Action Path:
A Location-based Tool for Civic Reflection and Engagement

by

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**Abstract**

Many platforms for civic engagement, whether online or offline, require that citizens leave the places they normally inhabit physically or virtually and commit to a separate space and set of processes. Examples include town hall meetings, occurring during specific times and in specific places, and online forums, where deliberation occurs within profile-based websites for which you need to sign up and to regularly return. This thesis responds to the design challenge and research question: How do you address barriers to minimum effective engagement in community projects, and ensure that all citizens can contribute their input on how to improve their local communities?

In order to raise levels of participation in community projects and expand the range of voices heard in governmental decision-making, there is a need for a civic engagement platform that is lightweight and compelling enough to enjoy continued use. To this end, I have developed a theoretical basis for effective citizenship through monitorial actions aided by mobile computing, finding connections between various theories of citizenship and learning to fill a gap in the literature and in terms of civic technology design. My argument and design goals for such a system are reinforced by findings from a needs assessment of Boston-area municipalities that confirmed a desire to use new technologies to elicit feedback on community issues from a more diverse demographic than those who currently attend public meetings.

Based my analysis of the literature and the distilled design goals, I built and completed early-stage user testing of a prototype smartphone app-based civic engagement platform called Action Path, which uses location-awareness in the form of geo-fences along with push notifications to prompt users to respond to one-item surveys dotting their urban landscape. Interviews with users suggest Action Path might help people see their communities as filled with opportunities for civic intervention, and might increase their sense of efficacy. Additionally, workshops about geo-fence design and curricular design with potential stakeholders showed how Action Path might be effectively deployed through civic technologists and in schools.
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Chapter 1: Introduction

Robert Putnam’s 2000 book *Bowling Alone* charted the decline in associational life and with American civil society during the second half of the twentieth century, sparking a new and fervent wave of public concern over the health of American democracy. Since then, research has shown the same indicators of civic engagement, like attending meetings and involvement in community projects, have continued to decline through the early part of the twenty-first century (Levine 2013). Furthermore, gaps in civic engagement appear to be widening between by races, classes, and generations. Whites generally have the highest levels of civic engagement, followed by Blacks, and then Asian Americans and Latinos are much lower (Bey 2008). Using college graduation as a very rough approximation of class, Levine finds that organizational membership and community project involved are much more prevalent among college graduates (2013). The Millennial generation votes at lower rates than older citizens, and also trail in their willingness to contact public officials (Pew Research Center 2010).

However, the news is not all grim. When looking at non-institutional political engagement or “participatory politics,” Millennials participate at rates up to 41% (Cohen and Kahne 2012). And combining both types of political practice, Black youth are most likely to have participated in some way (75%), followed by Whites (67%), Asian Americans (60%), and Latinos (56%) (ibid.). Participatory politics, defined by its emphasis on two-way communication and peer-based information and action networks, are often facilitated by digital technologies like social networks and mobile computing (Cohen and Kahne 2012). With high rates of technology use among youth (95%+), these are becoming primary media through which civic engagement is practiced (ibid.). Research has shown that Blacks and Latinos are as likely as the rest of the population to own a mobile phone, and more likely to use it for a wider range of activities (Zickuhr and Smith 2012).

Participatory politics and other technology-powered forms of engagement are still new and understudied, but there is a hope that they can help reverse the trends in civic involvement, especially for future generations. Henry Jenkins has argued that online communities might be the twenty-first century bowling leagues, connecting youth and “creating a starting point for other civic activities” (2009). And mobile computing may provide the best opportunity to engage traditionally disengaged minority populations.

Barriers to participation may include social class, the community values of where you grew up, your personal resources—money, time, knowledge, and skills, and your learned your ability
to convert what resources and experiences you have into civic action (Verba, Schlozman, and Brady 1995). These manifest in low attendance rates at local, institutional forms of engagement at town hall meetings. Although the busiest people also tend to be the most engaged (Hyman and Levine 2008), lower class individuals working multiple jobs and young parents taking care of children may lack the time to attend in-person gatherings. Latinos and other minorities whose first language may not be English will stay away if they feel they cannot fully participate in deliberations. And undocumented families may avoid any contact with authorities for fear of deportation. Additionally, youth across classes and ethnicities can feel marginalized at public events if their attempts to learn are perceived as naïveté or their voices are disregarded because they do not yet vote or own property.

1.1 DESIGN CHALLENGE

1.1.1 Research Question

The challenge and research question at the heart of this thesis is: How do you address barriers to “minimum effective” engagement in community projects, ensuring that all citizens can contribute their input on how to improve their local communities? To design the socio-technical system that addresses this challenge, I must create a technology that is accessible to the target user group as well as a set of social processes appropriate to the system’s core stakeholders. Like the civic engagement indicators, my focus is on local community projects, and I am coining “minimum effective engagement” to further focus this work on the ability of a user/citizen to have their preference, question, or comment heard by someone with the power to effect change in their community using that information. The intention is to avoid defining the system as facilitating participatory politics versus institutional politics, in order to emphasize the user’s agency and efficacy.

1.1.2 Design Goals and Evaluation

Through a combination of theoretical argument and empirical needs assessment, I identified four design goals for the system that would become Action Path in order to address the core research question and ensure it was appropriate to a real context, in this case Boston-area municipalities, and pushed civic technology design toward empowering citizens in a more profound way than simply providing an expedient service. The design goals stated as user outcomes followed by criteria for success are:
• Users will be more aware of their community’s needs (Users can articulate new knowledge of both the geographic and political landscape of their cities, e.g. “I learned that the city is planning to create new bike lanes near where I work.”)

• Users will see their city in less abstract terms (Users perceive areas of the city as connected to certain issues and current events rather than as landmarks or where certain people live, e.g. “The city is considering creating a new bike line on the stretch of road I walk between the bus stop and where I work, and I see cyclists everyday struggle to find room on the road among the bus and all the cars.”)

• Civic learning and engagement will be more integrated in users’ everyday lives (Users participate in community projects more regularly, e.g. “Everyday I answer a poll or read an update about an issue I care about because the actions and information are connected to where I live and work.”)

• Barriers to civic engagement will be lower for users, especially users from traditionally marginalized groups (Users participate in community projects that do not directly affect them, e.g. “I submitted a question about the benefits of a new property tax discount for senior citizens, even though I am only 25 because someone bothered to ask me in my native language.”)

While all of these design goals influenced the prototype app described in this thesis, only two were evaluated during the early-stage user trial discussed in Chapter 4. This is because the design goals about integration of civic and everyday experiences and lowered barriers to civic engagement require longitudinal evaluation of frequency and quality of participation during a major deployment of the system, which was beyond the scope of this thesis. However, the other two design goals could be evaluated during the in-depth interviews of user trial participants. I asked participants to describe what they learned from using the system and what they thought about when they arrived at their first points of action. The core research question was also evaluated during the user trial by asking participants how using the system made them feel and probing for reflections on their sense of efficacy.

1.2 WHAT IS ACTION PATH?

Action Path is a mobile app that uses geo-fences and push notifications to send one-question surveys to users when they walk past parts of their community that are currently involved in a decision making process about how they might be improved. Geo-fences are physical areas that can be defined in software to trigger some kind of activity on a mobile device
when the user enters or exits them. I call the surveys that users respond to after they receive a notification, “geo-fenced surveys.” These are designed in collaboration with sponsoring organizations like municipal governments, community organizations, small businesses, or others in order to elicit feedback on an issue to inform the decision making process. Users can follow the issues they contribute to, receiving updates and further opportunities to participate.

1.3 DESIGN METHODOLOGY

1.3.1 Methodological Development

To design Action Path, I committed to a methodology that is collaborative and reflexive. As a project of the MIT Center for Civic Media, the Action Path system described in this thesis aspires toward “co-design” as its design methodology. Affiliated faculty member Sasha Costanza-Chock, who teaches an MIT course on co-design,1 has developed a process for collaborative design, where students connect early on with community members and organizations to explore challenges around a particular theme, defining a target challenged through establishing a shared language, and then working together to design the solution with cycles of prototype design by the students and presentation and revision by the community members. The process produces both a technology that is appropriate to the needs and resources of the community and a set of social processes around the technology that ensure it can be effective and sustainable when incorporated with existing organizations, institutions, and behaviors.

The focus of co-design on the sociological side of sociotechnical problems ensures that stakeholders are integral to the design process. At the MIT Media Lab, projects tend to focus on the technical side of the problems, using the minimal amount of user-centered design methodologies to ensure that a system fits an existing need. Both approaches can have significant positive impact. Many important civic technologies have been built atop platforms employing no elements of co-design. The late founder of Apple Steve Jobs was famous for saying, “A lot of times, people don’t know what they want until you show it to them” (Reinhardt 1998). Apple’s focus on minimalistic design has produced a series of user experiences that are lightweight and powerful, making complex tasks straightforward for millions of users.

However, I am arguing with the design methodology in this thesis that civic technologies need to reflect the values of their users in more explicit ways. Civic technologies should embody an ethic of collaborative design and represent the product of the same deliberative processes they intend to support. Charlie DeTar’s MIT Media Lab dissertation represents an ideal example

1 See http://codesign.mit.edu.
through the design methodology he used to develop the InterTwinkles platform for small-group consensus-oriented decision-making (2013). Leo Burd’s MIT Media Lab dissertation developing technologies for local youth participation and civic engagement also involves collaborative design methodologies as well as action research (2007).

Action Research, first developed in the 1940s (Lewin 1946), is an experimental approach to social scientific research based on the premise that producing social change is inherently a questioning of the functions of society itself and serves as an empirical method of inquiry. Paulo Freire pushed Action Research into new collaborative terrain with “Participatory Action Research,” which like participatory politics emphasizes creating new power through collective action (1982).

More recently, Emerson College’s Engagement Lab has developed a methodology they call “Design Action Research with Government” or DARG that describes how they have been designing civic technologies in collaboration with the City of Boston (d-Philippi, Gordon, Osgood, and Jacob 2013). The methodology begins with goal setting in collaboration with a partner and then establishing research questions. This is followed by the technical design process that constantly reflects on the goals and research questions and involves ongoing meetings with partners and iteration both before and after initial implementation to ensure that the final product is appropriate and effective.

### 1.3.2 Key Components of Design Methodology and Chapter Overview

Action Path has been designed using a methodology similar to DARG and drawing inspiration from the co-design efforts at the MIT Center for Civic Media and approaches taken by those other MIT Media Lab researchers building civic technologies. Like DeTar and Burd’s dissertations, this project is combination of firsthand experience with problems around civic activity and the development of a concept for a technology or set of technologies that might address that problem. I developed a theoretical argument for Action Path, found in Chapter 2, by connecting a wide range of ideas about citizenship and expertise to barriers to broad engagement discussed at the beginning of this chapter. Over the course of several months, I attended numerous public and private meetings with Boston-area municipal officials and staff, active residents, and local organizations as ethnographic background research to inform the design of the system and work toward a shared set of design goals with community stakeholders, which produced the needs assessment in Chapter 3.

I designed and developed the prototype technology in parallel with the needs assessment process, producing a user experience based on the design goals and research questions, which I
evaluated against the design goals in a small user trial using a pre-trial survey, a 24 hour trial period collecting location and activity data, and a post-trial interview, all detailed in Chapter 4. Looking toward Action Path’s real-world deployment, beyond the scope of this thesis, I designed and ran two workshops with potential stakeholders to start developing the social processes around the tool, described in Chapter 5. The first explores how to help other technologists understand the best uses for geo-fences. The second workshop focuses on developing ways Action Path can be used for formal civic education.

This design methodology produced a set of design goals out conversations with real stakeholders that drove the current development of the social and technical components of the Action Path system, and inform its future directions and priorities as well as the assessment of the work to date’s value, as discussed in Chapter 6.

1.4 INTENDED IMPACT

Bent Flyvbjerg has been developing the concept “phronetic social science” for the past decade, taking the best from action research and mixed method case studies to develop social theories tailored to real world application (2001). He uses the Greek concept of phronesis from Aristotle’s *Nichomachean Ethics*, which is the knowledge of the value of something. Achieving phronetic social science requires understanding of context but also the projection of the usefulness of research and what impact might look like to all the stakeholders, including the researcher. Flyvbjerg argues that it is the responsibility of the contemporary social scientist to ensure they keep impact in mind when doing their research, such that when papers are published and accounts are given, they inform an audience of politicians, designers, urban planners, activists, and others about what is effective and what is not, and in what ways the efficacy was a function of context. The goal is providing your research subjects and audience the ability to iterate and do better subsequently. I believe this should be the academic goal of good civic technology, emerging from a solid design practices that are deeply informed by users and stakeholders, and I hope in the end this project can serve as an example of phronetic social science in its impact.
Chapter 2: Theory and Motivation

2.1 THE GOOD, THE MONITORIAL, AND THE EFFECTIVE

In his book *The Good Citizen*, Michael Schudson talks about different eras in America that idealized different types of citizenship (1998). What it meant to be a good citizen at the dawn of American democracy differs substantially from whatever it means now. In particular, Schudson talks about how the ideal of the “informed citizen” dominated the discourse of the 20th century and was deeply intertwined with the role journalism played in society.

We are now at a point where journalism’s role is in flux and where the range of information necessary to be a fully realized participant in democracy, according to these ideals, is overwhelming. There is too much to know and too much to have an opinion on. Schudson argues that we need a new framework, a new kind of citizenship for contemporary times.

In lieu of the informed citizen, Schudson proposes the “monitorial citizen.” In Schudson’s words, “Monitorial citizens scan (rather than read) the informational environment in a way so that they may be alerted on a very wide variety of issues for a very wide variety of ends and may be mobilized around those issues in a large variety of ways;” they “tend to be defensive rather than proactive”, engaging “in environmental surveillance more than information-gathering” (1998, 310–311). Monitorial citizens integrate their civic duties into their daily lives: watching over the kids on their block, keeping abreast of important consumer recalls, noting how weather affects the cost of groceries or their ability to check in on family members’ safety. Schudson notes that monitorial citizenship can be practiced every year and all year-round, rather than a season-long practice of citizenship like the voting and political volunteerism in the US that emerges every four years in the fall of a Presidential Election year.

In aggregate, monitorial activities might give the public the “omniscience” is needs to fully participate as citizens the way Walter Lippmann demands in his trenchant analyses American democracy and civil society (1922; 1925). Lippmann argues that the increasing complexity of society during the early twentieth century meant that an elite class of experts would have to lead the “bewildered herd” of the public in order for democracy to function, since the average citizen lacked the knowledge necessary to act effectively on a systemic-level. Lippmann’s criterion of

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2 An earlier version of this chapter was presented at the *Citizenship Studies* conference at Wayne State University on March 21, 2014 (Graeff 2014a).
sufficient knowledge to act is a prudent one, but it assumes that this must be manifest in separate individuals. Alternatively, we could “crowdsource” expertise for democracy (Howe 2008; Shirky 2008); that is, say the civic efforts and knowledge of a distributed network of citizens could be aggregated into an all-knowledgeable and effective citizenry.

Reflecting on Lippmann, Schudson agrees with his diagnosis that democracy cannot rely on citizens for expertise they do not possess, but hopes a balance can be achieved in splitting responsibility between expert governance and public participation. Polls and surveys that inform expert decision-makers rather than make decisions is one way to do this democratically. By expanding Schudson’s vision of monitorial citizenship using technology that provides information on demand for context as citizens come across an issue and thereby makes issues facing the community less abstract could close the expertise gap over time. Over time, citizens will accrue expertise relevant to their immediate communities.

However, the success of crowdsourcing depends on wide and diverse participation. As mentioned in Chapter 1, inequalities across race, gender, language, income, and skill present barriers to participation and gaining the necessary information to understand an issue and act, which prevents polls from being truly representative. Kovach and Rosenstiel call the differentiated expressions of localized knowledge and engagement by citizens, the “interlocking public.” They look at it from a journalist’s perspective, saying that for any published story there will be three types of reader: “the involved public” who has a personal stake and strong understanding of the issue, “the interested public” who has no direct stake but can connect to the issue through firsthand experience, and “the uninterested public” who will not engage unless it is made relevant to them later by others (2007, 24). A citizen is a member of each public with regard to some issue. Journalists have to write for all three types, and perhaps it is possible to design civic engagement to engage all three in different ways for effective action.

Ethan Zuckerman has been exploring the reality of citizens of differentiated knowledge and skill to find a definition for an “effective citizen” in lieu of a “good citizen” (2013; 2014). In his essays, Zuckerman talks about Schudson in relation to Lawrence Lessig and his book Code: And Other Laws of Cyberspace (2006). Lessig sees four ways by which complex systems are regulated: laws, norms, markets, and code (or other similar architectures). Similar to Schudson, Zuckerman accepts Lippmann’s challenge that the need for omniscient and omnicompetent citizens undermines democracy. Zuckerman’s suggestion is that rather than deferring to individual experts for all civic action, we just need to find the citizens who are knowledgeable or skilled in a particular area such as one of the four means of regulation Lessig outlines. As a team, they might in aggregate have all the necessary omnicompetence to act.
Effective change campaigns are typically multifaceted in a way in which they can work on multiple fronts: pushing for legislative change, while also working on public opinion to change norms, and introducing boycotts or buycotts to change the flow of money through political networks. Zuckerman’s analysis of aggregate effective citizenship focuses predominantly on what he calls “thick” forms of civic engagement, wherein citizens devise custom strategies to address social and political issues (2014). But not all citizens will be engaged at that level, some will still be marginally engaged or unwilling to seek out the information necessary to connect with an issue. Must we all be such “justice-oriented” and “participatory” citizens, to use Joel Westheimer and Joe Kahne’s terms (2004) for citizens that seek systemic change and lead their peers, or “actualizing” citizens to use Lance Bennett’s term (2008) for a citizen that questions the government and seeks change through networked action rather than simply voting? What is left for the “personally responsible” and “dutiful” citizens, or even the ”uninterested” and disengaged? Can they also be effective? This is where the model of technology-powered monitorial citizenship can make a difference.

2.2 PAIN POINTS OF PARTICIPATION

For the average citizen overwhelmed by the demands of daily life, tempted to disengage from civic life to cope with quotidian challenges, how could their barriers to engagement be lowered to encourage regular participation? At the local level, in-person participation takes the form of the town hall meeting, usually scheduled for a couple of hours in the early evening on a weeknight by some part of the municipal government in order to hear views from the community on a decision that must be made to advance the city in some way. These meetings pull residents out of their routine spaces, and in some cases force them to work synchronously, which represents a high barrier to entry for many would-be active citizens. The merits of synchronous, non-routine forms of engagement are many, of course. Community-building requires that people stop and pay attention to each other, finding and perhaps literally inhabiting common ground. However, this limits engagement to those who enjoy the freedom to make such commitments. In particular, it can exclude the voices of those who struggle with English, as most materials and discussions will not be translated, of youth may be viewed contemptuously for the reasons mentioned Chapter 1, and of middle-aged citizens who may lack flexibility in their schedules due to career-building activities and child rearing.

But local civic engagement is not simply inconvenient in these cases; the format itself may not be optimal for making issues relevant to citizens in terms of immediacy, personal connection, and the context of the actual urban landscape. These pain points emerge when we examine other
platforms for civic engagement, whether online or offline, which require that citizens leave the places they normally inhabit physically or virtually and commit to a separate space and set of processes. In addition to town hall meetings, occurring during specific times and in specific places, there also virtual town halls like MindMixer, where deliberation occurs within profile-based websites that require users to sign up for and regularly return to in order to participate. Electronic petition services like Change.org are easy to use and share but are only one-time, issue-specific interactions; they only really live on a standalone web page divorced from the community affected by issue.

“Report a Pothole” 3-1-1 service apps like Citizens Connect have taken advantage of the strengths of mobile devices to serve as location-aware data collection tools, enabling users to snap photos of street-level problems, geo-tag reports, and upload them to a central service to help increase the speed and efficiency of government service provision. These types of approaches are sometimes called Government 2.0 or “government as a platform,” as Tim O’Reilly puts it (2010), emphasizing the service provider role played by governments that might be made more efficient through private innovation and mounds of crowdsourced data. We could critique these apps in terms of smartphone ownership patterns and how that skews the data toward richer neighborhoods (Crawford 2013), but I think the more important problem with this approach is how poorly it handles deeper, structural issues in society. There is a need to facilitate collective action that enables citizens to engage more deeply and work on more complex issues, rather than just pooling individual pothole reports.

2.3 LIGHTWEIGHT CIVICS

In order to maximize rates of participation, forms of engagement need to be lightweight, integrating well with everyday life and posing few barriers to access. However, these goals conflict with the needs for effective impact and inherent incentivization. Games have been used effectively to lower barriers and incentivize engagement through play, especially by Emerson College’s Engagement Lab, which develops production quality civic games like Community PlanIt for youth and adults around processes like urban planning (Gordon and Baldwin-Philippi 2014). They use the inefficiencies of games that make games challenging and thus fun to play.

The Engagement Lab’s Street Cred app, which is built on top of Citizens Connect, attempts to incentivize collective action through by adding a point system that creates artificial relevance and incentives for participation unrelated to the tasks at hand. This is sometimes called “gamification.” I think their experiment is an important one for testing the use of this method for promoting such activity among youth. But I also believe civic engagement platforms can be
lightweight and compelling enough to enjoy continued use without resorting to simple point systems. A paradigm for lightweight and compelling civic engagement I believe should aspire to function like the creation and sharing of political memes, like those seen during the 2012 U.S. presidential campaign, where play, identity expression, and community building are inherent components and rewards of the activity (Graeff 2013).

Though critics of such lightweight or “thin” forms of civics—Zuckerman’s term for actions that are mostly about showing up (2014)—have derided activities like changing a profile photo, signing a petition, or sharing memes as “slacktivism” or “clicktivism” (Morozov 2009; White 2012), they can serve as gateways to thicker forms of engagement as well as important contributions in and of themselves (Kahne, Lee, and Feezell 2013), especially when seen as fitting in among different roles of citizens necessary for successful functioning of society, as Westheimer and Kahne’s categories imply. The key is enabling dutiful but lightweight citizen contributions that travel with users and encourage a moment of deeper reflection during action, developing of knowledge, skills, and experience that might enable and build confidence for thicker engagement—civic engagement as civic learning.

2.4 THEORIES OF CITIZENSHIP AND CIVIC ACTION AT WORK

Walking, especially along a non-routine path, can and should be a public service in itself and would represent a strong integration of civic learning and engagement integrating with everyday life. In her seminal book The Death and Life of Great American Cities, Jane Jacobs argued, “Lowly, unpurposeful and random as they may appear, sidewalk contacts are the small change from which a city’s wealth of public life may grow” (1961, 72). These connections with others that accrue over time build the knowledge and social capital necessary for a well functioning community. But it’s not just about meeting with others but also observing your surroundings.

One of Jacobs’ key contributions to urban sociology and planning is the need for what she calls “eyes on the street” (ibid., 35). She asserts that safe streets are a function of their levels of vitality, which is their ability to attract people and their eyes, whether it’s from windows above the street or benches along it or at the thresholds of businesses, where proprietors and customers interact with the street. This is different from surveillance. Rather, it’s the study of public life carried out in the open, where the monitored can see the monitor and countersurveil. Jacobs’ insights in her book are based on the observations she made on her home street in Greenwich Village and similar streets in cities across the United States. Moreover, it powered her arguments as a civic activist.
The Jane Jacobs Walk organization enshrines these principles of Jane Jacobs’ work as a community organizer and scholar, using the art of observation in urban spaces “to see how cities actually work through experience, to go out and see what makes a neighborhood thrive, or to see what makes a neighborhood struggle,” to quote their “About” page. This approach honors the unique qualities of different cities—communities need homegrown solutions born of local experience, and represents a quintessential case of monitorial citizenship in Schudson’s definition.

One of the barriers to tighter integration of civic and quotidian life is American civil society does not value public work in the same way it does private work. Citizens are expected to contribute to their communities as volunteers during their leisure time. This outlook almost guarantees a gap in civic engagement between economic classes. A long-term goal for a well designed civic technology platform may be a social component that connects Jane Jacobs-style urban exploration with Harry Boyte’s theory of “public work” (2011). Boyte has been advocating for decades to undo the separation between civic engagement and public service from normal life and work. He argues that the relegation of civic work to the voluntary sector has led to the professionalization of politics, where duties once designed for the average citizen are filled by paid professionals like lawyers and lobbyists who are now the only ones capable of effecting change at the highest levels.

Boyte’s proposal that we observe the paid work we do that already has public service implications—one example being the work of builders who might be engaged in the effort to create a public building or space that betters the community rather than something functional in only a strict sense. In line with the ideal of public work, prompts for civic engagement should arise naturally from what citizens already do, which is how connecting civic engagement to place as you walk by represents an experiment for creating a low-friction opportunity to reflect on a civic issue and take action.

The civic learning that takes place through integrating civics with everyday life produces an important outcome that Markus Prior calls “by-product learning,” which is when people “learn politically relevant facts as a by-product of nonpolitical routines” (2007, 4). Prior derives this concept from his study of the “efficiency” of citizens’ media environments, finding that less efficient systems like old-school broadcast television actually produce high levels of by-product learning because exposure to political information was high when so few channels and programming options existed. By-product learning through the nonpolitical routine of walking through the city is the key theoretical link the design goal of users achieving a greater awareness of their community’s. The city as a routine experience is generally perceived of as nonpolitical,
and yet it is of course teeming with political realities that could be exposed through an appropriately designed socio-technical system.

2.5 THEORIES OF LEARNING MADE CIVIC

Because this project is looking at civic learning as something that happens through doing, there is a need to examine theories of learning that suggest a socio-technical system can produce valuable learning experiences and encourage reflection so that observations become expertise. Donald Schönb’s concept of the “reflective practitioner” (1983), wherein professionals develop expertise through quick moments of thinking on one’s feet or “reflecting-in-action” in Schönb’s terms provides a theory for how this may be achieved. By having a body of these actions saved up, as well as the means for returning to issues through follow-up, it is possible to gain what Schönb calls a “repertoire” consisting of notes, images, and contributions that enable “reflecting-ON-action,” whereby practitioners can develop new theories and questions about their work, which feed back into their future practice. This is the development of expertise. And while it seems obvious—as in how all learning proceeds—there is a deeper concept behind Schönb’s insights, which is its critique of “technical rationality” (all problem-solving is a linear and logical process).

Schönb’s work on reflective practice and critique of technical rationality is motivated by his earlier work, published in Beyond the Stable State (1971), wherein he diagnoses mid-twentieth century society as one in which we can no longer rely on the stable state and its institutions in the same way we once could because they are in a continuous process of transformation. He argues that contemporary companies, social movements, and governments need to be “learning systems.” He says that learning happens at the periphery in response to technological progress, and then should ideally be absorbed into the core over time, through what he calls “dynamic conservatism,” which allows institutions to learn and transform while continuing to maintain some semblance of stability by continuing to perform the essential functions that keep them from collapse.

I want to unlock Donald Schönb’s concept of “government as learning system” from its Lippmann-esque paternalistic, top-down approach by re-emphasizing Schönb’s own arguments about learning happening at the periphery. The periphery isn’t just young, savvy bureaucrats. They are also private citizens who can participate in this process as reflective actors and contribute to policy designs at the core, so it is not just the government learning, but citizens learning to be citizens. I hypothesize that reflection on civic issues within the context of where
they affect the community will allow users of good civic technology to gain expertise and thereby become more effective citizens.

The thinker who pushes these ideas further is Ivan Illich. Similar to Schön, Illich is aiming for the learning society, but where they differ is over the role and location of expertise. In his book *Tools of Conviviality* (1973), Illich takes a Marxist view in that the control of the means of production in industrial institutions reduce people to mere consumers, deprived of the essential freedom to have a say in how things are made and what can be done with them. His greatest fear is a pure technocracy.

His antidote is the pursuit of tools and social processes of “conviviality,” which he defines as the “autonomous and creative intercourse among persons, and the intercourse of persons with their environment” (Illich 1973, 11). These tools and processes would ensure individual freedom through personal interdependence by being in the public interest and guaranteed so by being controlled by the public, in other words, by political processes.

Ideas like these make Illich an intellectual hero of the “maker” movement and constructionist educators, who focus on giving learners good things to make so that they might learn through making (Papert n.d.). In many ways, the internet—in its purest form—is the ultimate tool of conviviality. And the promise of the internet and associated digital media has been one of a return to the Agora of Ancient Athens, where direct democracy can be practiced with equal distribution of responsibility and at least the potential for expertise.

Of course, there are realities to contend with around access and ability in both cases. Few residents of Athens were allowed to be voting citizens, and those skilled in rhetoric had more power than those less skilled (Martin 2000). The contemporary versions of this are the digital divide and the “participation gap” (Jenkins 2006), rendering those without access to tools or without the ability to participate fully in the creation of effective digital media disempowered. Research by Eszter Hargittai and Aaron Shaw has shown that internet use, “Web-use skills,” and autonomous access to online social networks “help explain online political information practices, civic engagement, petition signing, and political engagement activities” and follow patterns of differentiation across the so-called digital natives of the Millennial generation (2013).

It’s possible there will always be a periphery disempowered through some means. Smartphone ownership trends in the developed world suggest that at the very least access to that technology may not be a barrier (Smith 2013), but execution is still critical to succeeding with conviviality.
2.6 TECHNOLOGY-POWERED MONITORIAL CITIZENSHIP AND ITS CRITICS

The power and potential of both active and passive forms of monitorial citizenship have been demonstrated by projects like Citizens Connect and the related 3-1-1 apps like SeeClickFix and FixMyStreet, which crowdsource demands for government service provision and offer follow-up, Ushahidi, which uses SMS to centralize eyewitness reports during crises, OpenStreetMap, which has been used in places such as the Kibera neighborhood of Nairobi to crowdsource a digital geographic record where institutions failed, and SafeCast, which developed an inexpensive Geiger counter after the Tsunami and Fukushima disaster and mapped radiation levels across Japan with truck drivers willing to put them out their windows as they drive their routes. However, the hardest thing to design is not the technologies themselves but the social processes that surround them—this is why Illich believes we must invert our institutions first, establishing a norm that connects individual efforts to official outcomes. Not all of the aforementioned projects translate well to new, unintended contexts. People are at the heart of these projects. It’s important that we design in collaboration with the real stakeholders, and that we negotiate and establish our values and expectations upfront.

In his latest book, Peter Levine argues technology-enabled crowdsourcing is an inadequate strategy for civic renewal (2013). He takes issue with the pure vision of crowdsourcing that emphasizes entirely bypassing traditional organizations in favor of decentralized, self-organized volunteer networks. Levine feels that the successful examples of crowdsourced civic action rely on preexisting shared values and goals, which require institutionalization through hard work and investment in organizing—processes beyond the capabilities of loosely affiliated networks. He instead favors networking existing civic organizations into coalitions that might be able to coordinate efforts to expand the number of citizens involved in deliberative democratic practice.

In their attempt to find models of “internet + politics” that truly transform political practice, Fung, Gilman, and Shkabatar identify “social monitoring” as a new model of participation that in reality reinforces “traditional mechanisms of institutional monitoring” (2013, 44). They looked at three deployments of the Ushahidi platform: the original post-election violence reports in 2008, the Uchaguzi project monitoring the 2010 Kenya constitutional referendum, and the Kiirti complaint processing platform designed for Indian NGOs. In each case, the authors argued crowdsourced items mostly helped “professional users” like NGOs, private companies, or journalists access user-generated information, meaning average citizens were still relying on intermediary experts to engage with governmental power. As a result, Fung, Gilman, and Shkabatar believe that what they call social monitoring and I would call monitorial citizenship
will be increasingly used, but precisely because reifies existing power structures rather than being transformative for citizens.

Both of these critiques are helpful for thinking about how civic technologies for learning and engagement ought to be designed differently, so that they take advantage of the lowered costs of participation of a crowdsourcing system without disempowering citizens by simply exploiting their time for a few data points used by expert governors. This might be done in two ways. First, designing for reflective practice can develop the expertise of the users, moving them out of the “uninterested public” category on more and more issues, and empowering them to engage more deeply in the future. Second, efforts need to be made to work with members of the community that are underrepresented within powerful institutions so that they are part of the design process of setting agenda of what gets surveyed through the tool. This is similar to Levine’s proposal in that collaborative design functions like the deliberative democratic practice necessary to establish starting point of shared values and goals.

2.7 LOGIC MODEL

Through the development of this theoretical argument and my own reflective practice, I produced a logic model (seen in Figure 2-1) for the tool that would become Action Path. The design goals are the outputs of the strategy of using Action Path as civic intervention to address the pain points discussed earlier and to strive toward long-term goals of wider and more effective engagement as well as public work-style citizenship being practiced in communities where the tool is deployed. I don’t expect these all to be met, even in subsequent trials and research, but they represent a model to strive toward for well-designed civic technology.
Figure 2-1: Logic Model for Action Path as civic intervention.
Chapter 3: Needs Assessment with Municipalities

From November 2013 through May 2014, I attended a series of public and private meetings and events with municipal employees, elected officials, community advisory committee appointees, and community activists from three Boston, Massachusetts area municipalities: Somerville, Arlington, Cambridge, and Chelsea. These meetings served as opportunities for needs assessment, informing the design of Action Path’s software and potential deployments. The result of the needs assessment was a strong confirmation of the need for a tool like Action Path expressed by local urban planners and officials as well as community representatives.

3.1 MEETINGS LOG

The following log of meetings and events (Table 3-1) represents approximately 40 hours of engagement with community leaders, pitching Action Path, and learning about the needs and workings of municipalities in order to inform this thesis and related civic technology work. The majority of the meetings happened in Somerville, where I am a resident and member of the Somerville Community Corporation (SCC). My intention was to find an ideal contemporary planning project with which to test Action Path. The names of attendees have been omitted unless they are a public official.
Table 3-1: Log of all Meetings with Boston-area Municipal Personnel and Community Leaders

<table>
<thead>
<tr>
<th>Date (d/m/y)</th>
<th>Municipality</th>
<th>Meeting Name and/or Attendees</th>
<th>Purpose of Attending</th>
</tr>
</thead>
<tbody>
<tr>
<td>07/11/2013</td>
<td>Somerville</td>
<td>SCC New Members Open House</td>
<td>Learn about SCC’s programs</td>
</tr>
<tr>
<td>13/11/2013</td>
<td>Somerville</td>
<td>Davis Square by Design event run by Somerville by Design staff</td>
<td>Observe what an open house planning event looks like, note current projects, and introduce myself to Somerville city planners</td>
</tr>
<tr>
<td>29/01/2014</td>
<td>Somerville</td>
<td>SCC Annual Meeting and Dinner</td>
<td>Network with other SCC members, connect with my alderman Katjana Ballantyne</td>
</tr>
<tr>
<td>12/02/2014</td>
<td>Somerville</td>
<td>Mtg w/ Somerville by Design staff at City Hall</td>
<td>Pitch Action Path to the Somerville city planners</td>
</tr>
<tr>
<td>21/02/2014</td>
<td>Somerville</td>
<td>NEA Grant Mtg in East Somerville</td>
<td>Learn about East Somerville initiatives tied to NEA grant and offer Action Path as a tool</td>
</tr>
<tr>
<td>04/03/2014</td>
<td>Somerville</td>
<td>SCC Somerville Housing Forum</td>
<td>Observe and engage in participatory planning process around affordable housing</td>
</tr>
<tr>
<td>05/03/2014</td>
<td>Somerville</td>
<td>Union Square Redevelopment Meeting</td>
<td>Observe the Union Square Community Advisory Committee in action vetting bids for the master planning contract</td>
</tr>
<tr>
<td>06/03/2014</td>
<td>Somerville</td>
<td>Green Spaces, Community Places open house meeting in East Somerville</td>
<td>Learn about green spaces planning initiatives in East Somerville and reconnect with Somerville by Design staff</td>
</tr>
<tr>
<td>12/03/2014</td>
<td>Somerville</td>
<td>Mtg w/ an economic development specialist at City Hall</td>
<td>Pitch Action Path for use in the Union Square planning process</td>
</tr>
<tr>
<td>21/03/2014</td>
<td>Somerville</td>
<td>Mtg w/ my alderman Katjana Ballantyne</td>
<td>Discuss using Action Path in Ward 7 for current planning questions</td>
</tr>
<tr>
<td>03/04/2014</td>
<td>Chelsea/Revere</td>
<td>Phone call w/ director of community engagement from The Neighborhood Developers</td>
<td>Discuss Action Path and current projects in Chelsea/Revere, where the tool might help</td>
</tr>
<tr>
<td>14/04/2014</td>
<td>Cambridge</td>
<td>Mtg w/ City Councilor Nadeem Mazen and coUrbanize co-founder</td>
<td>Discuss bringing more youth into Cambridge city planning process through civic technology</td>
</tr>
<tr>
<td>06/05/2014</td>
<td>Arlington</td>
<td>Mtg w/ Arlington supervisor who heard about Action Path through a Civic Media colleague</td>
<td>Pitch Action Path and brainstorm potential to deploy in Arlington</td>
</tr>
<tr>
<td>13/05/2014</td>
<td>Somerville</td>
<td>Teele Square Community Meeting</td>
<td>Learn about planning process in my neighborhood; network with business owners, introduced by my alderman Katjana Ballantyne</td>
</tr>
<tr>
<td>20/05/2014</td>
<td>Arlington</td>
<td>Mtg w/ Town Manager, supervisor, and other city staff</td>
<td>Pitch Action Path and learn about Arlington’s current projects and governance structure</td>
</tr>
<tr>
<td>21/05/2014</td>
<td>Somerville</td>
<td>West Somerville Resistat Meeting</td>
<td>Network with and learn about what the City of Somerville’s data team does</td>
</tr>
</tbody>
</table>
3.2 SYNTHESIS OF MUNICIPALITY ENGAGEMENTS

The key insight gleaned through these many meetings and associated literature produced by municipalities was the nature of city planning projects. Understanding where citizens can have meaningful input into the process is critical to Action Path being effective in its goals. Fortunately, the planning processes I had window into were all highly participatory. Multiple and creative opportunities for citizen involvement were designed into planning. The Somerville by Design team epitomized this through their use of open houses and design charrettes that gave participants hands-on opportunities to think about the future of their public spaces. These meetings are still typically scheduled in the early evening on weeknights. Publicity is problem as the city cannot pay for extensive advertising but does send notices out to the channels they control and will post fliers in schools and even send them home with students. At meetings, activists on staff at local community organizations and local small business owners directly affected by the planning were usually in attendance and represented key voices.

Both Somerville and Arlington are going through master planning processes, the former is hiring a private developer to lead the planning process for redeveloping a large area and the latter is trying to create a vision for the city that will include development goals and steer planning processes far into the future. Master planning is a process involves many more decisions that must work in harmony because they affect a large geographic area and have many stakeholders. There is need for not just wider and more diverse participation in those processes but a way to inform citizens of all aspects and issues at hand. Inevitably meetings are derailed by questions that catch participants up to speed—I observed this in the smallest meetings I attended, but the problem is magnified amidst complex master planning processes. Long reports are written by municipal staff and posted online, but there can be no expectation that a meeting attendee has read all that content. A technology that provides information and context as-needed and allows people to participate in city planning rounds without attending all the meetings is greatly needed.

3.2.1 Somerville, MA

Three quarters of my meetings were in and about Somerville. My strongest connections are there, reinforced by my residency. The Somerville by Design team, whom I met for the first time at their Davis Square by Design open house event in November 2013, have continually expressed strong interest in Action Path and helped brainstorm ideas for deployment as well as invite me to many additional meetings so that I could pitch my project and find a good fit among the many planning efforts underway.
The key use case for Action Path came out of the Davis Square by Design open house, and was reinforced when I went to the Green Spaces, Community Places open house. As seen in Figure 3-1, the city planners would present poster boards with proposed projects around the area. Usually these would involve photographs of what it currently looks like and artist or architectural renderings of proposed changes. Planners would stand next to the boards and explain what attendees were looking at and then do quick polls about preferred options or ask people to explain why they liked or disliked something.

![Figure 3-1: City Planning Proposals on Display at the November 13, 2013 Davis Square by Design event.](image)

Planning in Somerville is proudly guided by the SomerVision comprehensive plan document covering 2010–2030. The document was developed through a highly open and participatory values and goals development process with the public between 2009 and 2012. I was handed a bound copy of SomerVision to keep during my first private meeting with the Somerville by Design team. The other major force in Somerville planning is the Green Line
Extension, a promised public transportation expansion from Lechmere up to Winter Hill, with multiple stops along the way, each of which will need new stations and significant redevelopment to accommodate the trains and the people that will be concentrated around the stations.

The first two new stations will be at Union Square and Washington Street in East Somerville. Because of the complexity of the Union Square redevelopment and history of engagement among its residences, the City decided to go through a master planning process. They put together a community advisory committee to oversee the early phase of the bidding process and help with community input in the process. I initially wanted to push for a deployment of Action Path in Union Square as part of the master planning process after several meetings was convinced that it was not a good time in the process. Once a master planner is chosen then the planning process begins to concretize into something that residents can give feedback on, since the bids are simply presentations of past work and evidence of creative design aptitude.

The other place I was looking to deploy was East Somerville. I was invited to participate in a meeting of community leaders who had received a grant from the National Endowment of the Arts for community revitalization around the Broadway Avenue / Main Streets area. At the February 21 meeting in East Somerville, I learned about Chuckie Harris Park and the open question about how to visually connect the newly redeveloped park with Broadway.

Chuckie Harris Park, completed in 2013, is a playground built on top of a once vacant lot. The park features a rain wall that can be used as a movie screen and several community garden plots. The City of Somerville wants to ensure that residents know about the park, as it is about a block removed from the main road and partially hidden by the Senior Center on the corner. This was the first example of an ideal use case for the tool I wanted to build. So I designed a geo-fenced survey with possible options, and used it to demonstrate Action Path’s potential to MIT Media Lab sponsors and potential partners. The poster I created is in Figure 3-2. I had hoped the Chuckie Harris Park geo-fenced survey would be the first question deployed in Somerville, but the NEA (National Endowment for the Arts) grant’s process was not ready to begin its community planning phase. This was a recurring issue in my discussions with each municipality; many were on community planning timelines that spanned years rather than weeks or even months. So aligning a deployment with a concrete need and opportunity was difficult. There is a broader insight here also about technological innovation outpacing planning projects, many of which require years of preparation before they start and may involve special grant applications wherein they budget for new technologies that may be obsolete by the time they are used.
At a different meeting in East Somerville, I had a long discussion with one of the Somerville city staff about procurement. They estimated they sometimes spend more than 50% of their time on procurement and related compliance paperwork. They do have some limited discretionary funds for prototype projects, which could support a launch event for Action Path. But money can be difficult to come by and exists on its own timeline, complicated by grant cycles and approval processes.

With Alderman for Ward 7 Katjana Ballantyne, I have been discussing economic development and planning in Teele Square, Somerville. There is interest in connecting the local business owners to residents, especially young adults, to work on keeping Teele Square vibrant. There is a desire to connect youth into the participatory process with the municipality. However, there is a language barrier to putting the technology in place in Somerville. All of the SCC meetings I have attended are interpreted across four languages in real-time: English, Spanish, Portuguese, and Haitian Creole. A successful deployment in Somerville will need to accommodate these different languages.
3.2.2 Arlington, MA

While I have only had one formal meeting with Arlington town staff, the engagement has been rich and they are excited about deploying Action Path in their municipality. Arlington is proud of its diversity. New families are particularly attracted to East Arlington on the border with Cambridge, but the town is struggling to connect with them when it comes to representation in municipal planning. This is a younger and more diverse demographic, which is both physically as well as socio-economically disconnected from the rest of Arlington.

Like Somerville, Arlington has its own long-term planning vision document called Vision 2020, which was created in 1990 through a facilitated brainstorm. The town is currently going through a phase of master planning. The summer will be consumed by processing the new insights produced during the town meeting. They also hired a consultant to facilitate a public “visual preference survey” on June 10, 2014, in order to provide a baseline for design discussions in the later phases. The Arlington representatives I spoke with identified four neighborhoods as strong candidates for trying to use an app like Action Path to elicit broader public input on planning processes: 1) Cambridge Gateway, 2) the area around Jimmy’s Steer House, 3) Poet’s Corner, and 4) Gold’s Gym / Lowell Street.

We are looking toward the next phase of the master planning as a good deployment opportunity, which will begin at the end of September 2014. This coincides with “Arlington Town Day,” an annual municipality-wide festival on September 13. The town staff and I saw Town Day as a possible launch date for the Action Path deployment. All of the Vision 2020 committees sponsor booths there and hand out information: I could hand out QR codes for downloads and lead residents on Action Path walking tours.

3.2.3 Chelsea, MA and Revere, MA

My conversation with a staff member at the community development cooperation The Neighborhood Developers opened up my eyes to the possibility of working in Chelsea or Revere. Part of their work is doing community engagement, attempting to build “social capital” by connecting residents around civic engagement. Voting levels are low in the cities and most decisions are made without much residential input.

They estimate that up to two thirds of the residents they interact with are smartphone users. They also work multiple jobs with little time for sleep, let alone civic engagement. Social media and text messages might be a key way of mobilizing this community.
Both cities are in the middle of working on three-year plans and are open to community feedback on the plans. Internationalizing any systems we might build around Action Path would be a serious undertaking in Chelsea/Revere. In addition to a majority minority Spanish-speaking population, they have large Khmer and Arabic-speaking communities. TND sponsors GSL and ESL classes, which might be a good starting point to explore deployment.

### 3.2.4 Cambridge, MA

City Councilor Nadeem Mazen was elected in 2013 on a platform of increasing participation among youth and organizing the Arabic community in North Cambridge. During a meeting in April 2014, Mazen expressed interest in using a tool like Action Path for the latter effort, as well as two potential crowdsourcing projects: 1) helping to identify good future bike parking spots and 2) suggesting locations for new public art.

### 3.3 Stakeholders Identified

Through the municipal meetings and early design discussions with MIT Media Lab researchers who have worked on similar projects, a number of stakeholders for Action Path emerged. The core stakeholder are the active and potentially active citizens who represent the users of the app. City planners and officials looking to get input on community issues are another set of stakeholders. Community organizations, which may also want to sponsor surveys through the app, represent a similar stakeholder group. Additionally, community organizations represent important recruitment points for users since their membership comprises more active citizens.

Within the city governments and community organizations are technical personnel who might be in charge of managing an Action Path deployment, especially if its independently run by them without a partner organization or developer like myself. They will also help design the geofences with photography or other elements to load in the app, uploading these resources to a remote server. Additionally, Action Path may be used in wider civic education efforts put on through the city, community organizations, or schools and thus students and educators represent another stakeholder group to consider, as additional social processes around the system may need to be designed to fit goals of a deployment with particular learning objectives.
Chapter 4: Action Path System and Evaluation

4.1 TECHNICAL DESIGN

Action Path is a native Android mobile application utilizing the Google Play services client library. The goal of the app’s design is to be lightweight as possible while it tries to notify the user of opportunities to practice monitory citizenship by responding to geo-fenced surveys designed to connect the user to the community and elicit authentic feedback.

4.1.1 User Experience

Action Path users start the app on their Android device, which brings up a startup screen. The deployed version of Action Path will load geo-fence definitions automatically at regular intervals; the test version requires that the user press a button to refresh them. The app then runs in the background checking the user’s location periodically. As illustrated in Figure 4-1, while a user walks around, if their smartphone’s GPS coordinates, as read by Google Play services, discover they intersect with an active geo-fence definition (latitude, longitude, and radius in meters), a push notification is sent to the phone using the Big Text style notification. The notification will stay in the user’s notification drawer until dismissed or otherwise acted upon.
The user is invited to “Take a Survey” a.k.a. “Take Action” by following the notification to a pre-designed survey pertaining to the local area and a locally-relevant issue, following the model of city planning open house as described in Chapter 3. Pressing the “Take Action” button opens up the Action Path app to a survey page showing one question and a multiple choice set of options. The response options can be purely text or can use images as buttons. Selecting one of the options by tapping its button takes the user to a “Thank You” page. The page tells users they are automatically subscribed to follow updates on the issue they just completed a survey about. The user can “Dismiss” the app or “Unfollow” this issue and then close the app by tapping the corresponding button. If the user “unfollows” that action is logged by the app before it returns to the background causing the app to go away. The user interface can be seen through the survey user experience flow in Figure 4-2.
4.1.2 System Architecture

Action Path’s system architecture is a purposefully simple standalone Android app. It loads a list of active geo-fences from a Google Spreadsheet on a remote server, implemented in order to make it easy to update by nontechnical partners sponsoring and managing geo-fenced surveys. The geo-fence ids from the Google Spreadsheet are matched against assets embedded in the app, which are then loaded in system preferences waiting for an intent on the background service to match it to a location from Google Play Services using an extended version of Android’s native Geofence class. The user cycles through the “Activity” classes throughout the UX, and all of their actions are logged on the smartphone’s local storage for testing and debugging purposes.
4.2 USER TRIAL

On June 19–20, 2014, 6 MIT Media Lab affiliates tested Action Path during a 24-hour period. They each took a pre-trial survey, installed the app on their own phone or a loaner Android smartphone, carried that phone with them home and then back to the Lab the next day, where I downloaded the log data from their phones and recorded a 15-minute post-trial interview with them. Instructions, surveys, and interviews were all administered to participants individually in the MIT Media Lab’s third floor atrium.

4.2.1 Participants

Recruitment

Participants were recruited through an open call on the main MIT Media Lab and MIT Center for Civic Media mailing lists. The text of the invitational email is in Appendix A. Participants were not screened for any particular characteristics other than their ability to use the app overnight and come in the next day for the post-trial interview. Donuts were provided as compensation on the second day.

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3 MIT’s Committee on the Use of Humans as Experimental Subjects approved the user trial’s research plan, consent forms, and protocols.
Sample Characteristics

Six participants completed all parts of the user trial. Nine potential participants completed the pre-trial survey (see Appendix C for survey questions); another two potential participants expressed interest and intention to participate but did not show up. Table 4-1 includes the tabulated responses from the six participants. In general, the participants are well educated, savvy with a smartphone, and fairly knowledgeable about their cities of residence, but don’t feel they are especially involved (6–7 on a Likert scale⁴) in making their cities better. Four participants were from Cambridge, MA, where MIT is located, whilst two other participants had longer commutes home to Somerville and Waltham, which would require public transportation or a long bicycle ride. While not a statistically significant number of testers, their demographic variance represents a reasonably good first opportunity to hear feedback from potential Action Path users who might experience the local built environments, and/or use their smartphones, differently.

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⁴ A Likert scale is a commonly used psychometric scale allowing survey takers to agree or disagree with a given statement according to how strongly they feel about it. In the pre-trial survey, participants could respond from 1 (strongly disagree) to 7 (strongly agree) with a neutral response in the middle (4).
Table 4-1: Summary of Responses to the User Trial Pre-trial Survey

<table>
<thead>
<tr>
<th>Age</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>34.5</td>
</tr>
<tr>
<td>Median</td>
<td>36</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Gender</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>2</td>
</tr>
<tr>
<td>Male</td>
<td>4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Highest Completed Education</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Bachelor's</td>
<td>2</td>
</tr>
<tr>
<td>Master's</td>
<td>4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>First Language</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>English</td>
<td>4</td>
</tr>
<tr>
<td>Spanish</td>
<td>1</td>
</tr>
<tr>
<td>Bengali</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Has ever used a smartphone?</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>6</td>
</tr>
<tr>
<td>No</td>
<td>0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Owns their own Android smartphone?</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>4</td>
</tr>
<tr>
<td>No</td>
<td>2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Self-assessed skill with a smartphone (1–7)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>6.25</td>
</tr>
<tr>
<td>Median</td>
<td>6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Self-assessed knowledge of their city (1–7)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>5</td>
</tr>
<tr>
<td>Median</td>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Self-assessed level of involvement in making city better (1–7)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>3.5</td>
</tr>
<tr>
<td>Median</td>
<td>4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>City of Residence</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Cambridge, MA</td>
<td>4</td>
</tr>
<tr>
<td>Somerville, MA</td>
<td>1</td>
</tr>
<tr>
<td>Waltham, MA</td>
<td>1</td>
</tr>
</tbody>
</table>

4.2.2 User Trial Parameters

Participants were given a “Directions” handout (Appendix B) and consent form. After taking the pre-trial survey and filling out a consent form, I installed Action Path onto each participant’s phone by either downloading an Android application package (APK) file to their phone or installing as a direct build via USB cable from my laptop to their smartphone using the Eclipse IDE. I confirmed that the geo-fences loaded properly and then handed the participants their phones, at which point the “Media Lab” geo-fence would have already triggered a notification with a survey for them to respond to.
Active Geo-fences for Trial

Five geo-fenced surveys were designed for the user trial, as seen Table 4-2. Three geo-fenced surveys were placed around MIT’s campus (MIT Media Lab, MIT East Campus Gateway, and Mass Ave Food Trucks). The MIT East Campus Gateway survey was taken directly from the recent planning discussion between the MIT Corporation and the City of Cambridge. Another geo-fenced survey was placed near Central Square, Cambridge (Vail Court), which was based on Denise Cheng’s “Postmarked” project (2013). And another was located in East Somerville (Chuckie Harris Park), which was based on the same issue raised by the Somerville by Design team mentioned in Chapter 3.

Unfortunately, in the Geo-fence Definitions for the user trial, Chuckie Harris Park was given the GPS coordinates for the light post nearest to the Western exterior doors of MIT Building E25’s atrium, which had been used for earlier testing of the app. In other words, the test app suggested that Chuckie Harris Park was about two miles south of its actual location in a place likely to be triggered by many of the MIT Media Lab-based user trial participants. While the data generated by engagement with this geo-fence are irrelevant to the design goals related to connecting issues to physical places, I chose to include them in the quantitative and qualitative part of the assessment because it was the only geo-fenced survey that used image-based responses and the error created an opportunity to look at how users response to a geo-fence that they can’t locate around them.

The questions and available responses for the geo-fenced surveys are in Table 4-2, their GPS coordinates and geo-fence radii listed in Table 4-3, and their geo-locations mapped using the Google Maps Engine in Figure 4-4. The radii for geo-fence were set at distances that would ensure they would fully encapsulate the location and nearest intersection in the case of the MIT campus-based surveys (70 meters), and at least two blocks in either direction in the case of the off-campus locations (90 meters).
Table 4-2: Geo-fenced Surveys for User Trial

<table>
<thead>
<tr>
<th>Survey ID</th>
<th>Question</th>
<th>Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chuckie Harris Park</td>
<td>What’s the best option for connecting the new Chuckie Harris Park to Broadway?</td>
<td>A. Street paint at intersection</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B. Gate over Cross St</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C. Grass corridor by Senior Ctr</td>
</tr>
<tr>
<td>MIT Media Lab</td>
<td>What addition to the 3rd Floor Cafe would you most like to see?</td>
<td>A. Popcorn Machine</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B. Pizza Oven</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C. Kegerator</td>
</tr>
<tr>
<td>MIT East Campus Gateway(^5)</td>
<td>Which redevelopment option do you like most?</td>
<td>A. Renovation of E38 + New Transparent T Headhouse</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B. New Narrower Multi-use Building + New Transparent T Headhouse</td>
</tr>
<tr>
<td>Vail Court</td>
<td>What should the owners of Vail Court do with their property?</td>
<td>A. Sell it to city/developers for new apartments</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B. Sell it to city/developers for new office space</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C. Pave it over and add more paid parking spots</td>
</tr>
<tr>
<td>Mass Ave Food Trucks</td>
<td>What cuisines would you like to see added as food trucks here?</td>
<td>A. Korean BBQ</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B. Falafel</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C. Pretzels</td>
</tr>
</tbody>
</table>

\(^5\) This geo-fenced survey was meant to have an image accompanying each option like in the Chuckie Harris Park survey, however they were omitted prior to the user trial when they failed to display on the test devices.
Table 4-3: Geo-fence Latitude and Longitude Coordinates and Radii for User Trial

<table>
<thead>
<tr>
<th>Survey ID</th>
<th>Latitude</th>
<th>Longitude</th>
<th>Radius</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chuckie Harris Park</td>
<td>42.361420</td>
<td>-71.086884</td>
<td>90</td>
</tr>
<tr>
<td>MIT Media Lab</td>
<td>42.360539</td>
<td>-71.087447</td>
<td>70</td>
</tr>
<tr>
<td>MIT East Campus Gateway</td>
<td>42.362306</td>
<td>-71.086097</td>
<td>70</td>
</tr>
<tr>
<td>Vail Court</td>
<td>42.366839</td>
<td>-71.103972</td>
<td>90</td>
</tr>
<tr>
<td>Mass Ave Food Trucks</td>
<td>42.359025</td>
<td>-71.093575</td>
<td>70</td>
</tr>
</tbody>
</table>

Figure 4-4: Map of Geo-fence Survey Origins used in User Trial

Collecting Action Path Log Data

The user trial version of Action Path logged all actions by users involving the app, and stored them locally on the smartphone in a log file with date- and time-stamps, as well as current GPS coordinates of the phone upon logging (except for Dismissing the Thank You Page and Unfollowing an issue). Loggable actions included:

- Loading the Latest Geo-fences
- Entering a Geo-fence
- Exiting a Geo-fence
- Clicking on a Notification
- Submitting a Response to a Survey

The actual latitude and longitude coordinates for Chuckie Harris Park in East Somerville are latitude: 42.389235, longitude: -71.085226.
• Dismissing the Thank You page (passively following an issue)
• Unfollowing an Issue (active unfollow)

When participants came for their post-trial interview on the second day, I downloaded the log file from their smartphone via USB cable to my personal computer and deleted the app and the log file unless they requested to keep it.

**Collecting Photographs from Notification Locations**

I asked participants to take a photograph showing where they were, but not of themselves, when they received a notification. The goal was to see where participants were and what they might have been doing when they actually responded to notifications. My assumption was that they would not be responding to all of the notifications immediately and therefore not near the actual locations of the geo-fences. So, I compared the photographs’ EXIF data from the photographs to the log data to better understand user behavior, and to corroborate commute stories from the post-trial interviews.

Unfortunately, only four of the participants took photographs and emailed them to me, and only three of these actually took them at the time of notification response. Following the post-trial interview when they had reviewed my directions, the fourth went out and took photographs based on memory of where they were, which rendered the EXIF data containing the timestamps useless.

**Post-Trial Interviews**

I designed the interview protocol (see Appendix D) to elicit rich qualitative feedback about the participants’ experiences of Action Path as well as its design. I wanted to know about both the practicalities of each participant’s commute in tandem with the psychological impression of the experience. Thus, I asked a series of questions such as “What did you think about when you arrived at your first point of action?” “What did you do? Describe your process,” and “How did using Action Path make you feel?” When it came to design, I asked explicitly about what they didn’t like about the design and what changes they would suggest, including new features in order to help prioritize future software development.

All interviews were recorded digitally and subject notes were taken during the interview to highlight side comments or participants’ non-verbalized responses. The data was analyzed using thematic analysis. Each interview was transcribed and then all were coded iteratively in order to find emergent themes.
4.2.3 Findings from Log Data

The goal of this quantitative analysis to understand where and when users respond to the notifications they have received on the Action Path app. I looked at the latitude and longitude fields and the date-time stamp fields to determine the distance and time between the last notification being triggered for a geo-fenced survey and when it is actually clicked on and then responded to. For these metrics, I excluded any geo-fenced surveys that were completed while with the participant was with me. This usually means excluding a participant’s first MIT Media Lab survey.

Thanks to the onboarding process usually triggering the MIT Media Lab geo-fenced survey immediately upon installation, only the MIT Media Lab survey was triggered, clicked on, and responded to by every participant. While five participants triggered the incorrectly located Chuckie Harris Park geo-fenced survey, only three clicked on the notification and responded to it. All three who entered the geo-fence of the MIT East Campus Gateway survey responded to it. Only one managed to trigger and respond to the Mass Ave Food Trucks survey. No participants triggered the Vail Court geo-fenced survey, although one participant during their interview described a commute that would have taken them within the radius of that geo-fence. These instances of geo-fence survey engagement are tabulated in Table 4-4.

Table 4-4: Number of Participants who Triggered, Clicked on, or Responded to each Geo-fenced Survey

<table>
<thead>
<tr>
<th>Survey ID</th>
<th>Triggered (# Parts.)</th>
<th>Clicked (# Parts.)</th>
<th>Responded (# Parts.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chuckie Harris Park</td>
<td>5</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>MIT Media Lab</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>MIT East Campus Gateway</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Vail Court</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Mass Ave Food Trucks</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

In Table 4-5, I break down the same data by participant to show variance of engagement with the geo-fenced surveys across the sample. Participant F managed to enter three times as many geo-fences as the next nearest participant, but the three geo-fences are all near the MIT Media Lab, suggesting they didn’t necessarily travel far, but rather back and forth often. Participant F and Participant C had the most diverse experiences in terms of responding to three different geo-fenced surveys during the user trial. Participant A had the lowest engagement.
numbers across the board. During their interview, they admitted to not checking the loaner phone they had been given, assuming they would hear the notification.

Table 4-5: Number of Geo-fenced Surveys Triggered, Clicked on, or Responded to by each Participant

<table>
<thead>
<tr>
<th>Survey ID</th>
<th>Triggered (unique)</th>
<th>Clicked (uniq.)</th>
<th>Responded (uniq.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Part. A</td>
<td>4 (2)</td>
<td>1 (1)</td>
<td>1 (1)</td>
</tr>
<tr>
<td>Part. B</td>
<td>6 (2)</td>
<td>7 (2)</td>
<td>3 (2)</td>
</tr>
<tr>
<td>Part. C</td>
<td>5 (3)</td>
<td>5 (3)</td>
<td>5 (3)</td>
</tr>
<tr>
<td>Part. D</td>
<td>6 (3)</td>
<td>2 (2)</td>
<td>2 (2)</td>
</tr>
<tr>
<td>Part. E</td>
<td>7 (2)</td>
<td>7 (2)</td>
<td>6 (2)</td>
</tr>
<tr>
<td>Part. F</td>
<td>22 (3)</td>
<td>4 (3)</td>
<td>4 (3)</td>
</tr>
</tbody>
</table>

**Average Time to Click or Respond to a Notification**

This metric is used to determine how long it took for the participant to see a push notification and take action on it from the time it was triggered. MIT Media Lab surveys completed with me were excluded from the raw data. If the same geo-fenced survey was triggered, clicked, and responded to multiple times by a single participant, those times were averaged first before averaging with the participants’ times so as not to bias the results toward one participant’s fast or slow reaction times.

Table 4-6: Average Times to Click a Notification and Response to a Geo-fenced Survey

<table>
<thead>
<tr>
<th>Survey ID</th>
<th>Time to Click (min:s)</th>
<th>Time to Respond (min:s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chuckie Harris Park (n=3)</td>
<td>10:47.6</td>
<td>00:43.0</td>
</tr>
<tr>
<td>MIT Media Lab (n=3)</td>
<td>03:39.6</td>
<td>00:06.5</td>
</tr>
<tr>
<td>MIT East Campus Gateway (n=3)</td>
<td>01:08.4</td>
<td>00:32.1</td>
</tr>
<tr>
<td>Vail Court</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Mass Ave Food Trucks (n=1)</td>
<td>03:44.4</td>
<td>00:03.9</td>
</tr>
</tbody>
</table>

Table 4-7: Average Times to Click a Notification and Respond to a Geo-fenced Survey by Participant

<table>
<thead>
<tr>
<th>Survey ID</th>
<th>Time to Click (min:s)</th>
<th>Time to Respond (min:s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Part. A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Part. B (n=3)(2)</td>
<td>01:54.2</td>
<td>00:44.3</td>
</tr>
<tr>
<td>Part. C (n=4)</td>
<td>03:54.7</td>
<td>00:09.7</td>
</tr>
<tr>
<td>Part. D (n=1)</td>
<td>00:19.3</td>
<td>00:40.4</td>
</tr>
<tr>
<td>Part. E (n=5)</td>
<td>06:13.3</td>
<td>00:10.9</td>
</tr>
<tr>
<td>Part. F (n=3)</td>
<td>08:38.9</td>
<td>00:36.1</td>
</tr>
</tbody>
</table>
At over 10 minutes, participants were slowest to click on notifications about Chuckie Harris Park, which also required the most time to choose a response once on the survey page. This may be due to the confusing nature of the dislocated intersection or because it is a harder question, as one participant would admit later during their interview. Similarly, the MIT East Campus Gateway demands that you think carefully about which development option you should choose, and the three participants who answered that spent over 30 seconds on average. MIT Media Lab question was short and simple, as well as “whimsical,” to quote from a participant’s interview. This resulted in a very easy question to answer, only beaten out by the Mass Ave Food Trucks to be the fastest survey—but the speedy Participant C accomplished that feat on their own.

Looking at the average times by each participant to click on a notification, only the single geo-fenced survey encountered by Participant D resembles a reaction time conforming to the intended user experience of responding to surveys shortly after you are notified of their existence. The problem may have been the lack of a clear audible notification and flashing light—a missing feature raised by several participants during the interviews. However, because the key is answering the question near to a geo-fence not necessarily within a timely fashion, we look at data about distance in the next section.

**Average Distance from Geo-fence Origin to Point of Click**

This metric is used to determine how far away participants are from the origin (central latitude and longitude coordinates) of the geo-fence survey notification they are clicking on. These are not measured from the point where the notification was triggered because those are at the edge of the geo-fence’s radius and the goal is that participants will be near the survey’s actual location to offer additional context when responding to the question. A good distance should be within 70 or 90 meters, since those are the radii used for these geo-fences. I calculated the distances in Table 4-8 and Table 4-9 by entering the latitude and longitude for each data point against the relevant geo-fence origin coordinates into Adam Schneider’s great circle distance calculator on GPSVisualizer.com and then averaging them in the same fashion as the times above.

Looking at Table 4-8, it appears there is something about the location of Chuckie Harris Park and even the MIT Media Lab that results in participants missing their notifications until they are far from the geo-fence origin. However, Table 4-9 reveals how Participant F skews the data significantly by responding to notifications far from their relevant location, whereas the other participants are all within a reasonable average distance from the geo-fence survey origins they

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7 Although I initially wanted to present this information geographically, I did not map the locations of individual users over time in order to preserve their privacy.
respond to. In future user trials, this data should be collected and analyzed ahead of interviews so that specific questions can be targeted at participants like Participant F to understand why they respond to notifications so far from their location. In their interview, Participant F did mention responding to notifications while at their apartment.

Photographs taken by Participant B and Participant D show their close proximity to the MIT East Campus Gateway location when responding to the survey, confirming their low distances. Participant E’s unusually low score was thanks to his office being within one of the geo-fences. Every time he went to his office it triggered the geo-fence survey, which was a comfortable and convenient place to respond.

Table 4-8: Average Distance from Geo-fence Origin to Response Submitted for each Geo-fenced Survey

<table>
<thead>
<tr>
<th>Survey ID</th>
<th>Distance (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chuckie Harris Park (n=3)</td>
<td>624</td>
</tr>
<tr>
<td>MIT Media Lab (n=3)</td>
<td>229</td>
</tr>
<tr>
<td>MIT East Campus Gateway (n=3)</td>
<td>103</td>
</tr>
<tr>
<td>Vail Court</td>
<td>N/A</td>
</tr>
<tr>
<td>Mass Ave Food Trucks (n=2)</td>
<td>43</td>
</tr>
</tbody>
</table>

Table 4-9: Average Distance from Geo-fence Origin to Response Submitted by Participant

<table>
<thead>
<tr>
<th>Survey ID</th>
<th>Distance (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Part. A</td>
<td>N/A</td>
</tr>
<tr>
<td>Part. B (n=2)</td>
<td>83</td>
</tr>
<tr>
<td>Part. C (n=4)</td>
<td>105</td>
</tr>
<tr>
<td>Part. D (n=1)</td>
<td>35</td>
</tr>
<tr>
<td>Part. E (n=4)</td>
<td>62</td>
</tr>
<tr>
<td>Part. F (n=3)</td>
<td>769</td>
</tr>
</tbody>
</table>

4.2.4 Findings from Post-trial Interviews

Additional Questions that Proved Useful

During the course of the interviews, the conversations prompted me to ask follow-up questions that proved useful in understanding user behavior and will be incorporated in a future user trial interview protocols for Action Path. They include:

- Did you use any external resources when you were answering survey questions?
- What did you think about the option to follow the issue after submitting your response?
• Ideally, how would you receive updates about issue you followed? What if you got an update in the form of a geo-fenced push notification similar to the surveys?
• How do you treat notifications from other apps? Which do you allow, disallow, or throttle?
• Where did you think your responses were going? Did you have any expectations for how they would be used?
• Do you feel like using Action Path changed the way you looked at the city?

**User Experiences Summary**

All of the participants said the design was some combination of easy to use, “minimalist,” “seamless,” “simple,” and “unobtrusive.” Not all of the users found Action Path’s user experience fit neatly into their mobile computing habits. Three participants claimed that their normal commute involved stuffing their smartphone in their backpack and not checking it again until they got home and unpacked. They tried to keep it closer to them when they walked and check it more regularly than they would, something the non-backpack stuffers also did. However, no explicitly defined notification sound or light for the Action Path app’s notifications meant that most of the participants had to be looking at their screens to see the notification. Everyone agreed that it needed a unique notification bell to remind them to check it.

Three of the participants had trouble opening the Big Image notifications in their notification queue because they were unfamiliar with that user interface element. This led to frustration about notifications that did not appear to open and accidentally canceled notifications. I showed them how to swipe down to open up the notifications or swipe away the earlier notifications in the queue to open Action Path’s on the top. The problem suggested that normal notifications, while capable of holding less content and fewer options like multiple buttons might be necessary for widest ease of use.

The “bug” in the testing environment that keeps the notifications triggerable even after they have been responded to annoyed two participants. Their low bug tolerance may have been magnified by the fact that these were also notifications, which are inherently interruptive. It will be important to thoroughly test Action Path before major deployments as non-testers will be even less bug tolerant and could jeopardize success of any field testing.

While the same two participants had hoped “unfollowing” the geo-fenced surveys would stop the notifications, none of the participants were bothered that the following function was not working. Rather, participants were enthusiastic about the feature and felt that it gave them a greater sense of agency. One participant felt, “The wording was a little weird. ‘Dismiss’ almost
felt too…. I forget what the other option was; it was like ‘don’t get any further notifications.’ ‘Dismiss’ also felt like a pejorative or a negative option.” This should be changed in a subsequent version.

All six participants wished there were more geo-fenced surveys available. They were disappointed when there were no actions attached to locations near their homes and favorite places or in most of the neighborhoods they explored during the 24-hour test period. This indicates an interest in a higher density of actions, although it may be an artifact of it being a test run, where participants were eager to try out the app more. Among the available actions, the three participants who entered the erroneously set Chuckie Harris Park geo-fence all expressed a strong preference for its survey style that used images in the response options. In contrast, the MIT East Campus Gateway survey was considered particularly confusing by two of the participants without images accompanying the options. If the ideal geo-fenced survey uses well-designed imagery this means that sponsor organizations will need to have a designer, or someone willing to be trained to design good imagery, on the team managing their Action Path deployment.

**Feature Requests**

The number one request among participants was more information or context attached to the surveys. While participants who took the Chuckie Harris Park and MIT East Campus Gateway surveys said they learned about the places and the issues involved, meeting the design goal of greater awareness of the community’s needs, it was not enough. One participant went so far as to suggest an entire design,

“I can imagine—sorry I’m going to drift into design mode here—if there was a panel that described all of the details of a given question and then tabs, one of which was like a more in-depth description of it and another one was the previous conversation people had about it, and another one was to see where the vote was at, then before voting I could actually pan through. But maybe you don’t want to give people the results of the thing before they answer, which is common.”

Most participants simply asked for a link to more information about the issue, rather than seeking access to an ongoing conversation. Maps were also requested to help find the location of the geo-fenced survey target, a need reinforced by the distance from the targets where participants appeared to be answering their surveys according to log data. Interestingly, when asked if they
had sought information on their mobile browsers or looked up locations using map/navigational applications, none said they had, even though they were interested in learning more and informing their decisions. One participant also hoped for write-in option, in addition to the pre-formulated responses in the hope that they could “pose a question for more information or engage in some kind of conversation with the people that wrote the survey in the first place.”

I asked all of the participants how they would ideally receive updates to an issue after responding to and following one of them. Three participants wanted or expected an email, with one specifying it would be in a digest format. Another participant emphatically did not want email updates, saying,

“Email is kind of annoying now. There are lots and lots of issues that go through email right now, and it might be too much of a time sink. So it would be interesting just to have things in my Facebook feed or my Twitter feed where they just show up time-to-time and I could just scroll through them on my own time. That I think would be ideal because you are really limited by the characters you can use but you can still include a link so if I was more interested or had something to say about it, I could easily voice my opinion, and I could easily follow the issue.”

**Concerns**

I followed up my question about ideal update formats by asking specifically about whether they would like to have updates via location-based notifications, in the same fashion as the surveys. Three participants were very eager about that idea in lieu of other kinds of announcements because they found location-based notifications to be a “novelty” and “cool.” However, all participants, including those three, expressed concern about the volume of notifications that might be generated. To quote one of the three, “If it turns out that every five seconds I get one, then I would turn it off.” The backdrop for these concerns is a variety of behavioral patterns among participants for dealing with smartphone notifications. When I asked them about it, two participants said they disable most notifications by default. Another two allow them all by default. One of whom said, “There are apps that I use that are like notifications all the time, and I just clear them away, clear them away, clear them away. I don’t think I’m bothered by it for some reason. I never really play with it too much. Unless they get really incessant and then I just usually mute it.”
When I asked if they would be willing to regularly use the app if it was installed on their phone, everyone said they would, but it is difficult to read this as an unbiased response. One of the notification disablers told me, “I think I would leave it on full-time. I would probably want there to be some kind of “do not disturb” option, whether that’s like phone-wide or just this app.” Other notification-heavy apps like Field Trip have a “snooze” feature as well, which might be useful to place on the notification if the design continues to use Big Image notifications. These responses raise important questions connected to the design goals of integrating civic learning and engagement in everyday life and lowering barriers to participation about what is the best way to interrupt users, and which channels should be explored through which follow up on issues are distributed. Additional user trials capable of collecting longitudinal data will be needed once various options are added for notification frequency/limitation and for where follow-ups should be sent in order to find the most effective balance between simplicity and customizability.

One last major area of concern was about where the questions come from and how the responses would be used. Three participants expressed varying levels of concern about who the sponsors of the survey questions were. One participant was emphatic that the questions not have any commercial framing, arguing “there is a difference between feeling like you are donating your data and opinion to a commercial thing versus a civic… or something that would improve your community.” They went on to cite Google and Facebook as examples of companies that want their data “so that they can sell ads better, which doesn’t relate to my overarching goals for Waltham. Another participant wanted to verify that the question was connected to power so that it makes a difference, “I guess it was unclear what that agency was, who was behind the survey, who was behind the answer—was it simply somebody who didn’t have any agency themselves who proposed the survey? It was hard to tell how far my interacting with it would go.” This indicates an interest in transparency that will need to be designed with sponsoring organizations. Commercial developers may want to use the app for planning purposes and there will be need to ensure that users feel like they are contributing to a cause that is improving the community rather than enriching the company, which is a part of designing a good and inclusive planning process as discussed in Chapter 3.

Civic Learning Outcomes

Despite the confusion over where and what Chuckie Harris Park was, two of the three participants who triggered that notification felt very strongly that it was their favorite survey, and not only because it of its use of imagery but because it represented a challenge demanding
substantial reflection and engagement, evoking Schön’s reflective practice. One participant argued,

“The more it felt like solving a problem or genuinely answering a hard question, not something that was simply an opinion poll, but where I felt like I was bring some strategic thinking to bear, I think it was more fun to do that…. The Chuckie Harris question was probably the simultaneously most and least fun. It was the most fun because I felt like I could actually really work through a hard problem.”

The other participant commented,

“Chuckie Harris Park—I really liked that notification…. That was something I have never encountered before. It appeared to me as city design, an urban design campaign, or like participatory design that I have never seen before…. I am already using some apps that provide me information about certain architectural places or any other points of interest. That is just one-way information; there is nothing I can do. I can take a picture, I guess, but nothing more. I kind of know a little more—I guess—that you are tying actions along with the place idea. That was most effective for the Chuckie Harris Park.”

This comment validates the current in-person planning methods, whereby planners and architects present sketches to the public at open houses and garner feedback on what people do or do not like, or the creative design charrettes like those organized by the Somerville by Design team set in the locations where planning is meant to happen. Action Path might be able to extend those experiences beyond the few hours that they last and reach people who could not make it or are more comfortable thinking through those questions by themselves on their own time.

Most of the participants felt that using the app, albeit for a very short period, changed how they approached their city—moving them closer to the design goal of a less abstract experience of the city. For two participants, this was a psychological mindset like “low-level mindfulness” or “exploration,” which evoke the potential for Prior’s by-product learning, and thus achieving a greater awareness of the community’s needs. For two others, it inspired them to reflect on the places they care about and wonder, hopefully, that there was a geo-fenced survey connected to those places, which they could participate in. For example,
“I started rooting for ‘Will I get things that really matter for my surroundings?’ But I never got any of them. For example, I went to the Muddy [Charles Pub] and I was already starting to think, ‘I wonder if it is going to talk about the future plans of the Muddy?’ And then I was excited, but that never came. And then as I walked home, I wondered what stuff is happening around here…”

This raises the question of whether users should be able to add geo-fenced surveys themselves. There is a great opportunity for users to take thicker civic action by making survey creation a feature. However, it runs into the concern over whether feedback is being submitted to someone who has the power to effect change. From a technological standpoint, creating the location-based version of Change.org that allows users to place new electronic petitions throughout their community is straightforward. To ensure impact Change.org then has a large staff of professional organizers who help maximize the efficacy of submitted petitions—a complex socio-technical system with high labor costs.

As mentioned earlier, several participants felt like they had a greater sense of agency by using Action Path. For one this was specifically experienced in terms of information access: “I had access to a layer of information that I was previously unaware of.” Two subjects felt empowered by the ability to follow an issue, representing a kind of two-way responsibility. One said,

“I love the idea of following. I actually think that is really important. Because it’s like your participation matters and it feels like it matters and then you can follow up and verify that it mattered in some way. And you might have been made aware of an issue or an existing set of possibilities in a particular space. And since you have been made aware of that, you then probably would want to know what happens to that—what are the current debates on that.”

The other argued that it represented a uniquely maintainable level of responsibility, a good indicator that Action Path could lower barriers to engagement,

“It felt like not only did my voice matter but I could continue on the issue if I was interested. I thought that was the simplest, easy way to get involved in the community. It wasn’t a high commitment level, it was just whether or not I
wanted to follow an issue, and the idea of following is so well-ingrained because of Twitter—I thought it was perfect.”

A finding that reinforces the need for a civic engagement tool like Action Path that lowers barriers through convenience, but not the hope of civic learning toward thicker engagement, was the fact that no participant researched additional information about the issues or locations mentioned in the geo-fenced surveys. This was despite their curiosity being inflamed and their insistence they want more information and context from the app. One participant offered, “the cognitive load of standing in the middle of the sidewalk trying to figure out what I thought of Chuckie Harris Park and also looking up Chuckie Harris Park was a little more than I was willing to do.” This makes practical sense. However, the fact that none of them looked up information later is troublesome. This behavior should be explicitly asked about in future user trials.
Chapter 5: Exploratory Workshops with Potential Stakeholders

In parallel with the technological design of the Action Path app, I designed two workshops for potential stakeholders in order to explore the social processes involved in deploying the tool. The first explored how to help fellow technologists understand the way geo-fences work and think through the best applications for them, which allowed me to develop and test materials and approaches for conveying that material to the teams I will partner with on Action Path deployments. The second workshop was with current high school students and explored how to develop a civics class based on Action Path, which allowed me to gather ideas for civic education interventions using the tool as well as get early reactions from young adults about how they perceived the app and its civic learning potential.

5.1 DESIGNING WITH GEO-FENCES WORKSHOP

I ran this workshop at the MIT Media Lab on March 14, 2014 with the help of MIT Center for Civic Media colleague J. Nathan Matias, who also helped with documentation.

5.1.1 Workshop Motivation

For geo-fences and other location-based activity to become a basic part of civic engagement strategies and civic technology design, organizers and designers will need to become familiar with best practices for creating good geo-location services, just like they have learned to use Facebook, Twitter, web publishing, and online donations. This workshop was a first step towards developing trainings and perhaps co-design events that can make geo-location an effective tool for civic life.

5.1.2 Workshop Design and Content

The workshop lasted two hours and had three parts: the first involved a presentation and discussion with participants about what geo-fences are, when to use them, and how related design considerations, the second involved a hands-on coding exercise working with early Action Path

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8 This workshop account is adapted from an April 3, 2014 post published on the MIT Center for Civic Media’s blog (Graeff 2014b).
code as a example app, and the third involved testing the example app with live geo-fences outside.

**Participants**

I designed the workshop for MIT students with an interest in location-based app development. It was announced on mailing lists targeting Media Lab and computer science students at MIT, as well as through teaching assistants of relevant courses. Prospective participants were asked to fill out a short online survey indicating their affiliation, experience with Android development, and what kind of an Android device they possessed, if any. Out of ten respondents, five participants were invited in order to create a diverse cohort in terms of affiliation and Android development experience. Another five students enrolled in a course working on civic mobile apps were invited to participate.

**Part 1: Discussing Geo-fencing**

The workshop began with a differentiation of geo-fencing from geo-location and geo-awareness using the following definitions:

- **Geo-location**: identifying the real-world location of a user with GPS, Wi-Fi, and other sensors
- **Geo-fencing**: taking an action when a user enters or exits a geographic area
- **Geo-awareness**: customizing and localizing the user experience based on rough approximation of user location, often used in browsers

Since geo-fencing is focused on action and not all location-based mobile experiences require it, many designs can and should avoid the messiness of using geo-fencing by relying on basic geo-location services.

Good, or common, uses of geo-fencing include: location tracking of objects and users, lifehacking, games (in the form of run-arounds, check-ins), and hyper-local ads and offers. Apps that are obvious employers of geo-fences include: Foursquare (check-in reminders), ChildrenTracker (alerts for parents when kids are home or at school), and Field Trip (notifications about places to see around a community). However, there are some clever, non-obvious uses of geo-fences like Google Keep, which allows you to set location-based reminders for notes to self (lifehacking) and Pandora’s radio app, which sends hyper-local ads to you as you walk-about, most notably ads for McDonald’s.
During the workshop, we discussed more general design considerations inspired by these examples and known limitations of smartphones and their use. One key concern is accuracy. Users can set their location mode on their phone to be anywhere from high accuracy, which uses both GPS and Wi-Fi Position System, or they could have it on low accuracy (only GPS) or completely off. This affects how well an app can detect geo-fences, especially in cases where there is a small radii set around them. The user’s mode of transportation and movement speed can also affect accuracy. Phones sometimes struggle to update their location information while on a car or bike versus walking—some apps actually allow you to toggle modes. Device variability can also affect the accuracy of geo-fence detection, which is dependent on hardware details and network connectivity.

We stressed that the user experience design needs to consider the user’s tolerance levels for frequent or repetitive notifications. It is advisable to avoid notification fatigue by throttling the number of geo-fences and triggered actions. Good designs account for overlapping geo-fences and boundary areas where walking a straight line can trigger an overwhelming number of geo-fence events triggered by entrances and exits.

Geo-fences also take a toll on device performance. Location services draw a lot of battery power for frequent checks against GPS, Wi-Fi, and maps that talk to background services that use CPU resources while listening for notifications. The data download issue also brings data usage into the picture—some users might have limited accounts and systems designed to exchange a lot of data between a server and the device could cause users to overcharge their data plan. Good designs will balance local data processing with processing on a remote server, perhaps caching some data locally for upload at later times, perhaps over Wi-Fi.

Lastly, designers need to think about adoption, permissions, and privacy. Geo-fence applications are standalone apps with background services, downloaded from the Play Store. Whenever a service requires an app download rather than simply publishing a web page it loses a significant number of potential adopters. Many geo-location applications work fine with basic location data available to the browser. Users may also be scared off if permission agreements necessary to run a geo-fencing app and service are too broad. This connects back to the issue of privacy: geo-fence applications need to know your location, and many geo-fence apps collect that data in a central location. When building software in an academic setting, designers need to take seriously the risk to users. For commercial app makers, it’s also an important consumer rights issue.
Part 2: Building Geo-fencing Code

On Android, geo-fences are created using Google Play Services, a set of libraries that are compatible across many versions of Android and can be updated via the Google Play Store. Play services is used to connect Android phones with maps, Google+, game libraries, Google Drive, and more. The geo-fence libraries enable developers to create geo-fences with a specific location and radius. As the phone’s location data updates across multiple sensors, the libraries check to see if the phone is likely to have entered or exited one of those circles.

Geo-fence transitions are triggered as Android Intents. In the workshop, we showed participants how to create an Android IntentService that listened for transitions and fired new intents that triggered further actions, including a diagnostic logger and rich notifications. We also showed participants how to associated geo-fences with persistent objects that could store names, images, tasks, and other metadata about a location.

After fiddling with Eclipse and ADT, we were able to support every participant to successfully add a new geo-fence to the software, build our sample code, and deploy it on their phones.

Part 3: Testing Geo-fencing Apps

The most important part of the workshop was testing the apps, walking through the geo-fences both virtually and literally. This gave our workshop participants a chance to experience what it was like to enter and exit geo-fences. It also gave them first-hand experience at the accuracy issues faced by geo-location apps.

We started by using location spoofing, forcing our smartphones to enter geo-fences without leaving our room. When we advertised our workshop, Richard Stallman strongly urged us to include information about location spoofing and privacy. It was great advice, especially since location spoofing is a basic debugging technique. After enabling developer options on our phones and selecting “enable location spoofing,” we installed location-spoofing apps on our phones and played with pretending our phones were in a variety of locations.

We then headed outside to do some “bodystorming”-style testing of geo-fences (Schleicher, Jones & Kachur 2010)—everyone with their own device in hand. In conducting previous workshops, we have found that embodied experiences with data offer powerful learning experiences for workshop participants.

We had preloaded geo-fences in the courtyard next to the MIT Media Lab. Once outside, we placed an orange cone at each geo-fence center. Participants tried walking up to, away from,
and past the various points. Figure 5-1 shows the Google Maps zoomed-in view of the courtyard. The blue markers all represent the center of geo-fences, which we gave a five-meter radius. We used iTouchMap.com to get the GPS coordinates.

Figure 5-1: MIT Courtyard Geo-fence Positions

For the first five minutes, no one was able to trigger a geo-fence. After some fancy use of Google Maps, I realized that my phone placed me around ten meters away from my actual location. The orange dot in Figure 5-1 represents where I was able to finally get a reading on the geo-fence around the rightmost blue marker.

The GPS coordinates we had painstakingly grabbed from specific points on the zoomed-in map were all off-center by at least ten meters. This could arise from inaccuracies in the software we used to define the geo-fences, skew arising from the isometric maps view we used to identify our location, or inaccuracies in the devices themselves.

We anticipated a mishap like the orange dot; we wanted to give our workshop participants practical experience with the strengths and limitations of geo-fence systems. Although location-spoofing software is a helpful time-saver, it can give designers a false sense of confidence. When in doubt, geo-fence radii should be larger to account for possible errors in the tools being used. And ideally, geo-fence designers will test their experiences in-person with bodystorming to get the location and radius right for their applications.
5.1.3 Workshop Outputs

The workshop gave me a chance to develop materials for future workshops involving not just software developers but urban planners employed by municipalities and community activists who will be involved in the design process of geo-fences for future Action Path deployments. I have a slide deck for the presentation and discussion, as well as the aforementioned public blog post documenting this first workshop, which I can share with others. Discovering the discrepancy between the assumed location of a geo-fence based on GPS coordinates provided by the iTouchMap.com service was a key lesson from this exploratory workshop, not only for our participants but for myself as a geo-fence designer and workshop organizer. Working through this specific issue will be formally incorporated in the future workshops.

5.2 CIVIC EDUCATION WORKSHOP

I ran this workshop at the MIT Media Lab on May 21, 2014 with the help of several MIT Center for Civic Media colleagues focusing on student and educator stakeholders.

5.2.1 Workshop Motivation

As discussed in the Theory and Motivation chapter, a core goal for a civic technology like Action Path is that it be useful for not just civic engagement but civic learning. I want to work with educators and students to design learning experiences around the tool that provide a more practical, and ideally playful, approach to developing competency and confidence as a citizen. Civic education need not happen in a formal school environment, but the concentration of attention and assured presence of a teacher-mentor mean schools are important sites of intervention when it comes to civic learning. This is doubly true where a civics course is already on the school’s course catalog, and might still be taught as a dry review of government attributes and processes like the “separation of powers” and “how a bill become a law,” which does not build competence and confidence in practical ways. This workshop represents a first attempt to pose technologies created at the MIT Center for Civic Media to students to design their own civics class lesson plan around them. The goal in doing this exercise was to treat the students as experts in secondary education, which they are, and have them instruct us how we might best bring our technologies into a school. Another such workshop is planned for November 2014 with social studies teachers from across the country, which will follow a design-oriented structure informed by this workshop.

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9 This workshop account is adapted from a May 26, 2014 post on the MIT Center for Civic Media’s blog (Graeff 2014c).
5.2.2 Workshop Design and Content

The workshop lasted two hours and had three parts: the first involved a tour of the MIT Media Lab framed around creative learning, the second involved a discussion around what civic education is, and the third involved a design sprint wherein groups of students developed lesson plans for their school around three civic technologies (including Action Path) from the MIT Center for Civic Media.

Participants

I designed the workshop specifically for the Phillips Academy Andover students, who came to the lab for the workshop as part of their “Hacking Andover” class. They were investigating ways to remake the educational experience at their elite preparatory school. The eight students in the class and their teacher came to the MIT Media Lab just for the workshop.

Part 1: MIT Media Lab Creative Learning Tour

Before they arrived, I asked the students to read Mitchel Resnick’s paper, “All I Really Need to Know (About Creative Thinking) I Learned (By Studying How Children Learn) in Kindergarten” (2007). Resnick’s paper does a great job of laying out the learning philosophy at the Media Lab, which is underpinned by a culture of imagination and experimentation. Academically, it falls under the heading of constructionism, and more popularly, it’s seen in the “Maker movement.” This was the frame I brought to the tour of the Media Lab that kicked off the workshop. We started at the shop on the first floor and talked about the raw materials and tools for making concentrated there in a place that brings students together from different research groups to create new things. But the shop isn’t just a place in the Media Lab, it represents a philosophy of creative learning that permeates our Media Arts and Sciences programs and the project-based research carried out by our diverse research groups. As we walked through the lab spaces of Lifelong Kindergarten, Object-Based Media, and Personal Robots, we saw how miniature shops, stocked with LEGO bricks, soldering irons, and actuators, were embedded in these open “classrooms,” living side-by-side with demos of projects current and past, which serve as inspirations to students to create new projects and push envelopes further. The tour and creative learning discussion served to get the students thinking creatively about creative learning and what they could bring back to their high school.
**Part 2: What is Civic Education? Discussion**

After the tour, we opened up a discussion on civic learning and technologies using a “human spectrum,” wherein we asked the students to line themselves up from “strongly agree” to “strongly disagree” in response to a couple of statements:

- Andover has prepared me to be a good citizen.
- Facebook is a good tool for civic engagement.

As the students gave reasons for their positions on the spectrum and shuffled back and forth in agreement or disagreement with each others’ arguments, we learned a lot. According to the students, Andover’s curricula focuses on more theoretical approaches to subjects like politics, government, and social justice, but there are several ways that students can do community service work through after-school activities. The students were ambivalent about Facebook’s utility for civic engagement. Some cited the problems of miscommunication through the medium, while others noted they had only become aware of certain contemporary socio-political issues thanks to Facebook.

One student asked a crucial question during our discussion: What do you mean by civic education? Using the word “education” tends to frame the issue in terms of teachers, classrooms, and curricula. But what if your school, like Andover, lacks a Civics course? In response, I reframed our discussion by saying that at the Media Lab we often talk about “learning” rather than education. As in Resnick’s paper, (creative) learning can mean education that is literally extra-curricular, powered by self-directed, project-based exploration. Similarly, “civic learning” is a more accurate term for what I was and am trying to get at in my efforts. Talking about civic learning really opened up the discussion to all the ways Andover students can gain civic experience as well as what the students would like to see more of both inside and outside of the classroom.

**Part 3: Lesson Plan Design Sprint**

My colleagues and I talked through some of the civic technology projects developed in the MIT Center for Civic Media. We discussed three different projects, which we hoped would be well-suited for civic learning: NewsJack, which allows you to remix a website’s home page (like FoxNews.com or CNN.com), Grassroots Mapping, which uses balloons and kites to capture aerial photography, and Action Path.

For the remainder of workshop, we worked in small groups to brainstorm ways that the presented civic technologies could be used as starting points for lesson plans in a future civics
class at Phillips Andover. Three groups of students, with one or two researchers plus their teacher mixed in, each took on a technology and had 15 minutes to sketch out a lesson plan addressing at minimum these three components:

- Context: How does the lesson connect to other themes of a civics class?
- Activity: How do you use the technology? How do you connect it to the students’ reality? How do you make it engaging?
- Takeaway: What do you want people to gain—knowledge, skills, both?

The NewsJack team developed an impressive lesson plan teaching news and information literacy and putting students in the place of news editors balancing ethics, newsworthiness, and other considerations necessary to sculpt the front page of a news site. The Grassroots Mapping team developed a full course looking into the secondary effects of environmental changes by measuring air, water, and land quality through sensors in connection with a longitudinal analysis of aerial photography.

The Action Path team also designed a full course around environmental issues and emphasized their interest in puncturing the “Andover Bubble,” involving students with the community to have a real impact. The course would develop technical skills through designing geo-fences that would be used to illustrate the biodiversity of an area. Students would be prompted to identify species and take and share photos with the wider community to help document the environment. They hoped that by working with local environmental groups they could help students become more aware of Andover’s biodiversity and instill a greater sense of responsibility for the environment’s care.

5.2.3 Workshop Outputs

The workshop gave me a chance to develop the outline for the larger workshop with social studies teachers that is planned for November 2014. The Andover students agreed that I could present their ideas to those teachers as starting points. Additionally, one of the high school student participants went on to do his final project for the Hacking Andover class on “Civic Hacking” using elements from the workshop. The paper he shared with me will contribute to future civic learning workshops and future interactions with Phillips Academy Andover, which the teacher is interested in organizing.
Chapter 6: Conclusion and Future Work

6.1 SUMMARY OF CONTRIBUTIONS

6.1.1 Theoretical

In this thesis, I have presented a theoretical argument for technology-powered monitorial citizenship to address declining and unequal levels of civic engagement. I argue that rates of participation in community projects can increase both in the near-term and the long-term by deploying civic technologies like Action Path, which have been carefully designed to facilitate what I call “minimum effective engagement” and to serve as civic learning experiences that develop users’ expertise and sense of agency.

6.1.2 Methodological

I have argued for and employed a collaborative and reflexive design methodology for civic technology design based on principles of co-design and related participatory approaches. The research methodology unites ethnographic needs assessment with community stakeholders, iterative technological design with rigorous user testing involving both quantitative and qualitative approaches tailored to location-based civic technology, and exploratory workshops with potential stakeholders to inform the broader set of social processes required to deploy a technology for maximum impact. I do not claim that any of the individual parts of my methodology are original. But as a whole, the methodology contributes to ongoing efforts to improve design practices like co-design and DARG by adding the aspiration to phronetic social science, rather than a purely functional set of social, psychological, or technical assessments.

6.1.3 Practical

I have developed a prototype native Android app capable of delivering geo-fenced surveys using push notifications. After an early-stage user trial, data suggest that it is well on its way to fulfilling its design goals of helping users be more aware of their community’s needs and seeing their city in less abstract terms. More development, testing, and research are needed to evaluate Action Path against its remaining two design goals of integrating civic learning and engagement more tightly into users’ everyday lives and lowering barriers to
civic engagement. However, data from the user trial has helped identify additional features and prioritize others relevant to fulfilling those goals.

6.2 LIMITATIONS

The claims made in this thesis are preliminary. A rigorous and detailed user trial was conducted, but the technology was at too early of a stage and the sample of participants too small to draw any solid conclusions about the real-world viability of effective civic engagement and civic learning through the practice of monitorial citizenship using Action Path. Specifically, the claims around how this socio-technical system will enable monitorial citizenship cannot be tested until a full deployment aggregates user activity to crowdsource expertise and contribute to decision-making or otherwise effect change within a city.

6.3 FUTURE WORK

6.3.1 Boston-Area Municipal Deployments of Action Path

Deployments in two Boston-area municipalities are still in negotiation at the time of writing this thesis. While the key user experience and interface elements are already in place, the deployments will require 1) significant improvements be made to Action Path’s technology and 2) the organization of a series of participatory design sessions with municipal staff and relevant community members in order to develop geo-fenced surveys and launch events for the app.

Major Technological Needs before Municipal Deployments

The following represent key pieces of architecture that still need to be put in place in order to effectively deploy Action Path across a municipality:

1. Secure data collection and dashboard system for recording and storing responses from users.

2. Mechanism by which survey sponsors can remotely update users about the issues they are following.

3. Internationalization of app into most widespread community languages.
4. iPhone version of Action Path.\textsuperscript{10}

**Additional Technological Priorities to Consider based on User Trial**

Beyond the major software development advances needed to bring Action Path to a broad municipal user based, several smaller bugs and features illuminated by the user trial demand attention ahead of major deployment. The following are listed in priority order:

1. Develop an effective audio- and light-based notification that works across all major smartphones to ensure notifications are noticed when not looking at the screen.
2. Replace the Big Image Notification with a normal notification more familiar to the majority of users, and thus less likely to be accidentally canceled.
3. Add a map to the survey to help users find the location of a geo-fenced issue
4. Change the wording on the Thank You Page for “Dismiss,” so that it is a positive action in contrast with the negative action of “Unfollow.”

**Social Process Design Priorities**

As discussed in Chapter 2, the social processes of a system are often harder to design than the technical ones. The user trial raised concerns about how information will be used. Since users will have accounts through Action Path, there is a user education component to be designed, which informs users how their data will be stored, how anonymous or not anonymous they will be to the survey sponsors and to other users, as well as transparency about who is sponsoring a survey and their ability to effect change with your input.

Part of this work will be done during geo-fence design sessions like the workshop reported on in Chapter 5. Designing a good geo-fenced survey includes the location specification, question wording, and context provided around the question and available responses, as well as how responses will be used in reports and decision-making and how contributing users will stay informed about the progress of the issue. This requires a sponsor like a city government to dedicate time and energy to developing and executing a protocol for working with Action Path that is integrated into their normal processes. This must be a co-designed effort between government staff and myself to ensure the resulting social processes are appropriate to and ultimately well integrated into the user experience.

Similarly, the launch events and other distribution mechanisms need to be designed with partners to make sure a wide cross-section of the community are informed about the app’s existence and given the opportunity to install and try it. Ideas like the Arlington Town Day booth

\textsuperscript{10} This is not necessary for initial field-testing but will be necessary before Action Path can be fully adopted as part of the feedback system used by municipalities and community organizations.
with QR codes and walking tours mentioned in Chapter 3 require careful planning. Pamphlets may need to be translated into multiple languages and multi-lingual staff may need to be on hand. Tours need to be constructed in a way that excites the potential users to install and use the app on their own. In addition, community leaders at key institutions like churches should be contacted and trained.

6.3.2 Civic Education Workshops and Partnerships

The other future social process work for Action Path is the continued push toward developing new civic learning experiences with the tool. Connections with schools and organizations dedicated to promoting technological literacy are being developed, and additional workshops are being scheduled in order to generate more ideas for learning with civic technologies. In November 2014, I will lead an expanded version of the Civic Education workshop conducted with Phillips Academy Andover students as a pre-conference session of the National Council of the Social Sciences convention in Boston. The workshop will be held at the MIT Media Lab and be open to social studies teachers from around the country in town for the convention. With the technological milestones met for the municipal deployments, Action Path’s additional capacities may expand the ways it can be used in civic learning curricula. Attendees will be presented with the Andover students’ ideas as inspiration and then have the chance to create their curricula during a similar design sprint. The workshop announcement is included in Appendix E.

6.3.3 Business and Grant Development

To achieve all the goals for Action Path, additional funding will be needed. Some of the stakeholders such as municipalities and property developers may be willing to invest in the tool ahead of a deployment to aid in their planning processes. Municipalities would likely be looking toward innovation grants from major foundations, whereas property developers might use some of their master development budget to put the technology in place. With the right business model, Action Path could become a sustainable social business like coUrbanize, MindMixer, and others. However, test deployments are still key to proving the concept both academically and practically in terms of increasing the quantity and quality of civic engagement. These deployments can also serve to test the viability of Action Path as a standalone app. The right model may in fact be to apply any lessons learned and design principles established by Action Path to a pre-existing project already operating at scale—a point I explore in the next and final section.
6.4 A CIVIC TECHNOLOGY RESEARCH AND PRACTICE AGENDA

Can a solution like Action Path really scale? Assuming the iPhone version can be developed and internationalization into all the relevant languages of a community can be attained, how can Action Path overcome the low adoption rates and persistent small N’s faced by town hall meetings and civic engagement apps alike, as the self-selecting citizens participate and the uninterested and disengaged do not.

To me, this suggests a research agenda of two parallel components. First, I think researchers and technologists need to keep developing prototype civic technologies and field-testing them. Some of these will be production-quality, like the tools coming out of Emerson’s Engagement Lab. Others will remain proofs of concept, following the model of phronetic social science, and serve as the source material for future iterations and projects and the design principles ready for application in consumer apps and tools that already enjoy wide uptake. Like Nick Grossman (2013), I argue that we should try to make all apps more civic, rather than just make more civic apps.

Simultaneously, we need to redesign civics education or, as I have tried to argue in this thesis, open up civic learning to incorporate the practical means by which young and old can push for change in their communities and throughout society. Effective citizenship in the form of monitorial citizenship is practical; it comes down to knowing how to know more about issues affecting your world and how to find small ways to contribute toward bettering that world one action at a time. That is what Action Path is really about.
References


APPENDIX A: USER TRIAL INVITATION EMAIL

Hi friends,

I am looking for any and all Labbers who use an Android smartphone and are willing to test a demo app for me. I’ll do installations TODAY after 4:30pm in the 3rd Floor Atrium.

I’ll install my app Action Path on your phone and you’ll sign a consent form and take a quick online survey. Then you’ll just go home like normal and come back to the Media Lab the next day, when I’ll collect the data from your phone and ask you some follow-up questions (time flexible). The app may or may not send push notifications to you during that period of time with prompts for quick surveys to take. Note: The app will only collect data related to use of the app and shouldn’t interfere with any other functions on your phone.

If you are willing to test it out, please send me a quick e-mail then bring your smartphone to the 3rd floor atrium during one of the install periods.

I’ll have donuts Friday morning when we re-connect.

Thanks,
Erhardt

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APPENDIX B: USER TRIAL DIRECTIONS

DIRECTIONS for Action Path – Media Lab Trial – 1

1. Get Subject ID #:


3. Install and Run Action Path app; leave running in background

4. If you respond to an "action" on your smartphone, please:
   a. Take a photo of where you are / your context; do not include yourself in the photo.
   b. E-mail all photos to erhardt@media.mit.edu with Subject Line: "Action Path pic."

5. Find me in the 3rd floor atrium the next day: I’ll download the Action Path data from your phone and do a quick post-trial interview.

6. Eat donut

If you have any questions email Erhardt Graeff, erhardt@media.mit.edu.
APPENDIX C: USER TRIAL PRE-TRIAL SURVEY

Action Path - Media Lab Trial - 1 (Pre-survey)
Please sign the consent form and then fill out the following survey. Any questions, please ask Erhardt Graeff (ehardt@media.mit.edu).

* Required

1. Subject ID *
   Researcher will enter

Please enter the following information

2. Age *

3. Gender *

4. Highest Education Completed *
   Mark only one oval.
   - Did not complete High School
   - High School/GED
   - Some College
   - Bachelor's Degree
   - Master's Degree
   - Advanced Graduate work or PhD

5. First Language *

6. What city or town do you currently live in? *
Please answer the following questions

7. Have you ever used a smartphone? *
   Mark only one oval.
   ☐ Yes
   ☐ No

8. Do you have your own smartphone? *
   Mark only one oval.
   ☐ Yes
   ☐ No

9. What kind of smartphone is it? *
   Manufacturer, model, etc.; if you are taking an Android smartphone on loan write LOANER; if no smartphone write N/A.

10. Who is your wireless service provider?
    Mark only one oval.
    ☐ Verizon
    ☐ AT&T
    ☐ Sprint
    ☐ T-Mobile
    ☐ U.S. Cellular
    ☐ Other: ________________________________

Please respond to the following questions on a scale from 1 (less so) to 7 (more so)

11. How good would you say you are with technology? *
    (less so) 1 - 7 (more so)
    Mark only one oval per row.

    1 2 3 4 5 6 7
12. How well would you say you know your city? *
   (less so) 1 - 7 (more so)
   Mark only one oval per row.
   
   1  2  3  4  5  6  7

13. How involved would you say you are in making your city better? *
   (less so) 1 - 7 (more so)
   Mark only one oval per row.
   
   1  2  3  4  5  6  7
APPENDIX D: USER TRIAL POST-TRIAL INTERVIEW PROTOCOL

ACTION PATH INTERVIEW PROTOCOL

Subject #:

Experience Questions
What did you learn from using Action Path?

What did you think about when you arrived at your first point of action?

What did you do? Describe your process. Describe your commute from the Media Lab to home and back.

How did using Action Path make you feel?

Was using Action Path fun?

Was it bothersome?

Any bugs that you came across while using it? Same geofence triggered multiple times, crashes?

How regularly would you use Action Path if you could have it on all the time?
Design Questions

What did you like about Action Path?

What didn’t you like about it?

How easy was it to use?

Would you suggest any changes to its design?
APPENDIX E: NCSS CIVIC EDUCATION PRE-CONFERENCE WORKSHOP
TITLE AND DESCRIPTION

Title
Civic Technologies and Participatory Approaches for Civics Education

Description
Curious how to adapt civics education in light of new technology? Join MIT Center for Civic Media researchers for hands-on demonstrations of technologies we’ve built and collaborative lesson plan design. Researchers will introduce the technologies for civic engagement and civic media research they have been developing, as well as their vision for participatory approaches to civics that tie technologies to impact. Participants can then collaborate with the researchers to brainstorm and design how the demonstrated technologies and approaches might be integrated into formal civics education, after-school clubs, informal activities, or even student governance. You’ll walk away with handouts describing the civic technologies, as well as any outlines we develop together for lessons, curricula, and activities. This workshop is best suited to high school-level educators already using digital technologies of some kind (laptops, cell phones, cameras, etc.) with their students.