed that the processes and ideas that originated elsewhere would not work for their population. Thus, I then spent several months conducting fieldwork to understand the nuances of their population and the implementation of the program at their site before we could begin to craft a collaborative vision statement. By working together over these months, we were ultimately able to articulate multiple research questions and a general direction that incorporated portions of each of our original ideas and some that emerged during our time working together. These research questions were both substantially more relevant to the real issues at hand and more credible in terms of developing knowledge due to their connection to both the literature and the local context. Context and community are thorny words in any research, but in HCI, they can become even more so. When considering information and communication technologies, knowledge is no longer strictly place or infrastructure based. They can include people, structures, technologies, localities, and virtual spaces. Of course, not every community collaborator is interested in traditional academic research questions, regardless of discipline. Thus, in AR, the notion of a "research question" must be broader than those that can be published and include questions about process and outcomes that are important to the community partners who are interested in quality improvement and assessing the impact of an intervention on their sites.

Operational statements follow from vision statements and specifically detail how all of the individuals involved will work together to ensure that the vision statements can be met [Stringer, p. 151]. As such, operational statements operationalize the vision and often include phrasing such as "the [organization] will enact its vision through" followed by a list of detailed changes that will be made. Operational statements can be hard to craft and even harder to support and commit to completing. Thus, the action researcher, as research facilitator, must work to support participants in communicating with one another, compromising, and prioritizing some activities over others. In terms of HCI projects, these activities can also include prioritizing some features and functionality in technological artifacts over others. Again, it is important to recognize here that the researchers have some expert knowledge (e.g., what can be done technologically, what timeline and funding resources constrain the project) as well as the ability to see things as outsiders. However, local knowledge is also vitally important and should be treated as expert knowledge in its own right. Thus, these decisions should be made collaboratively as part of a negotiation between all of the stakeholders and participants in the project. Addressing these issues early in the project can enhance the commitment of all members of the team to ensuring that both the intervention and the research are completed successfully as well as enable the airing of any potential concerns before they grow into substantial problems.

Action and Intervention

The action in AR can include any of a variety of social and technological changes within the larger sociotechnical context in which the AR project is situated. Adjustments must be made to both the technological and the organizational systems at the same time. This "joint optimization" accounts for the necessary training required to "operate in [the new] technical environment" and the necessary design required given the particular behaviors or features of the organization into which the technology will be deployed (Greenwood & Levin, 2007). Technological and organizational designs are therefore inseparable. Furthermore, as with the research questions and vision and operational statements, design of these sociotechnical interventions must be conducted collaboratively with the community partners. This kind of engagement is related to but distinct from that traditionally advocated in participatory design (PD) (e.g., Greenbaum & Kyng, 1992; Muller, 2007; Schuler & Namioka, 1993). Both PD and AR stem from the notion that change should be designed and implemented democratically and inclusively (Foth & Axup, 2006). However, the scope of PD is typically more limited to the design of solutions, whereas the scope of AR includes the notion of *learning through action*.

Although this kind of reflection is important to design, and in particular the PD process, it is not the same as the construction of scholarly knowledge through action required of AR. This kind of learning stems from the extensive co-construction of knowledge before, during, and after the implementation of any change—technological or otherwise. This broad scope ensures that the problems as well as the solutions are collaboratively developed and articulated. Furthermore, the emphasis on research over design in AR drives home the idea that the end goal of AR is not *the best* solution to a problem but rather greater understanding of the setting through engagement in change and production of *potentially better* solutions iteratively and over long periods of engagement. For example, in a 5-year ongoing project with a public school in Southern California, we have been working towards an understanding of the role of digital tools in providing visual support for students. Over time, these tools have taken a variety of forms, and as the teaching practices and available hardware have both changed, so too has our software. Being unafraid of using something that is not "done" has enabled us to make positive change in the classroom activities and to unpack interesting research questions about the design of these artifacts and their use in schools. Recognition that the ultimate goal of AR is to learn through doing can free the designers and researchers in the project from what Stolterman refers to as "design paralysis" that can occur through "endless opportunities" in a messy design space (Stolterman, 2008). AR teams create interventions after thoughtful consideration. However, an attitude that focuses on the outcome of learning something, regardless of the "success" of the design or the intervention, can free up the team to attempt interventions that may be risky or underdetermined.

Evaluation

Proponents of AR frequently note that evaluation is neither a natural nor a neutral act. Evaluation as a process begs the following questions: Who evaluates? What gets evaluated? What power structures and decision processes led to this evaluation strategy? Thus, evaluation in AR, just like problem definition and intervention design, is recognized to be a value-laden enterprise. AR projects seek to ask and answer questions of interest to the research community as well as those that are of interest to the community partners. Furthermore, AR seeks to "define outcomes in ends that are acceptable to stakeholders, rather than those whose degree of success may be measured against some set of fixed criteria" [Stringer, p. 141]. In this model, evaluation is carried out as a joint construction among all the participants. Stakeholder groups are encouraged to air all of their concerns, review data that has been collected about and for the project, resolve any issues they can, and prioritize a list of unresolved items ("future work," in HCI parlance) (Guba & Lincoln, 1989). Both scholarly and practical questions around the change must be addressed. Because action researchers often engage deeply with a field site prior to any change occurring, some traditional measures of change can often be deployed (e.g., surveys, observational measures). Ideally, the change is sustained, but the use of the technology might not be, leaving room for a pre–during–post-intervention study design. For example, in one project focused on teaching social skills to students in elementary school, we removed the technology after an intervention period, but the adjustments to student behavior remained. This research finding had the positive practical impact of allowing the teachers to create a curriculum model that includes a brief but intense intervention each year that has lasting effects on the social behavior of the students throughout the year.

These methods inevitably lead to disagreement in some projects. Furthermore, the academic pressures of publishing—and the position of the research facilitators as people who know what is of interest to the academic community—can privilege some portions of the evaluation activities over others. Academic researchers are skilled in arguing their points, have deeper knowledge of the research literature than community partners, and carry with them innate status. Thus, they must be careful of "model monopoly" (Braten, 1973), in which the professional researcher dominates the conversation with their own models of the community partners and the situation. This kind of dominance ultimately enables the professional researcher to thereby dominate the plan of action. It is important during evaluation as much as at any point in an AR project to remember that the researcher should act as facilitator for a team, not leader of a project, and ensure that all of the perspectives are represented in the plans for evaluation and analysis.

A compromise on the means for evaluation to ensure that all perspectives are represented is core to the AR approach, even when it means substantial additional work on the part of the research team. One example of such compromise occurred in my work with a special education school over a 2-year period. The research questions we initially developed as a team focused on whether teachers would be able to

collect the data required for a particular school practice more efficiently and with less burden using the technological intervention we had designed. As it became clear that the teachers would easily be able to conduct these practices using the technology, the teachers and other school-based professionals began to iterate on the goals of the project, noting that the quality—beyond efficiency—of teacher practice might be changed using the tools we had provided. There were also questions about the quality of teacher-based assessments when compared with professional experimental assessments regardless of whether the teachers were using our tool. This quality was best measured by gathering substantially more data and analyzing these data in a way that would produce rigorous results that could be included in year-end reports about each child as well as each teacher's progress but would be of little to no interest to the HCI research community. Because our first duty in AR is always to our community partners, we included these issues in our evaluation and analysis. The additional data not only addressed the questions raised by our community partners, but it also enabled the co-construction of new knowledge that was unexpected by both the community partners and the research facilitators but emerged through the partnership. These results, though not directly relevant to HCI researchers, were of much interest to the community partners, to special education researchers, and to our interdisciplinary team. Ultimately, their inclusion strengthened the work and led to further publications outside the HCI domain. Of course, respect for all the viewpoints in an AR project could mean not collecting data that the researchers themselves want. For example, collecting the data might be too invasive or too cumbersome for the community partners, particularly when for legal, access, or ethical issues these data must be collected by the partners. In these cases, a compromise would have to be created that respects the viewpoints of the entire team.

Disseminating Knowledge and Documenting Progress

The full inclusion of community partners in AR projects does not end with the implementation of the research or with the analysis of results. Rather, AR explicitly requires writing with engaged partners. The written material generated from these collaborative activities can come in three forms: reports written for the local group only, scholarly works written for the research community most closely aligned with the community partners, and scholarly works for the research facilitator's research community.

Reports generated for the local group should have a written component, both to serve as a formal record of the project and to ensure the specificity of language and reflection by all participants. However, they may also be accompanied by presentations or even dramatic plays and other performances. For example, in a project in Southern California, we recently created a video report to show to busy members of a local school board who were unable to spend more than a few minutes discussing any particular project or issue at their meetings.

These reports can serve multiple purposes in an AR project. First, and most importantly, the activity of creating a report itself makes space for an explicit time during which the entire research team comes together and reflects on the actions they have taken. By doing so in writing or another presentation medium, team members must carefully articulate their responses and the results of this reflection to one another and potentially to the outside world. Second, these reports often serve to update local sponsors and gatekeepers (e.g., a local school board or hospital administration) on the project's progress, the research outcomes, and the results of the action in terms these stakeholders use and find important. Third, community partners are often accountable to outside organizations, such as funding organizations. Reports written in lay terms for a local audience can often be appropriated by the community partners in their communication activities with these external bodies. For example, when conducting a research project focused on a technology-oriented curriculum for adolescent girls during summer camp, we worked with a local branch of a major national girls organization. Our community partners used our local report, which included a video, to present the results of the camp to both the national board of their organization and local donors. We have since used the created video in fund-raising and recruiting efforts at our university, an unexpected benefit of the creation of this video report.

Scholarly writing and academic papers may be more familiar to researchers than the kinds of local reports described above. However, scholarly works—particularly in computer science, information science, and HCI—are almost certainly more familiar to the research facilitators than to the community partners in an AR project. Many community partners may never have published in an academic venue, and if they have, the publications may not have been in the disciplinary style or the venues of the professional researchers. Thus, researchers must attend carefully to ensuring empowerment to influence the scholarly production for all members of the team. Specifically, teams should work to ensure that alternate ways of contributing to the scholarly publication are available for those not as comfortable with this format of reporting. Additionally, scholarly publications should be submitted to places that can help the careers of both the research facilitators and the community partners when possible. For example, top-tier conference publications are often the primary goal for HCI researchers (e.g., CHI, CSCW). However, the computer science tradition of low acceptance rates and high prestige being afforded to these venues does not translate well into many other disciplines. Thus, decisions about publication venues should be made collaboratively when possible. Furthermore, an appropriate amount of time must be built into the writing plan to ensure for translation of language among different communities and inclusion of everyone's input. When writing a paper for a computing venue, for example, the HCI research facilitators may need to take extra time to explain the venue, the types of papers, and the questions of interest in this community to the research partners. Often, it would be simpler and more expedient to skip these steps, writing the reports within the academic portion of the research team and then asking for feedback on a nearly completed draft from the community research partners. However, to meet the goals of a truly collaborative AR experience, the entire team should be included from the beginning to the end when possible, and a variety of reporting mechanisms should be employed.

Moments of Celebration

Getting results of an AR project published is certainly a cause for celebration, and presenting the results whether at a local event or a national conference provides the team with a defined moment of celebration. However, in AR projects, because there is no clearly defined ending point in most cases, it is also important to recognize intermediate moments of celebration throughout the project.

In one research project in a school, teachers were asked to perform a set of activities with two children in each of their classes. They worked with me as well as with my community research partner in the schools to complete the tasks in their classrooms over the course of approximately 3–5 weeks per child. Once everything for an individual child was completed, we brought the teacher a gift bag filled with things she needed for her classroom: hand sanitizer, snacks, school supplies, and so on. Each time they would receive their gifts, the teachers called over their aides and sometimes the students as well to publicly open the gift bags and join us in thanking the entire classroom and celebrating the completion of one portion of the research effort. These kinds of public displays of celebration can be much more effective in building good will and compensating research participants for involvement than simple cash payments.

In this same project, we also celebrated at bigger milestones. Once all four teachers involved had completed their work with two children each, the first phase of our project was completed. We took advantage of the ending of the school year for these teachers, which coincided with their completion of this first phase, to throw a party at my house. At this party, all of the researchers on the academic side who had helped in building the system we were testing, transcribing interviews, and performing other activities were present along with the teachers, school administrators, aides, and other team members from the schools. Many of the people present were meeting each other for the first time, with only a few of us having been heavily involved across sites. The team should be emphasized during these moments of celebration, not the individuals. So, at this party, I gave everyone a present from both the academic research team and the community research team and thanked them collectively and very briefly.

AR requires sustained long-term engagement with research sites and community partners. Although the exact time frame depends largely on the composition of the team and the work involved, this kind of relationship and effort can be exhausting to all involved. I have had sites begin to fall apart within months of engagement whereas others are still wonderful collaborative relationships years later. There are even examples in the AR literature, outside of anything involving technology, that last decades. As milestones are met and the iterative cycle of the project continues, it can be easy to lose some of the drive and focus that began the project in the first place. Thus, using moments of celebration to demark beginnings of new phases and endings of old ones can serve to build more collaborative teams as well as to reinvigorate everyone involved.

Leaving the Site

Although AR projects tend not to begin with defined ending points in mind, invariably the realities of the academic process and the constraints of the community partners' lives necessitate that the research facilitators leave the site. This time can be a painful one for all involved. In the worst cases, the team wishes to keep working together, but a change at the field site has eliminated the project, the academic team has lost funding, or some other problem has befallen the project. However, more frequently, members of the team have begun to recognize that the time for the collaborative part of the project may be ending. Faculty members and community partners move jobs, students complete their degrees, and researchers may be interested in exploring different research questions that may or may not build on the work done at the current site. Furthermore, successful AR projects result in sustainable, dependable change, which can be less interesting from a research standpoint than the implementation of novel solutions and the study of changes immediately following. Thus, action researchers must be prepared to leave the sites and the people with whom they have become intimately intertwined, and their community research collaborators must also be prepared for this inevitability.

In AR, the goal is ultimately to create sustainable change. That is to say, once the research facilitators leave, the community partners should be able to maintain the positive changes that have been made. In many AR projects, the changes made are based in the creation of new policies or the changing of the old, the development of new programs, restructuring of staff roles, and so on. In HCI, however, AR project changes often include the deployment of novel technologies. In these cases, one of the challenges to leaving the AR site is ensuring that the technologies can be left behind and when left behind can be maintained. It is neither in the best interests of the academic researchers—who have limited resources and other commitments—nor the community partners—who should be made to feel in power and in control of their own projects, particularly after the facilitators leave—for the technological infrastructure to continue to be maintained by the academic partners.

In some AR projects with which I have been engaged, such as those at hospitals and medical centers, IT support is already available within the organization. These individuals can be trained to maintain the equipment brought into the research site by the AR project. Of course, the request for this additional work on the part of the IT organization should be managed carefully as all relationships and new activities should be in an AR project. If possible, it may even be useful to include them on the project team from the beginning.

As an example, in one project I developed a simple mobile phone application to help medical clinicians implement a change in the way they monitored compliance with a home-based intervention. The IT support person who worked with this medical team primarily focused on more traditional enterprise issues (e.g., ensuring that the videoconferencing system was working before meetings, troubleshooting e-mail, and setting up servers). As part of the project, however, I had meetings with him to discuss his ideas for the phone application. He requested some changes be

made to the back end of the system so that he could more easily manage it, which I was able to make. After a few weeks of use, he no longer needed my help and had begun managing all parts of the system along with a nurse he had pulled into the process simply because she liked technology and wanted to learn more. Although my involvement in the project lasted for many months after this transition, when I did eventually leave the team, they had already become self-sustaining.

In other organizations, however, this solution may not be viable. For example, in many schools, although IT support personnel are available, they are usually already spread too thin and cannot easily take on additional responsibilities. In such a situation, a member of the original community partner research team or a research participant at the field site might take on the role of champion for the project and volunteer to maintain the technologies moving forward. This situation can offer a solution to the issue of sustainable change but should be managed carefully, because the change in role for this individual can effect a change in status or power dynamics within the team. Such was the case in a school-based effort in which two teachers wanted to continue to use the system we had developed after we left the research site. One had been enthusiastic from the beginning and, though she had no formal training, had a particular aptitude for handling computing systems. The other had originally been wary of the system and only engaged with it positively towards the end of my involvement in the site. Ultimately, we chose to leave the equipment in the hands of the teacher who had always demonstrated enthusiasm and aptitude. This decision strained their relationship, which was already tenuous for other reasons, and my relationship with the teacher who had not been chosen. Had we had the resources available, it would have been a better choice to provide them both with equipment and instruction for long-term maintenance.

Some Examples of AR in HCI Research

An early example of AR in HCI-related research—in this case, information systems—can be found in Ned Kock's AR study of communication media and group work (Kock, 1998). In this work, the researchers partnered with university-based process improvement groups to understand how groups might begin to adopt a new communication medium voluntarily, even as they perceived it as highly limited. Just as action researchers have come to use more and more ICT in their solutions, so too have ICT researchers begun to seriously engage AR in their work. The results of this confluence of activities are present in a variety of venues, including venues that focus on these approaches, such as the *Journal of Community Informatics* and *Action Research* (from Sage Journals). A recent special issue of Community Informatics on "Research in Action" includes multiple examples of high-quality AR projects that use ICT in their solutions or have access to and education about AR as their focus (Allen & Foth, 2011). For example, Carroll and colleagues describe their efforts to develop a community network over several years, including their interest in and approaches to enhancing "end-user participation in the design

of information technology" (Carroll et al., 2011). Other venues, that are not AR specific, have also found engagement with AR to be useful and meaningful. For example, in 2004, MIS Quarterly devoted a special issue to AR. In this work, a variety of approaches were demonstrated, all resulting in high-quality research findings. For example, Kohli and Kettinger described a project focused on working with hospital management and physicians to add digital resources and tools to help manage complex hospital information (Kohli & Kettinger, 2004).

Closing Thoughts and My Own AR Story

My career as an academic and as a researcher has been heavily influenced by being a child of academics. My parents, both educational psychologists by training, took different career paths, but both consistently tackled projects that were personally meaningful, democratically constructed, and in all the best ways quite practical. My father has written extensively on this topic (see, e.g., Blackman, Hayes, Reeves & Paisley, 2002; Hayes, Paisley, Phelps, Pearson & Salter, 1997; Paisley, Bailey, Hayes, McMahon & Grimmett, 2010; Paisley, Hayes & Bailey, 1999), all publications I neglected to read until after my formal introduction to action research outside my family influence.

I first formally learned about AR in May of 2005 at the Public Responsibility in Medicine and Research (PRIM&R) conference, a meeting meant to orient new members and provide continuing education for staffs and senior members of Institutional Review Boards (IRB). At the time, I had just joined the IRB at Georgia Tech as a student member, and I was in the middle of my dissertation work, which involved participatory research with educators of children with autism. I attended the AR session not because I was interested in AR per se but rather because the advertised talks seemed like they included research that I found intellectually fascinating and relevant to society's problems: needle exchange programs and transformation of school curricula for inner-city students. After introducing the research projects, the group began a somewhat heated discussion about how to ensure that the federal definition of research—which notably requires an attempt at "generalizable knowledge"—included AR. The intense discussion about the ethics of AR, how to write and talk about local solutions in a scholarly manner, and challenges for AR participants were quite useful in framing my dissertation work and sparked my interest in exploring the various ways an AR approach can be helpful in research projects.

My work at the time would best be described as a mix of technical and practical-deliberative AR, using McKernan's framework. As a student hoping to defend a successful dissertation, I was inclined to present the work as measurable and knowable, and the process of preparing a thesis proposal meant that much of the problem had been defined in advance. Schools are delicate places though, and working in them requires a lot of compromise, collaboration, and democratically determined research questions and approaches. Through my years of working with—and in

some cases for—the teachers who were participating in my studies, I developed a variety of new interests and problem statements, defined in the situation by the stakeholders and community partners who cared most. Substantial time in the field also taught me what many researchers know instinctively: that reality is messy, constructed, and complex. AR handles this kind of mess quite well by acknowledging it and incorporating the knowledge to be gleaned from the mess into the scholarship of the research program. Furthermore, an approach within AR that allows for the idea that some results may be predictive while others cannot be enables researchers to produce knowledge about particular situations while informing others about what solutions might work in other situations, a result that is both scholarly and practical at once. This kind of transferability does not speak well to an idea of generalizability at the level of the individual AR project. However, as theories are produced and lessons learned from these efforts, the corpus of work in the field—alongside other research projects, whether they take an AR approach or not—enables a kind of generalized thinking in the form of new theoretical models or common frameworks for the design of solutions.

This chapter serves as an introduction to action research within the framework of "ways of knowing" for human–computer interaction researchers. My hope is that it will be useful to those people, who like me are focused on attempting to create real solutions to real problems and want to include those most affected by those problems in the design of the solutions. The approaches outlined here echo those in the chapters on design (Research Through Design), ethnography (Reading and Interpreting Ethnography), and field deployments (Field Deployments: Knowing from Using in Context). Furthermore, action researchers can take advantage—in cooperation with their community partners—of a variety of the specific methods outlined in chapters here and in other research method publications. The pragmatic nature of AR does not require adherence to specific methods but is instead a way of knowing that reflects an agreement of sorts that we are all in this together—researchers, designers, community partners, and participants—and together we can develop solutions to sticky problems and through these solutions learn about our world.

Additional Reading for Gaining Expertise in Action Research and Related Areas

Core Action Research Readings

- Chevalier, J.M. and Buckles, D.J. 2013. *Participatory Action Research: Theory and Methods.* Routledge.
- Greenwood, D.J. and Levin, M. 2007. *Introduction to Action Research 2e.* Sage Publications.
- Herr, K.G. and Anderson, G.L. 2005. *The Action Research Dissertation: A Guide for Students and Faculty.* Sage Publications.

- McIntyre, A. 2007. *Participatory Action Research.* Sage Publications.
- McNiff, J. and Whitehead, J. 2006. *All you need to know about Action Research.* Sage Publications.
- Reason, P. and Bradbury-Huang, H. (Eds.) 2007. *Handbook of Action Research: Participative Inquiry and Practice.* Sage Publications.
- Stringer, E.T. 2007. *Action Research*. Sage Publications.

Reflective, Collaborative, and Critical Inquiry

- Alvesson, M. and Sköldberg, K. 2000. *Reflexive methodology: new vistas for qualitative research*. Sage Publications.
- Beebe, J. 2001. *Rapid appraisal process: an introduction*. Alta Mira Press.
- Malhotra Bentz, V. and Shapiro, J.J. 1998. *Mindful inquiry in social research.* Sage Publications.
- Bray, J., Lee, J., Smith, L., and Yorks, L. 2000. *Collaborative inquiry in practice: action, reflection, and making meaning.* Sage Publications.
- Carr, W. and Kemmis, S. 1986. *Becoming critical: education knowledge and action research*. The Falmer Press.
- Van de Ven, A.W. 2007. *Engaged Scholarship: A Guide for Organizational and Social Research*. Oxford University Press.

Collaborative Design and Information Systems Research

- Checkland, P. 1981. *Systems thinking, systems practice*. Wiley.
- Checkland, P. and Holwell, S. 1997. *Information, systems, and information systems: making sense of the field.* Wiley.
- Schuler, D. and Namioka, A. (Eds.) 1993. *Participatory Design: Principles and Practices*. CRC/Lawrence Erlbaum Associates.
- Moore Trauth, E. (Ed.) *Qualitative research in IS: issues and trends*. Idea Group Publishing.

Exercises

1. Compare and contrast action research with ethnography?
2. What are the negative aspects of having the participants be co-researchers in this endeavor?
3. What are the dangers when the project ends? How can those dangers be mitigated?

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