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ENHANCING PUBLIC OPINION PRACTICES

USING DIGITAL MEDIA AFFORDANCES

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Presented to
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Susan J. Robinson

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ENHANCING PUBLIC OPINION PRACTICES

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Approved by:

Dr. Alexandra Mazalek, Advisor
School of Literature, Media, and Communication
Georgia Institute of Technology

Dr. Carl DiSalvo
School of Literature, Media, and Communication
Georgia Institute of Technology

Dr. Jay Bolter
School of Literature, Media, and Communication
Georgia Institute of Technology

Dr. Charles T. Salmon
Wee Kim Wee School of Communication and Information
NanYang Technological University

Glorianna Davenport
MIT Media Lab
Massachusetts Institute of Technology

Date Approved: December 2, 2014

To Samuel Alexander Robinson, my late brother
Autodidact, dungeon master, code king, and accomplice

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

SUMMARY

In the United States, traditional opinion surveys feature closed-ended items or questions, which constrain the expression of opinion to a set of fixed choices. As technologies of representation, these surveys do not enable respondents to express their opinions in rich qualitative ways or to challenge the framing of topics. When the results are presented in the media, the representation of public viewpoints is reduced to narrow categories of responses, and nuances of opinion among individuals and groups are lost.

The affordances of digital media offer possibilities for enhancing public opinion practices by altering the ways in which viewpoints are gathered and represented. These affordances include the ease with which mobile devices can converge text, audio, video, and pictures; employ computational routines to deliver and tailor instruments; and use network connections to report data immediately. Such affordances make the combination of closed-ended and open-ended data not only possible, but feasible. As well, digital media tools continue to emerge for the rapid analysis and presentation of media-rich datasets, including interactive multi-touch tabletop technologies for use in broadcast studio production and in face-to-face settings, such as public meetings.

This dissertation investigates how digital media affordances may be used to enhance public opinion practices across the cycle of opinion formation, expression, aggregation, interpretation, and representation in the media. The investigation features two case studies designed to evaluate the acceptability and feasibility of novel technologies within a proposed model of public opinion production. One case study examines the acceptability and feasibility of fielding an experimental mobile survey that

tightly couples closed-ended items with open-ended video responses. The other case study explores the presentation of the dataset resulting from the mobile survey by means of an interactive tabletop surface in the context of a broadcast television public issues program. The case studies demonstrate the acceptability and feasibility of these technologies in the public opinion domain and the utility of using interdisciplinary theory from social and computing sciences in the design and evaluation of systems, and provide directions for future research.

CHAPTER I

INTRODUCTION

Opinion survey research came of age in the United States in the mid-twentieth century with the response-gathering devices of pencil-and-paper forms, face-to-face interviews, and telephone survey questions. In the early years of the discipline, a debate arose regarding competing methods of data gathering: on one side, there were those advocating for closed-ended questioning on surveys; on the other side, there were those who favored open-ended interviewing (Converse, 1984). In a battle between academics and marketers, relative costs largely factored into the argument. Those backing closed-ended questioning won the day, resulting in a dominant bias toward quantifiable results in U.S. opinion research. Although this bias is not as prominent in other countries and mixed-methods surveys are becoming more popular, the *quanti-quali* debate continues today (Mayer, 2008a).

Many have criticized the use of strictly quantifiable items on surveys, particularly in the public opinion field in which scholars have noted closed-ended questions have the effect of "rationalizing" people's views, turning feelings and values into a "thing" that is numbered and measured (Herbst, 1993). Furthermore, closed-ended survey items do not enable respondents to challenge the framing of issues or to express their opinions in rich, qualitative ways. Others argue that closed-ended questions alone fail to express nuanced differences among diverse *publics* that—in response to issues—may adopt similar positions but for differing reasons. For example, supporting policies of energy conservation could stem from a personal wish simply to save money or from an

expansive wish to save the planet (Brugidou & Escoffier, 2013). Using closed-ended questions also limits how survey results can be represented, particularly in mass media. Scholars have observed that broadcast media's presentation of opinion poll results offers only a superficial treatment of the nuances of arguments and either over- or underrepresents opinions in the minority (Fiorina, Abrams, & Pope, 2010).

As technologies of representation, public opinion surveys afford or hinder certain types of public opinion expression, and practices associated with their use to *measure* public opinion serve as constraints. However, the affordances of digital media offer possibilities for changing both the form of public opinion surveys and the ways in which public viewpoints are gathered and represented. Digital media, through its networked, encyclopedic, participatory, spatial, and procedural properties, enables the rapid gathering, storage, analysis, retrieval, and representation of more data points and types of data than previous technologies (Castells, 2002; Langman, 2005; Murray, 2011). These properties make possible new techniques in public opinion practices, specifically the (a) inclusion of rich media such as audio and video in the opinion dataset, (b) creation of feedback loops during data collection, and (c) innovative methods of interacting with the data collected to analyze and present viewpoints in discerning ways.

The challenge of applying digital media technology to enhance the forms of public opinion surveys and survey practices lies in the imperative for interventions in the data collection phases as well as in the presentation phases. These processes are inseparable: Collected data determine the types of expression, analyses, and representation possible; likewise, anticipated avenues of data presentation using

computation shape the data collection. In short, media affordances affect all parts of the process.

To investigate how this could be accomplished, I found through my research that I had to create new technologies for data *gathering* as well as data *presentation* and combine them in a novel way to address adequately this problem space. Toward that end, I led a team of researchers in the design and evaluation of a system featuring the use of mobile and tangible tabletop computing for gathering and presenting/interacting with public opinion data. My technological strategies were as follows:

> 1. Use the affordances of mobile media during data gathering to couple tightly closed-ended questions, which produce numerical responses, with an open-ended response mechanism, specifically video recording, to add narrative to the opinion dataset.
>
> 2. Structure the opinion survey to create opportunities for participants to challenge the framing of those questions asked with a video recording of their challenges.
>
> 3. Use the affordances of a tangible tabletop computing form factor to explore and to present this enriched dataset (numbers and narrative) through the use of interactive data visualizations.

Current practices have been described as reflecting ideological positions deriving from institutional needs, research ideologies, and social (political) forces (Asher, 2007; Converse, 1984); therefore, this undertaking demanded sensitivity to the politics in play. To guide my work, I drew upon evidence, theories, and frameworks from social and political sciences in the design and evaluation of technologies and in the design of the research. As a result, a further contribution of this study is a model that indicates how similar problems may be approached using those methods applied in a mixed-methods case study design.

1.1 Motivation: Enhancing Expression and Representation

Although opinion surveys are often presented in mainstream media as a reliable measure of public sentiment or will, a number of scholars have critiqued opinion polls as a culturally or ideologically determined form of representation; some argue that it is a tool of the elite to shape mass opinion (Herbst, 1993; Lewis, 2001). It has been argued that polls are framed by those who sponsor data collection; for example, elites, which limits true participation and/or meaningful conversations from a variety of "publics" (T. Glasser & Salmon, 1995). Another fundamental criticism of public opinion survey results, expressed as an aggregation of individual viewpoints, is that this practice treats all individuals as having similar or equal influence on a process or system when, in fact, individuals may exert widely varying practical effects; for example, on the democratic system as members of organized groups or as policy makers (Blumer, 1948).

Other scholars have observed that the ways in which public opinion polls are presented and interpreted through the news media, particularly broadcast media, are troubling. Reporters and broadcasters, due to aspects of news production, tend to address summarily the nuances of arguments and over- or underrepresent those opinions held in the minority (Edelman, 1988; Fiorina & Adams, 2011; Herman & Chomsky, 2002; Lasch, 1990). In the United States during the past two decades there has been a growing trend toward (a) political partisanship among elites with (b) party affiliation associated with issue positions, and (c) citizens adopting positions/opinions based on their party affiliation (Bartels, 2000; Hayes, 2008). Given these trends and because polls are often presented in terms of party affiliation, there is reason to be concerned that critical debate on public issues is stifled by polarized viewpoints that are produced by tying opinions

strictly to party affiliation and by presenting them as such for consumption via mass communication channels.

However, structural changes in mass communication channels created by the proliferation of networked and computational media are introducing challenges to the survey as the gold standard for measuring public sentiment and for framing political discourse. These changes include the erosion of one-way mass media channels and the emergence of multi-directional communication. Networked and social media enable non-elites such as nonprofessional citizen journalists and people from all walks of life to contribute their views in both quantitative and qualitative forms through a variety of digital formats using a range of devices (home computers to mobile phones). Two-way channels between professional broadcasters and the public are already enabling news stories and polls to be enriched with viewer perspectives that are contributed in text, audio, and video form. New form factors such as large-scale surface computing devices offer new platforms for presenting ideas and telling stories.

In the social sciences as well, there have been new methodological developments that support changes in practices within the public opinion field. There has been increasing interest in and reliance on mixed-methods research (Clark, Creswell, Green, & Shope, 2008; Couper, 2011; Vannieuwenhuyze, Loosveldt, & Molenberghs, 2011). Mixed-methods forms of inquiry combine quantitative methods such as randomized surveys to determine what is happening and qualitative methods, which often seek answers to why something occurs through naturalistic inquiries and purposive sampling. Yet, the domains of social scientists, political scientists, and communication scholars who study and comment on public opinion methodology and the domains of digital media

theorists and computer scientists who critique and plot the possibilities of new technologies, historically, have remained apart. Combining perspectives from the social sciences about public opinion practices with digital media and technology research efforts to enhance polling results clearly is a path forward that we should take. My motivation in conducting this research, which joins these disciplinary perspectives, is to exploit the *communicative affordances* of digital media to produce better data for articulating public issues at hand vis-à-vis their underlying publics and to bring individual voices, especially of people in marginalized groups, to the forefront. (Brugidou, 2009; Dewey, 1954; Stoneman, Sturgis, & Allum, 2013; Sun & Hart-Davidson, 2014).

Toward this goal, I applied theoretical frameworks and constructs from the humanities and social sciences to design novel form factors, processes, and interaction techniques for gathering and presenting public opinion data. These novel form factors, processes, and techniques were used to reveal attitudes, behaviors, and beliefs among both respondents and media professionals regarding the use of digital media technologies in this arena. The novel form factors were not designed or evaluated previously in the field of public opinion studies or elsewhere; therefore, the findings from this study can inform future technological inventions. The primary focus of my work is (a) to yield insights into how public opinion expression may be enriched using digital media technologies and (b) to discover how the feasibility of these technological changes and their acceptability by potential users could affect public opinion practices, given current norms of participation and interpretation.

Although my work is motivated from needs identified by scholars to address the uneven power dynamics between elites and the lay public in the production of public

opinion, addressing this larger societal problem by applying technologies to the production of public opinion could be criticized. First, even if one improves the quality of the data gathered and of its presentation, the use of such data to change policies is still dependent on channels (both interpersonal and mediated) largely controlled by elites. Second, the entire enterprise of public opinion polling, in terms of its use by policymakers to make decisions on behalf of citizenry, is bankrupt: What is congruent with the wishes of the powerful is used to justify decisions, and what is contrary is ignored (Lewis, 2001). Yet, one cannot witness the daily barrage of polls being presented in public settings or mass media without asking how these legacy forms of gathering public opinion, which originated during the mid-twentieth century, could be challenged or improved using new media technologies.

1.2 Research Questions

My overarching research question is

> *How can we enhance the expression and representation of public viewpoints using the affordances of convergent digital media technologies in the production of public opinion?*

I tackled this question by designing and evaluating new technologies to supplement current public opinion polling practices in the data collection and presentation phases. Current practices enacted during these phases can be modeled as an exchange between those who create surveys, typically media and political elites, and those responding to calls for the expression of public will, typically non-elite citizens (T. Glasser & Salmon, 1995).

Because public opinion practices involve actors and systems at multiple levels in complex interactions, to further expand my overarching research question I used a multi-

level analysis to generate additional focused research questions and to organize my efforts overall. The overarching model I used is the modified Coleman model proposed by McLeod, Pan, and Rucinski (1995) for multi-level analysis in public opinion (see Figure 1), which was derived from their multi-level model for communication research (Pan & McLeod, 1991). This model, presented as a diagram, shows relationships between macro-level outputs at the system level, (aggregated) public opinion and public policies, and micro-level outputs at the individual level, which are individual opinions and actions. The model articulates cross-level linkages between the macro- and micro-levels as social, organizational, and institutional processes. The authors note that

> on production and consumption sides, there are two types of cross-level linkages: (a) social, institutional, and structural constraints on individual media professionals or audience members and (b) integration or aggregation of individuals' opinions and behaviors into macro-level social changes and stability. (p. 145.)

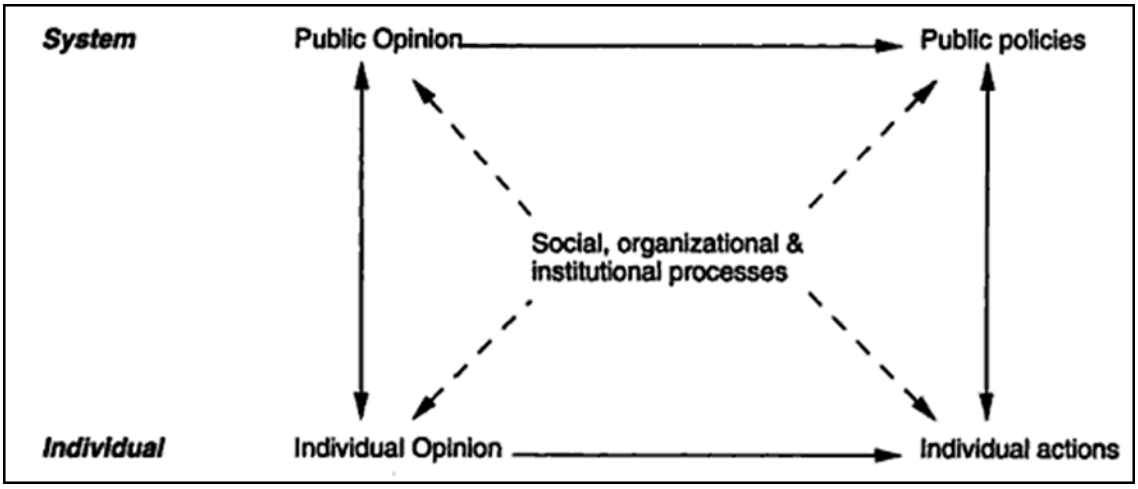


Figure 1. Multi-level analysis in public opinion research. Adapted from "Levels of Analysis in Public Research," by J. McLeod, Z. Pan, and D. Rucinski in T. L. Glaser and C. T. Salmon (Eds.), 1995, *Public Opinion and the Communication of Consent*, New York: Guilford Press, pp. 55-85.

System-level factors may include (a) biases of institutions that determine what questions or issues are examined in data gathering and the validity of the methods of

gathering; (b) constraints in dissemination or interpretation resulting from institutional ownership of media channels that present the results of public opinion surveys; and (c) conditions experienced by individuals, which shape their likelihood to participate in civic matters. Factors at individual levels are not well-articulated, but implicit. One could speculate that factors at the individual level beyond social forces include aspects that affect the formation and expression of opinion, including level of involvement in particular issues, emotional responses to questions or the process of participation, and cognitive abilities.

Types of relationships, in terms of flow of influence outputs, can be permutated as macro-to-macro, macro-to-micro, micro-to-macro, and micro-to-micro. In the following sections, I will present the remainder of my research questions and relevant theoretical lenses for examining these questions in the context of the relationships identified in the model.

1.2.1 Bridging the Closed-Ended/Open-Ended Divide

With closed-ended survey items, the types of opinion that can be gathered or expressed consist of arguments that can be expressed in categorical, ordinal, or scalar terms. This practice privileges particular types of rationality—what Herbst has argued as "instrumental" or "formal" rationality opposed to "substantive" rationality (Weber, cited in Herbst, 1993). According to Weber, formal or instrumental rationality derives from an aim to solve problems through the application of rules, such as laws and regulations, to achieve an end, such as fair operations of a market economy. Substantive rationality is the generation of a position and systematic actions based on values, such as loyalty or, broader yet, values situated in a religious or philosophic tradition, and political groups

(Jacoby & Sniderman, 2006; Kalberg, 1980). It is easy to see how measuring opinion through standardized means reflect an approach rooted in instrumental rationality and may be ill-suited to expressing nuanced views of various public(s) who may have conflicting value systems that affect their responses to an issue of concern.

At the Individual Level

A remedy for forcing participants into rationalized responses is the use of digital media affordances, which enables persons to contribute not only what they think by way of closed-ended questions, but also to explain why they think or feel a certain way through storytelling, by coupling their stories with the numbered responses. The research question I asked in relation to this issue is as follows:

> *RQ1. Can we enhance the expression of public viewpoints (human values) using digital media by coupling close-ended or quantified survey measures with open-ended response mechanisms, such as video recording*?

The Role of Narrative

To explore this research question at the individual level, I used mobile media to tightly couple closed-ended survey items with open-ended response mechanisms, binding the numbers from the closed-ended items to the narrative (i.e., the open-ended response). According to Bruner (1990), narratives (stories) are not only a way of representing or communicating about reality; they are a device by which individuals constitute and understand reality, in particular, social realities. Narratives describe people or other intentional and mental agents acting in settings in ways that are relevant to their beliefs, desires, theories, values, etc., and stories describe how these agents relate to each other (Dautenhahn, 2002). One could say that stories make human values visible.

The sharing of stories is more prevalent in some cultures than in others. The absence or lack of storytelling as a form of expression distinctly disadvantages those groups of people whose predominant form of public opinion expression must be an argument that can be expressed solely in rational terms. In public opinion research, Mathieu Brugidou, a French researcher, argued that less educated and less involved persons whose opinions are sought use different ways of framing their opinion than those who are more involved and educated (Brugidou & Escoffier, 2005). In a linguistic analysis of qualitative data from respondents across France regarding the routing of high-voltage electrical lines, Brugidou's team found two modes of discussion—one, "of ordinary discussion," governed by "requirements of authenticity and shared experience" and the other by "public debate, marked by the necessity to disindex [deindex] the argumentation in relation to the situation" (p. 19). Of the less involved and educated who participated in the survey, he noted:

> The argumentations concerning the countryside and the dangers presuppose a common experience, a common world (or life if you prefer). In this ordinary public opinion discussion space, it is grammatically incorrect (and quite simply impolite) to call upon knowledge and experience which cannot immediately be shared by all members of the group (for example, savant knowledge of electromagnetic fields which at the very best will look like an authoritative argument, and at the worst like priggish pedantry). (p.13)

In a subsequent publication, he calls for the addition of more open-ended questions and their analysis in conjunction with close-ended questions in survey construction as a response to these dimensions of opinions that are typically not represented in purely quantitative surveys.

Although different segments of society may tell different types of stories and formulate different types of narratives according to their respective social norms (rural

versus urban, more or less degrees of formal education), the addition of stories nonetheless should elicit the in-depth consequences of issues at hand, including personal impacts, emotional reactions, and congruence or disconnection from values held by participants. In my study, I measured whether or not providing the open-ended response mechanism provokes the telling of personal stories.

Enabling Feedback Loops

As stated previously, within the mainstream production of public opinion, the substance, timing, and interpretation of polls is typically controlled by elites in policy circles, research, and the media. The presentation of issues can be manipulated with more or less emphasis placed on their particular aspects, in part, due to the form in which questions are asked and to the subsequent mass media discourse. To date it has been primarily a one-way street: Members of the public are allowed to react to issues only by answering questions as they are posed; typically, with forced-choice responses. When individuals respond to surveys, issues of framing are exacerbated by the closed-ended question because each question is a sequence of word choices that frames the issue. The results are further constrained by the representational expression of the results in the form of numbers, such as the percent of respondents who answered *yes*. Thus, the discursive space afforded to participants is limited. Altering the dynamics of feedback enabled during the interplay of macro- and micro-level outputs requires the following research question:

> *RQ2. Can we enhance the expression of public viewpoints using digital media by enabling people to contribute alternative framings of issues through open-ended response mechanisms, such as video recording?*

Framing Theory and Agenda Setting

Framing Theory

Framing theory is central to analyzing how a proposed technological intervention might operate on the limitations of current opinion survey practices, which matured in an era when media channels did not afford feedback, unlike today's computational and networked media. According to framing theory, framing involves selecting aspects or elements to communicate (e.g., of a situation or an issue) and not selecting other aspects while varying the emphases on those selected. As Entman (1993) explained:

> To frame is to select some aspects of perceived reality and make them more salient in the communicating text, in such a way as to promote a particular problem definition, causal interpretation, moral evaluation and/or treatment recommendation for the item described. (p.52)

Framing can be achieved by choosing particular words; for example, selecting *pro-life* rather than *anti-abortion* or phrasing a survey question in a way that may present the current topic favorably for some readers or negatively for others. Framing also can be manipulated by narrative means such as the use of an analogy or story (Hallahan, 1999). Powerfully constructed frames draw upon the culture, values, and concerns of groups and individuals, as we witnessed during the U.S. health-care reform debate during the first Obama Administration, when conservatives framed the reform as a constraint upon personal choices and freedom instead of liberation from the worry of not having a health-care safety net. Lakoff argued that achieving connections to high-level values is critical to successful use of frames in communication (Lakoff, cited in Dorfman, Wallack, & Woodruff, 2005).

Agenda-Setting

The framing of questions and surveys greatly impacts which issues are determined to be the important issues of the day as a result of media reports of survey results and the use of

survey results by policy makers in the media to justify their positions. Agenda-setting is the notion that topics addressed by the mass media and the methods by which they are reported have a decided effect on the importance that people attribute to those issues at any particular time. Both the information the media delivers and how that information is framed have been shown to have an agenda-setting function in society (Cobb & Elder, 1972; McCombs, 2002; McCombs & Shaw, 1972). The concept of agenda-setting is central to practices by which public opinion is shaped, collected, and the results reported through the mass media. The goal of setting the agenda, i.e., influencing people to think of particular issues as important enough to warrant the attention and/or the resources of institutions, spawned the public relations industry.

Agenda-setting is on display in full force during political contests in the content of speeches at national party conventions and in the daily rhetoric from analysts according to their respective political stripes. Although mass media message framing at the national level certainly influences discourse among policy makers, at local levels the issues of framing can be magnified when diverse groups disagree in face-to-face meetings where arguments can occur in real-time among groups representing special interests or values held in common (Hardie, Moore, & Sanoff, 1989). Therefore, a second motivation in raising R2 was to address (a) the constraints produced by agenda-setting on the macro-level construction of public opinion surveys and (b) the limits placed on the discursive space afforded to participants.

At the System Level

Technological interventions must be considered in both the data *gathering* and *presentation*/*representation* phases of public opinion production to address fully the

problem space. Figure 2 expands the *processes* section of McLeod's multi-level analysis in public opinion research, which I formulated after a review of the literature that included scholarly revisiting of the work of Gabriel Tarde and other models (Crespi, 1997; Katz, 2000, 2006). On one side of this representational model of current processes are those within the opinion-gathering phase; on the other side are the processes of the opinion presentation phase. These cyclical processes are presented chronologically: (a) the representation of the issues (The terms, *represent* and *present*, are used interchangeably in this document.), which are driven typically by elites through media coverage, debates, and in the form of data collection instruments created by organizations; (b) the formation and potential deliberation of issues by the public(s) they engender, individuals, and groups; (c) the opinions that may be *expressed* in a variety of ways, including surveys (*Expression* is not a given; individuals often do not participate at this phase.); and (d) the expression of opinions is typically *interpreted,* as in the case of surveys, by the sponsoring institution.

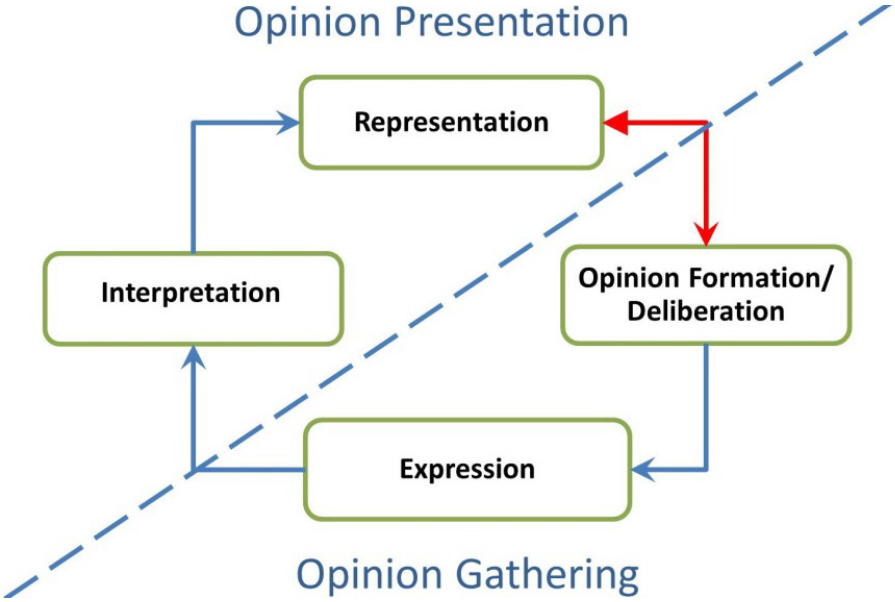


Figure 2. Public opinion production process.

Generally, the flow of information is unidirectional, proceeding clockwise in the model. Given the two-way nature of digital media channels, creating a bidirectional flow among one or more of these phases offers possible paths to enhancing the process. I have highlighted the interaction between the representation and opinion formation/deliberation phases because RQ2 implies this enhancement. The goal of intervening on the presentation side of this model prompts my third research question:

> *RQ3. In the production of public opinion, can we enhance the representation of public viewpoints using digital media by coupling quantitative survey data with video viewpoints by means of data visualization and tabletop computing?*

1.2.2 Theory in the Design and Evaluation of "Political Technology"

The production of public opinion is enacted through a complex interplay of societal-, group-, and/or individual-level processes and influences with technological infrastructure. As a result, users of opinion surveys, specifically respondents, may not have the reflexive wherewithal to recognize that public opinion polls limit how their views may be expressed, how their responses are depicted, and, in turn, how their opinions are shaped. Most individuals are not likely to understand the mechanisms behind polling or how technologies could be better designed. Rather than relying on traditional user-centered and participatory design inputs to address these gaps, I used, primarily, models, theory, and evidence from the social sciences and humanities to guide my conception of the problem space and potential avenues for action. I also incorporated user feedback during iterative design exercises and included typical user experience measures in the evaluation instruments.

The decision to use theory to reflect critically on this problem space led me to raise another research question, an answer to which could have applicability beyond my

current work. The question broadly stated is, what is the role of the digital media designer in addressing politically sensitive domains and how can *the political* be considered in design? To narrow its focus, I formulated the following question for my research:

> *How can designers use theory from the social and political sciences to inform the design of sociotechnical tools for politically sensitive domains?*

1.3 Approach

In summation, my overarching research question is: How can we enhance the expression and representation of public viewpoints using the affordances of convergent digital media technologies in the production of public opinion? Figure 3 shows my three specific research questions embedded within the model of public opinion production processes.

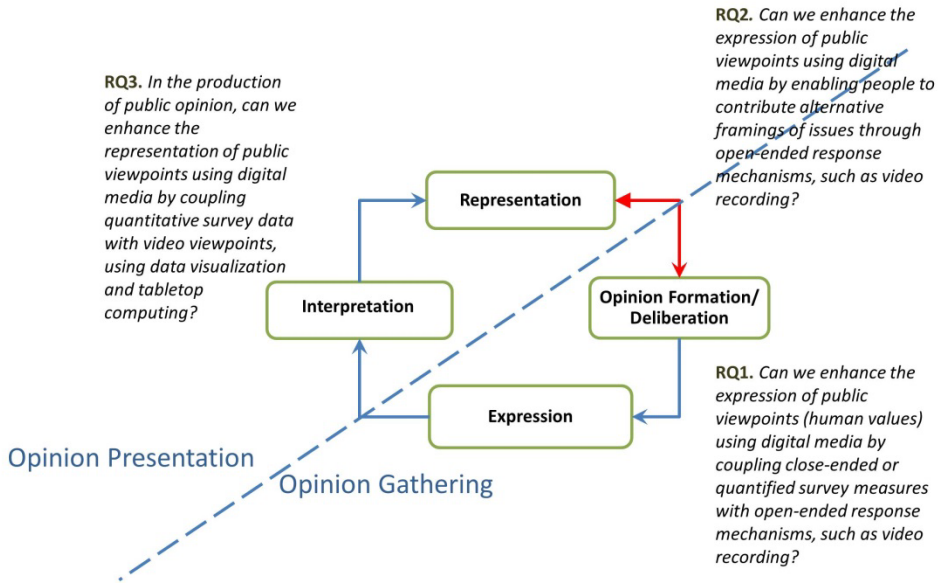


Figure 3. Phases in the production of public opinion and research questions.

To answer these questions, I completed formative research, including a literature review to identify (a) aspects of current public opinion practices open to intervention using the affordances of digital media technologies, (b) trends in technology use by institutions (media, elites) and lay public in the production of public opinion, (c) relevant theories

and frameworks for use in designing technology for remediating public opinion practices, and (d) best practices in the design and evaluation of the form factors that I anticipated using in my technological interventions.

Based on findings from the formative research design, I designed a system applying the affordances of digital media to enhance public opinion expression with the following components:

Opinion Formation/Deliberation/Expression (Opinion Gathering)

> A mobile polling application that enables the collection of both quantitative and qualitative data so that respondents may explain their choices, question the framing of survey items, and add information not anticipated by the designers of the data collection instruments.

Opinion Interpretation/Representation (Opinion Presentation)

> A tabletop computer system that enables the exploration of the dataset produced by the mobile polling application through the use of tangible controls, data visualization, and touch interaction techniques, suitable for use by multiple persons during a public meeting or in a broadcast studio setting.

Following the formative research and technology design phases of the study, I conducted a mixed-methods, multi-level case study using an approach advocated by Yin (2008), which calls for identifying relevant theory before conducting an investigation. In this manner, a model as well as hypotheses of what may be expected in an intervention can be built with the data collected to test the model's rigor. The overall study included two embedded case studies at two levels of analysis: the individual level for the mobile polling application and the institutional or system level for the tabletop computing system. (Note: In this study, I use the terms *tabletop computing* and *tabletop presentation* system interchangeably.) I translated the research questions into propositions for the model cases and further expressed these as null hypotheses to be tested.

Table 1

Research Questions Mapped to Claims, Interventions, and Evaluation Methods

Research Q	**Model Propositions**	**Interventions**	**Evaluation Methods**
RQ1: Can we enhance the expression of public viewpoints using digital media by coupling close-ended or quantified survey measures with open-ended response mechanisms, such as video recording?	Claim 1: Public opinion-gathering surveys that afford respondents the option to add video viewpoints that explain their choices will have a greater level of acceptance among people who have (a) high involvement in the issues, (b) low concerns for privacy, and (c) high familiarity with technology (i.e., social media).	**Mobile polling application** enabling individual respondents to couple video viewpoints with their numeric responses to explain why they selected a certain answer, e.g., by adding stories, narratives, and testimonials to the opinion data sets.	Field study with lay public and opinion leaders to test feasibility and acceptability of the mobile polling application.
RQ2: Can we enhance the expression of public viewpoints using digital media by enabling people to contribute alternative framings of issues through open-ended response mechanisms, such as video recording?	Claim 2: Public opinion-gathering surveys that afford respondents the option to challenge questions being asked will have a greater level of acceptance among people who have (a) high involvement in the issues, (b) low concerns for privacy, and (c) high familiarity with technology (i.e., social media).	**Mobile polling application** enabling individual respondents to couple video viewpoints with their numeric responses to explain why they selected a certain answer, e.g., by adding stories, narratives, and testimonials to the opinion data sets.	Field study with lay public and opinion leaders to test feasibility and acceptability of the mobile polling application.
RQ3: In the production of public opinion, can we enhance the representation of public viewpoints using digital media by coupling quantitative survey data with video viewpoints by means of data visualization and tabletop computing?	Claim 3: Media professionals will find the scenario of presenting public opinion data containing tightly coupled close-ended and open-ended public opinion using information visualizations on tabletop computing equipment designed for broadcast feasible.	**Tabletop/tangible data visualization platform** enabling performers to present new types of broadcast media programming featuring representations made possible by coupling close- and open-ended data in the public opinion-gathering process.	Laboratory-based study with television professionals to test feasibility of a tangible tabletop system for presenting this new type of opinion data set.

For the mobile survey technology, I designed a naturalistic inquiry involving a real-life survey of constituents of an elected official. For the tangible tabletop presentation system, I opted for in-depth interviews with media professionals in a laboratory setting regarding the use of the system for data storytelling. Each case study was analyzed separately and then combined in the overall model to tell the larger story of the successes and limitations of the proposed digital media technologies for enhancing public opinion processes.

1.4 Results and Contributions

Overall, the multi-level case study model of the proposed technological interventions to enhance public opinion practices was supported, although one facet of the claims under RQ1 and RQ2, which predicted that those with high involvement in issues would find the mobile polling method acceptable at higher rates than those with low involvement, produced mixed results and requires further study. The results expand knowledge about attitudes toward incorporating rich media-recording functions on mobile devices for public opinion polling, i.e., with video recording.

Given that a survey to include video recordings is a low-privacy method, this study also provides insight into dimensions of user experience that may affect survey results; i.e., known variables that affect participation in public debate such as levels of involvement in issues, privacy concerns, social media use, and differing demographics. Lastly, discussion of the methodological approach to this research, which, as a mixed-methods inquiry incorporating theory from the social and political sciences, may serve as a model for other investigations regarding sociotechnical tools for politically sensitive domains.

In summary, the research contributions are

1. A model for a creating and presenting a new type of public opinion data set using mobile media for data gathering and tangible tabletop computing forms for analysis and presentation with the latter using a broadcast studio scenario;

2. Findings regarding the acceptability, use, and usability of specific prototyped technologies, interaction techniques, and new forms of gathering and representing public opinion data using computational media; and

3. A discussion of the roles of social sciences theory and evidence in designing technological interventions for problem spaces with political aspects.

1.5 Overview of Dissertation

This dissertation contains eight chapters. Following this introduction, Chapter Two provides a background on public opinion and discusses technologies used in the gathering and expression of opinions both in the mainstream and at the margins. Chapter Three explores work related to this inquiry that informed the iterative design of the system, which is discussed in Chapter Four. Chapters Five and Six present two separate case study investigations, analyses of the results, and discussion. Chapter Seven explores major themes that emerged from the studies and discusses the meaning of this research using current and historical interpretive lenses. The Conclusion focuses on future work that this investigation prompts and implications for public opinion practices and other fields.

CHAPTER II

BACKGROUND

The work of examining how technology may be designed or deployed to enhance current practices of gathering, interpreting, and (re)presenting the viewpoints of individuals or groups of individuals (who may constitute different publics) in response to issues of concern begins with examining definitions of public opinion. The history of the concept of public opinion reveals many unresolved positions on the subject among scholars, professionals, and constituents. The debate spans the ages, starting with philosophical oppositions to the bases of opinion (i.e., human judgment versus "facts"); it crosses disciplines as diverse as sociology, political science, psychology, cognitive science, communications, and the humanities (Martin, 1984). This chapter sketches (a) the recent history of the concept of public opinion, (b) survey practices of measuring opinion, and (c) how technology in the twentieth century has shaped practices in the field.

2.1 Public Opinion

2.1.1 Definitions

What is *public opinion*? Scholars have noted that the concept of public opinion originated with Locke in the 1600s (Noelle-Neumann, 1979). During those turbulent times it came into symbolic, if not practical force (Glynn, Ostman, & McDonald, 1995). It is a complex term that has been the source of much debate and many disagreements. Krippendorff (2005) notes that "public opinion" is a socially constructed concept. Pierre Bourdieu (1979) voiced that "public opinion does not exist;" Dewey (1954) characterized

public opinion as "intermittent when it is not the product of methods of investigation," implying that the public holds nuanced and changing positions that form in response to an issue of interest, "It appears only in crises" (p. 178).

For the purposes of this study, I make use of the concept that circulates commonly that "the opinion of the public" is a *thing* which, with time's passage has been regarded as a measurable entity. Since it is reported almost daily in news reports, public opinion as a *thing* is an important factor in contemporary democratic life. I am interested in altering this concept by altering an instrument used in its construction, the opinion survey. As a noun, the term, public opinion, suits the purpose of exploring the questions of legitimacy. For example, what do leaders, policy makers, the media, and constituents hold as acceptable forms of public opinion polling? There are well-established standards enumerated on most research company and news organization web sites, but these standards reflect a narrow band of practices regarding survey data collection and analysis.

Adopting this definition, however, raises the question: Who constitutes "the public"? Blumer (1946), an early critic of polling practices, defined *a public* as "a group of people (a) who are confronted by an issue, (b) who are divided in the ideas as to how to meet the issue, and (c) who engage in discussion over the issue" (p. 189). However, Glynn et al. (1995) noted that in public opinion research, the public writ large includes those individuals whose opinions are considered relevant to a public issue (for example, marriage rights for same-sex couples), but who may not be very involved with an issue or issues, have a personal connection to one, or have thought much about such an issue. This follows Dewey (1954), "that there exist a plurality of social groupings, good, bad, and indifferent" (p.73). The "public" in public opinion is a plurality of *publics.*

A second definition of public opinion that I adopted for this study uses it as an adjective-noun combination; that is, an opinion or opinions that have been made public (Krippendorff, 2005; Salmon, 2012). As such, Noelle-Neumann (1984) defined public opinion as "opinions on controversial issues that one can express in public without isolating oneself" (pp. 62-63) according to social norms. A more encompassing definition is *any* viewpoint expressed in public. This definition is relevant to questions such as, When individuals participate in public opinion gathering, what have been their experiences? What are their expectations of privacy? What uses of their opinions are acceptable?

2.1.2 Forms of Public Opinion Expression

In the past 100 years in the United States, the most sanctioned form of public opinion expression is the statistical poll, otherwise known as the sample survey, offering full anonymity, a relatively new development in history. This survey form limits the possibilities for opinion expression, in the spirit of the second definition of public opinion (i.e., an opinion that has been made public). Alternatively, we can recognize any form of communication undertaken publicly by a collective group of persons as an expression of public opinion. For example, rioting is a clear expression of dissatisfaction with governing institutions. There are many instances of this: The French Revolution in the late 1700s; the Arab Spring, which blossomed in 2011; and protests in the city of Ferguson, Missouri in 2014. Another form of opinion expression is the presentation of concerns through petition. This practice has a long history in England: The presentation of parliamentary petitions by individuals and groups regarding grievances, often of a personal nature, dates to the 1300s (Myers, 1937). Petitions to governmental bodies

around the world—local and national—continue today abetted by the Internet. In the seventeenth century, as democratic ideals flourished, coffeehouses served as gathering places for discussion (Oldenberg, 1997) and prior to and following the French Revolution, private salons thrived and served as spheres of public opinion in Paris (Habermas, 1991; Kale & Kale, 2005).

With regard to polling, straw polls, popularized in the 1800s, were conducted by lay individuals who informally polled their friends or persons around them or by journalists who would poll people at a specific locale for their opinions on a topic, which were subsequently published by newspapers. Straw polls did not produce statistically valid results, but they did serve as a way to engage people in issues (Glynn et al., 1995). In the United States from 1915 to 1936, the predominant national poll was fielded by *Literary Digest*. It was distributed throughout a large pool of respondents (more than 10 million persons in 1936) who were neither randomized nor balanced using quota sampling (Squire, 1988). Failure by *Literary Digest* to correct for response rates (nonresponse bias) led to an inaccurate forecast of the winner of the Presidential Election of 1936. Famously that year George Gallup was able to demonstrate a superior polling method that gained him notoriety. Gallup's poll relied upon random selection of participants and quota sampling that matched the attributes of the respondents to the attributes of the expected electorate (Igo, 2006).

Gallup established a new standard for public opinion surveys based on large samples, random selection of respondents, and anonymity of responses. Today, these techniques are applied across a range of poll types from issues polls to ratings of candidates. Some scholars argue that this has led to the "rationalization" of opinion; in

effect, it changed the idea of opinion from something that is determined or associated with an individual's values, which are not quantifiable, to something that is measured (Cantrell, 1992; Herbst, 1993). A guarantee of anonymity, which has many beneficial effects in terms of reducing bias from fear of social consequences, has fostered the expectation that when an opinion on political matters is shared with a pollster it will not be made public on an individual basis; rather, it will be part of the sum of public opinion writ large. This norm is relevant to my research. For example, I predicted that when faced with the circumstance of having one's opinions "made public" (i.e., associated with the individual's name and/or face) beyond the limited circles in which an individual feels control (e.g., personal Facebook page), a person will become uncomfortable—for a variety of reasons.

2.2 Technologies for Public Opinion Expression

In the twentieth century, media technologies have evolved from supporting a unidirectional collection and transmission of information, i.e., from fixed perspectives to supporting the generation and transmission of information from multiple perspectives on channels that enable feedback loops among participants and promote greater engagement. These developments are changing the ways by which public viewpoints can be expressed and the processes of gathering, interpreting, and (re)presenting public opinion.

A national or local survey that is administered by an institution or an official represents a one-way mechanism of institutionally sanctioned data collection. The results are distributed through newspaper and television reports and are often combined with expert interpretation. In contrast, networked digital media offer new places for debate and discussion on-line that enable interaction among participants. Examples of cyberspace

places that enable two-way participation with public issues include (a) blogs with comment sections, (b) virtual town halls, (c) live on-line polls and chat forums, (d) combination face-to-face and chat channels, and (e) mass media programs featuring convergent media forms such as television talk shows augmented by Twitter where experts and lay audiences can interact in real-time to shape the conversation.

My consideration of new technologies for enhancing public opinion embraced both traditional and emergent practices in public opinion expression—the latter made possible by networked, mobile, and computational media. The next sections provide a survey of technologies used in the data collection (opinion gathering) and presentation (opinion [re]presentation) phases of the public opinion production process. In these sections, I examine practices that are both mainstream (legitimized) and marginal (activists and advocates).

2.2.1 Traditional Practices

Institutional practices rely on scientific and systematic approaches to collecting and analyzing opinion data using quantitative (numerical) or qualitative (words, observations, etc.) methods, or, in some instances, a combination of both. Through such means one can make accurate predictions related to prevailing viewpoints held by members of the public on issues or candidates if one's predictive model and sampling strategy are a good fit to the real world. Activists and advocates who are less interested in predicting the future than with influencing the present and who possess far fewer resources than institutions and less overall public legitimacy or access to media channels rely on less formal procedures.

Data Gathering and Expression

Quantitative: Survey Evolution

Ironically, early conceptions of the survey comprised a range of data-gathering methods, including the interview, direct observation, questionnaires, and review of records. Jean Converse (1984) wrote in her extensive history of survey research in the United States that survey research has its roots in the *social survey* that was pioneered in England by Charles Booth at the turn of the twentieth century. Aimed at documenting conditions of poverty with the goal of providing needed evidence for reform, Booth and other early proponents of survey methods used approaches more akin to today's case study methods than techniques of standardized questionnaires (Bulmer, Bales, & Sklar, 1991). In the U.S., the use of the social survey at a local level as a tool for community improvement was used notably in an urban setting directed by Paul Kellogg in what came to be known as The Pittsburgh Survey; similar work was conducted by others with rural populations as efforts to improve country life (Greenwald & Anderson, 1996).

This type of social survey declined in the 1930s as interest increased in using surveys, not for advocacy but for scientific discovery, with sociologists from the University of Chicago advocating for more disengaged approaches. (Bulmer et al., 1991) A new type of survey, the sample survey, came to the fore with its focus on (a) measurement techniques such as standardizing wording of questions to increase reliability and (b) improving sampling through selection techniques such as cluster sampling and randomization. These new techniques set the stage for investment in the field of survey research by the federal government; by the mid 1930s, surveys of rural attitudes, a national health survey, and election-related inquiries were among the

government-sponsored activities, with ever-increasing emphasis on empirical rigor (Marsden & Wright, 2010).

As stated in the Introduction, during the 1940s a debate arose regarding competing methods of data gathering known as the closed- and open-ended debate (Converse, 1984). This debate arose, in part, due to differences in opinion-gathering practices developed for agricultural surveys, which relied more on interviewing people, and those developed by marketers, who favored closed-ended question items. Those backing closed-ended questioning on surveys prevailed, but as this brief history of survey research shows, survey methods historically have included research activities beyond the standardized questionnaire.

In mainstream practices throughout the years, surveys have been administered with a variety of modes. For example, mailed pencil-and-paper surveys; random digit dialed telephone surveys, including computer-assisted interviewing (CATI); interactive voice response (IVR); and web-based surveys (Couper, 2011). Typically, surveys preserve the anonymity of the respondents and often balance the respondent pool through quota sampling to match the characteristics of particular group of interest, e.g., "likely voters." Many surveys used at the national level are well-established and have been fielded repeatedly, such as the American National Election Studies (ANES) conducted by the Center for Political Studies at the University of Michigan (see www.electionstudies.org). ANES data show chronological trends of characteristics of the U.S. electorate and its attitudes toward general and specific issues.

By contrast, activists who often are limited by their circumscribed scopes of influence, work diligently—either in local chapters supported by a national organization

or simply on their own—using petitions or informal surveys to demonstrate the existence of views that are counter to those expressed in sanctioned surveys and advocate for their inclusion in decision making. Many of the efforts of activists function, in part, as community engagement and agenda-setting activities for organizing opposition to public policy. An example of this type of activity would be a door-to-door survey regarding the use of nuclear weapons fielded by a national advocacy group (e.g., Greenpeace) and administered by volunteers at their local chapters across the country.

Qualitative Methods

Converse (1984) noted that until the great debate of the 1940s, open-ended interviewing had been a component of the survey process, dating to the days of the social survey. Interviewing was a central feature of practices at the U.S. Department of Agriculture in the 1930s, which sent "scouts" into the field to learn and understand how farmers responded to New Deal policies created to stabilize economic conditions (p. 51). During this time, several issues generated tension among leaders in market research. They struggled with methodical questions about how much the process should be standardized, including (a) the desire for informality and naturalism to put respondents at ease, (b) the differing levels of interviewers' data-gathering skills, (c) the effects of interviewer bias, and (d) the potential for interviewer cheating on the reliability of results. As Converse noted, these controversies continued well beyond the 1940s (pp. 95-97).

Today, institutions typically gather qualitative data through third-party research organizations and consultants to determine the reasons for and other qualitative aspects of an opinion, to augment survey data, or to inform the construction of future surveys. Knowing how people talk about an issue, in vernacular terms for example, is useful for formulating ways to persuade members of the public to accept decisions from an

organizational, policy, or political perspective. Typical activities involve in-depth interviews with individuals and focus groups. Another way institutions gather such information is through public meetings, for which they have the resources to plan and organize the agenda, plan activities allowing more or less public participation, and promote engagement. As with quantitative methods in the twentieth century, methods have evolved to enhance the selection of samples, which, for example, can be purposive or randomized, and to control bias in data collection and analysis.

Traditionally marginalized populations (i.e., activists and advocates) are more at home with qualitative methods because stories are an important feature of resistance efforts. Resource constraints, however, often prohibit formal processes to collect and analyze systematically narrative data. Such efforts are labor intensive. Advocates also often must rely on untrained volunteers and convenience or snowball (referral by interviewees to others) samples to build evidence in an anecdotal fashion for their case. Tactics include organizing individuals to present personal or eyewitness accounts at public meetings and conducting letter-writing campaigns.

Activists and advocates have a history of creating their own records or accounts using alternative or independent media to publicize critical opinions that are underrepresented in the media. By the 1960s, portable video cameras (e.g., *Portapak*) and improvements in amateur film formats (i.e., *Super 8*) introduced the public to motion picture making and contributed to calls for a revolution in the making and distribution of media. As Shamberg (1971) described in his classic text, "Guerilla Television is grassroots television. It works with people, not from up above them. On a simple level, this is no more than 'do-it-yourself-TV'." A notable instance of community engagement

through media making was a project that occurred on the Fogo Islands in the 1960s. During that time, the National Film Board of Canada's (NFB) Challenge for Change program granted film and video equipment to remote or underserved communities so that they could record accounts of their lives and social issues. Under this program, filmmaker Colin Low and community development worker Donald Snowden worked with people on Fogo Island in Newfoundland to produce a series of short films detailing their lives. This work formed the basis of recommended techniques for community filmmaking eponymously known as the *Fogo Process.*

White (2003) wrote about the Fogo Process in *Participatory Video,* a compendium of cases on the use of video in community development. She noted that Low advocated for short films about the community featuring a unique structure, which he coined, "vertical" films versus "horizontal" films. The shorts featured only a single interview (vertical), rather than intercutting among persons with different viewpoints (horizontal). Low believed that this technique allowed an individual to present his or her perspective without interruption or competition. This undermined framing either "right" or "wrong" perspectives or adversarial positions within the media piece and minimized the risk of disadvantaging or disenfranchising someone in the process. White noted that when these shorts were juxtaposed in a series of screenings:

> What seems decisive to me is that individuals are able to overcome their isolation from one another and see a collective representation of their community. The creation of a sense of community depends upon the ability to project a collective image where none previously existed . . . the process of seeing oneself on film is empowering because it creates . . . an "imagined" community. (p. 131)

In recent years, *Photovoice* projects have been used for community mobilization around social needs, particularly in health education and public health. For example, in South Africa's *EQUITY Photovoice Project*, educators gave youth cameras and assisted them with photographing and telling stories about issues in their communities. They organized their work into an exhibit, and—in a strategic move—policy makers who could influence those issues were invited to the exhibit. The *Photovoice* technique is attributed to the work of Wang and Burris (1997) at the University of Michigan who acknowledged their debt to the late, highly acclaimed educational philosopher and activist, Paulo Freire *(The Communication Initiative*, 2011).

The case studies from *Participatory Video* and *Photovoice* projects clearly demonstrate that media making can be a catalyst and tool for dialogic problem solving, collective action, the building of networks, and effective communication with policymakers whose decisions influence our lives. One can find guiding principles within these case studies for working with community members to produce media artifacts (e.g., interviews) across different media formats (video or audio) and visual evidence (e.g., photographs) for making viewpoints visible. Traditional media examples are just as relevant in the age of digital media: the social factors within communities critical to participation are the same today as in the era of analog media.

Gatekeeping and Dissemination

In representing data—shaping and presenting public opinion—institutions traditionally have an advantage due to their superior access to and control of mass media channels, although in the digital age syndicated news sources must compete in an increasingly fragmented environment. Institutions also have the resources to field large surveys on a

range of topics that enable them to make news when the results are released. Public opinion in the news is reported typically in numerical form with results represented in the form of statistical charts and graphs of aggregated data. Although investigative news and documentary programs bring more singular and critical viewpoints to the fore, media executives, who must balance business interests, decide what issues will be presented and when, not advocates. To publicize public viewpoints outside the margins of sanctioned discourse, advocates stage actions such as protests and demonstrations to create news.

Table 2

Traditions in Public Opinion Gathering and Expression

	Mainstream	**Marginal/Activist**
Opinion-Gathering Practices		
Quantitative	Large-scale opinion surveys, Computer Assisted Telephone Interviews (CATI), mail surveys	Small-scale opinion surveys, door-to-door petitions, mail surveys
Qualitative	In-depth interviews, focus groups using accepted methodology, public meetings	Stories and anecdotal accounts, testimonials at public meetings, letter campaigns, demonstrations
	Public issue programs, news stories and documentary reporting	Social issue, investigative, and participatory documentaries; media advocacy, letters
Opinion Presentation Practices		
Quantitative	Mass media channels, reporting of polling results in the statistical forms	Delivery to policy makers, news-making as possible with access challenges
Qualitative	Public meetings, public engagement sessions, news reports	Public meeting participation, public gatherings and demonstrations, media screenings (prior to Internet)

2.2.2 Emergent Practices

Today, with the rapid growth of networked and mobile digital media in the form of social media channels that promote sharing, institutions, the media, groups, and individuals connect by way of bidirectional, multi-noded communication paths. These paths have (a) forged new data streams for assessing the viewpoints of the public, (b) collapsed the collection and presentation phases, (c) created new avenues for expressing public opinion, and (d) increased the public's participation in political life (Gil de Zúñiga, Molyneux, & Zheng, 2014). Examples include on-line protests occurring simultaneously with events on the ground, interactive polling and on-line data visualizations, and on-line town halls with government officials (Farina, Newhart, Heidt, & Solivan, 2013; Grossman, 2009; Ivanov, Erickson, & Cyr, 2006). Technological developments support the distribution of stories via video accounts to mass audiences through the Internet; since 2006, when YouTube emerged as a mainstream channel, video on the worldwide web has reached millions of viewers with YouTube, even though the capabilities existed in 1997 (Lovink & Niederer, 2008).

From Land to Cyberspace

By 2012, more than 85% of the American public accessed the Internet regularly, and institutional practitioners of public opinion research increasingly used Internet-based research methods for quantitative measurement of opinions (Pew Internet & American Life Project, 2012). Following the Internet revolution, the market for mobile technologies skyrocketed across all demographics in the U.S., resulting in a decline in the use of land-based telephones. On the global level, the number of mobile phone subscribers overtook the number of fixed-line subscribers in 2002 (Feldmann, 2003), and the number of

smartphone users is increasing at a rapid pace. In the United Kingdom, more than 70% of all persons between the ages of 16 and 64 years reported owning a smartphone (Maxl, Döring, & Wallisch, 2009). In the U.S., more than 55% of all cell phone owners reported possessing a smartphone, with declining disparities in ownership among lower age brackets due to socioeconomic status (Smith, 2013). Increased use of cell phones over land lines has contributed to declining response rates to fixed-line random digit dialed surveys, making the move to mobile lines by survey researchers ever more important.

Public opinion experts acknowledged that declining response rates for traditional telephone surveys were potentially affecting the quality of the results, although some studies suggested otherwise (Price, 2011). Starting in 2008, the industry began earnestly considering the use of smartphones for market and opinion research; smartphone technology also offers video and multimedia data collection possibilities (Bailey & Wells, 2012; Tarkus, 2009). In 2011, leading marketing research firms were seriously discussing the use of mobile survey methods in industry conferences, but the methodologies were only in the pilot stage (Graham & Conry, 2011).

Researchers also have turned to the Internet for qualitative studies. The use of qualitative methods has become a more viable option as the digital divide has narrowed to the point that it is less a divide per se among higher and lower income groups than an unevenly distributed inequality in terms of access speed and skills (DiMaggio & Hargittai, 2001; Stiakakis, Kariotellis, & Vlachopoulou, 2010). As one researcher noted, "the vast majority of social spaces on the Internet bear a remarkable resemblance to real locales" (Kitchin, 1998, p. 395). Networked media provide a rich source of study data and participants, and researchers have been honing their methodological practices such as

on-line focus groups since the mid-1990s (Lang & Hughes, 2004; Schneider, Kerwin, Frechtling, & Vivari, 2002; Stewart, 2005).

With these new avenues for data collection, research and media institutions' costs for reaching respondents have declined, and their interest in mixed modalities for the collection of opinions has increased; for example, the combining of face-to-face interviews with mobile data collection. However, researchers have noted that the use of networked and mobile technologies can introduce threats to the validity of survey results from biases in populations using these technologies as well as self-selection by respondents. Researchers are studying ways to mitigate these effects (DiSogra, Chan, & Dennis, 2011).

From Many-to-Many

As mainstream institutions struggled with issues of validity and reliability of measuring public opinion gathered using digital media, advocates and activists used networked and mobile media with increasing effectiveness as a means of political expression and public mobilization. The enabling affordances of networked media have accelerated the pace by which information can be generated, exchanged, interpreted, and acted upon, thereby shifting the balance of power away from institutional forces. Now, marginalized publics—activists, special interest groups, advocates, and citizens alike—can connect with and influence members of the larger public; they can create on-line content that can "go viral" and be seen directly by policymakers.

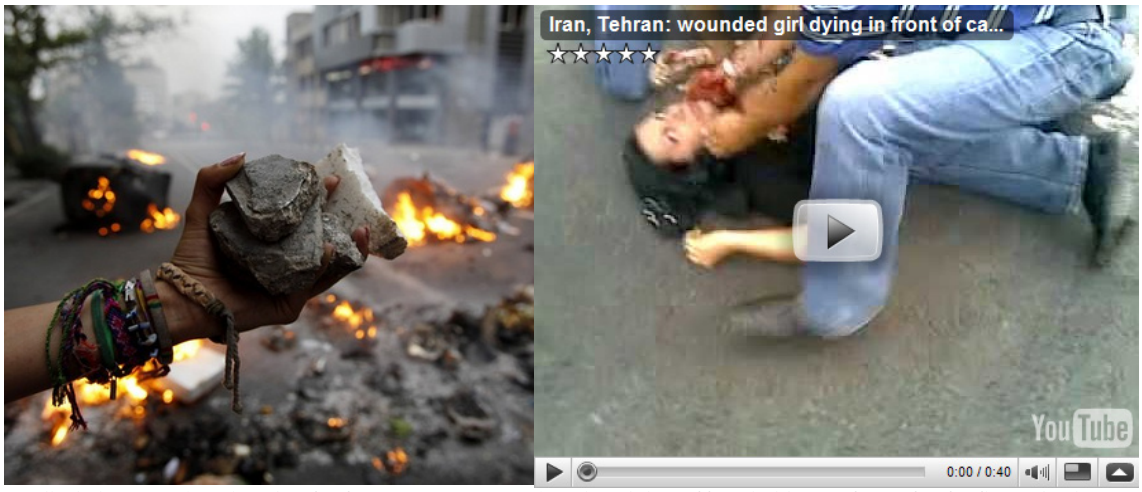
Citizens and advocates can set the agenda through organized efforts online and shape narratives that influence public opinion by connecting events. Riots in Ferguson, Missouri in 2014 in response to the police shooting of an unarmed young man, Michael

Brown, were fueled in part by linkages to the killing of another teen, Trayvon Martin, in 2010. In the latter case, the event—in less than two months—prompted more than 2.26 million people to sign an on-line petition calling for the arrest of the man who confronted Martin and killed him (Change.org, 2012). The petition itself was not a poll, but a powerful expression of public will. A poll fielded during the same period by Reuters/IPOS painted a more divided picture, but was summarily contested (Charles, 2012; Barro, 2012). The Ferguson event led quickly to open discussion around the country regarding excessive use of force by the police through the sharing of videotaped accounts showing violence.

The 2009 Iran election is an oft-cited early case in which networked technology afforded thousands of people the opportunity to amplify their viewpoints in real time as the story of a contested national election unfolded. On June 12, 2009, the elections were held; it was reported that the incumbent, Ahmadinejad, had won with roughly 62% of the vote to about 33% of the vote for his challenger, Mousavi. Pictures from amateur photographers of people voting appeared on Flickr.com, a photograph-sharing site.

The election results were reported on Wikipedia and immediately contested not only in traditional news reports, but also on the short text message platform, Twitter.com. Twitter enables comments from a single person to reach his or her "followers" or those following a particular hashtag, who, in "retweeting" the comments, extend the individual's reach to potentially millions of people. In the days after the elections, street protests began as citizens disputed the legitimacy of those elections. Social media transmitted news of these events to the world. Protesters used mobile phones during

protests to record and transmit events beyond Iran's borders, thus drawing international attention to the uprising.



Credit: kaka.0098 (Retrieved 10/25/09 http://mashable.com/2009/06/21/iran-electiontimeline/)

(Retrieved: http://mashable.com/2009/06/21/iran-election-timeline/#disqus_thread 10/31/2009, 1:38 PM)

Figure 4. Connecting with strife in Iran post-elections. Credit: Unnamed protesters.

As protests continued, people updated the Wikipedia entry for the elections and reported daily events on Twitter. As the violence escalated, the death of a young protester, Neda Agha-Soltan, was captured on camera and posted to YouTube, sparking outrage. Then, the events were amplified on mainstream news channels (e.g., CNN) and in on-line news outlets such as *The Huffington Post*. To date, this scenario has been repeated many times, resulting in the reversal of the traditional news-making and gatekeeping role of major media organizations.

Non-professional media makers are now empowered to capture and comment on their world as makers of moments and as interpreters of them, leading to an explosion of multiple viewpoints on events of political importance. The rich media affordances of the Web enable the creation and delivery of video and collaboration among on-line users through social media applications such as Facebook, YouTube, Instagram, and more. Community applications like Yahoo Groups, Ning, and, in the U.S., Nextdoor.com, allow

one-to-many and many-to-many relationships, accelerating both the formulation and dissolution of groups and publics.

Battle w/ Police - Tehran, Iran - June 20th 2009
by mightier-than

6:55 PM ET -- A bit more on Neda. A blogger apparently in touch with Neda's family members offers some new details (translated by reader Nima): she was born in 1982, apparently her full name was Neda Agha-Soltan, and she was at the protest with one her professors and several other students. She was, they said, shot by a basiji riding by on a motorcycle. Also, she was apparently buried today at a large cemetery in the south of Tehran. ABC News' Lara Setrakian writes, "Hearing reports Neda was buried in Behesht Zahra cemetery earlier today, memorial service cancelled on orders from authorities."

Figure 5. The Huffington Post: Iran election live-blogging.

Increasingly, these technologies are being colonized by institutions. The advantage of using such channels to engage the public was well-demonstrated in the 2008 election when the Obama team effectively used Facebook to organize supporters across the country through local parties, etc. Post-election, Obama's team effectively used change.gov to enable people across the country to communicate with the Administration through the submission of questions and issue concerns (Clark & Aufderheide, 2009) and

by holding *hangouts* on Google, Twitterchats, and Twitter *town halls*, all of which have become routine methods of communicating. Each of these mechanisms represent new venues through which individuals can express their opinions directly to policymakers.

Tailoring Reception

Despite on-line developments, a 2013 study that collected more than 600 responses on television viewer habits, dynamics, and behaviors, confirms that television is still a major platform despite other Web offerings (Abreu, Almeida, Teles, & Reis, 2013). Television broadcasts provide a unique opportunity to use cross-platform media approaches to engage technologically connected and adept viewer/participants. Opportunities include using mobile video captured by citizen journalists (Murray, 2012), live Twitter feeds during political events (Shamma, Kennedy, & Churchill, 2009), promoting interaction using mobile devices during TV shows (Geerts, Cesar, & Bulterman, 2008), and supporting social interaction during and after television programming (Antonini et al., 2013).

In conjunction with traditional broadcast channels, the affordances of networked, mobile, and computational media enable people to engage in new ways with news and opinion information. Affordances include being able to tailor news, stories, and data of interest; for example, the *MyNewsMyWay* project focused on ways in which professionally produced news material could be personalized by viewers and shared socially, challenging the traditional top-down news production cycle and model of consumption (Koponen & Väätäjä, 2009). Examples of this type of work include the *NewsCube* application, which parses on-line text articles using keywords and weighting to arrange differing viewpoints on a topic in an on-line browsing structure, with careful

attention to layout (Park, Kang, Chung, & Song, 2009); and the *Videolyzer* application, which enables consumers and journalists to annotate on-line videos and to augment automated content analysis to further assess information quality, including level of bias (Diakopoulos, Goldenberg, & Essa, 2009).

For viewers to be able to shape what they receive and to amplify their viewpoints through sharing with others alters the force of mainstream media influence on public opinion. Mobile applications that enable continuous interaction with news information, immediate feedback from users, and the use of location data offer many unexplored possibilities for novel types of news experiences. One example is the *New York Times* interactive application"Thoughts for a Second-Term President," in which Washington, DC residents provided commentary (Davis, Niedermeyer, Spangler, & Williams, 2013). The use of *second screens* to add depth to the television experience is well underway (Doughty, Rowland, & Lawson, 2012; Romero, Ahn, & Hardman, 2013).

Table 3

Transitions in Public Opinion

	Institutional/Mainstream	Non-institutional/Activist/Advocate
Opinion Gathering & Expression		
Quantitative	Probability-based on-line panels and internet surveys; media channel "straw polls"	Self-selected, convenience sample on-line surveys, straw polls, petitions
Qualitative	Internet intercept chat; on-line focus groups; textual analysis of blogs and social media streams	Organized on-line and email input to institutions, elected officials, media outlets; social media outreach
	Mass media channel convergence with on-line and mobile media channels, real-time participation from viewers using social media	Social issue, investigative, participatory documentaries; media advocacy; on-line dissemination and outreach
Convergent & Multi-modal	On-line data mining, "multi-modal" survey techniques (CATI, Internet, & mobile), mixed methods	Web 2.0 technologies: rich and social media; on-line groups and forums; live events & networked and mobile media (demonstrations, flash mobs, etc.)
Opinion Presenting: Representation/Interpretation		
Quantitative	Mass media channels, reporting of polling results in statistical forms, information visualization and interactive news graphics	Results of surveys and polls communicated in real-time or quickly
Qualitative	Public meetings, public engagement sessions, Web sites, news reports, on-line video, graphics, text (e.g.,Twitter)	Use of viral videos (e.g.,YouTube, Facebook), on-line media channels (e.g., LinkTV); social media channels (Facebook and Twitter)
Convergent & Multi-Modal	Live mass media augmented by live social media	

CHAPTER III

RELATED WORK

In the field of public opinion research, the systemic *coupling* of closed-ended questions with open-ended questions to examine underlying arguments and narrative patterns has been explored to a limited degree, particularly by Brugidou (2003). Although the inclusion of qualitative response mechanisms in surveys is not new, few, if any, surveys have presented a *series* of paired closed- and open-ended response mechanisms to probe systematically why choices are made *across a set of questions* that can result in a corpus of text from each respondent. Tight coupling is a key step to overcoming the divide between quantitative and the qualitative approaches of expressing the rich, interrelated perspectives of opinion from individuals and groups. Once opinions expressed by numbered choices are bound with words—the narrative content behind the choice—these two types of data can be used in tandem in analysis and presentation. Also, the formidable task of sorting through unstructured, qualitative information can be automated, in part and visualization supported (Stoneman et al., 2013).

This chapter will present work related to tackling this complex problem space from a range of subdisciplines in the computer and social sciences. From the technology aspect, rather than detailing all relevant findings, I will discuss key projects and principles that are most relevant to tackling the problem space. Highlights will include (a) successful interaction practices or user experience strategies for mobile surveys and devices, (b) relevant tangible user interface models and techniques for designing tabletop interaction, and (c) data visualization principles. From the social sciences, I will focus on

theories, concepts, and constructs for formulating the claims and hypotheses of the study. Drawing on practices from the social sciences, I will end by detailing how these claims will be investigated using a case study design employing mixed methods.

3.1 Mobile Survey Methods

Recent investigations in survey research methods regarding mobile surveys have focused on concerns that commonly occupy researchers; for example, mode effects, response rates, question layout and wording, and usability (Couper, 2011; Millar & Dillman, 2012; Peytchev & Hill, 2009; Tarkus, 2009). Guidance on the survey length and layout was important to this study in addition to the design heuristics offered in the human-computer interaction (HCI) literature (Bertini, Gabrielli, & Kimani, 2006). Also relevant to formulating a sampling strategy are classic challenges to constructing representative samples of persons and overcoming biases due to technology use (Graham & Conry, 2011). When considering whether to field a survey remotely or face-to-face, typically, studies outside of HCI have employed surveys that are remotely delivered or *pushed* to desired respondents. However, content is increasingly *pulled* from more actively involved participants. For example, one investigation had students capture cultural trends they identified using pictures and short text explanations via multimedia messaging services (MMS) (Wallisch & Studler, 2009). A mass media-focused effort involved an application sent to more than 700 members of a standing panel during a royal wedding; respondents answered a close-ended survey item and attached rich media (i.e., pictures and/or text) (Atkinson & Conry, 2012). In the field of HCI, Experience Sampling Methods (ESM) feature a *diary* approach, with participants annotating pictures or video, retrospectively or in real time using rich-media phone functions and short message services (SMS) or MMS

(Carter & Mankoff, 2005; Gerken, Dierdorf, Schmid, & Sautner, 2010; Yue, Litt, Cai, & Stern, 2014).

In the specific domain areas of urban planning, public health, and design, numerous projects have explored how the rich media functionality of mobile devices can increase community engagement and improve understanding among lay participants and professionals. The *PhotoVoice* technique, mentioned previously, in which community members document their concerns on subjects by capturing their environment, has been used with youth safety and neighborhood violence, transportation and master planning (da Silva-Vieira & Antunes, 2014), and diverse public health assessments (Barlow & Hurlock, 2013). In design, mobile MMS platforms have been used to garner reflection from participants about the ways they live in context (Hagen, Robertson, & Gravina, 2007) and to support the construction of narratives from captured experiences. Advantages cited by authors include the generation of richly thematic content, support for storytelling, and better understanding of problems under investigation (Poppinga, Oehmcke, Heuten, & Boll, 2013).

3.2 Tabletop Tangible Interaction

The use of interactive surfaces have become more common in television broadcasting, from John King's *Magic Wall* on CNN to EPSN's *SportsNation*, but as of 2014, their use is not well-documented in the computing literature. The goal of this study was to move interactive displays from the wall to a touch-sensitive studio anchor desk surface with added tangible user interface controls as part of the overall design. This strategy was selected after studying performance challenges experienced by on-air performers introduced by vertical displays, which include the reporter/broadcaster occluding the

display from viewers or having to turn away from the camera to manipulate an image or, in John King's case, a data visualization (Robinson, Mendenhall, Novosel, & Mazalek, 2010).

Touch-sensitive tabletop surfaces combined with tangible user controls are well-suited for having more than one person interacting with content and collaborating with others. Tables have been used for these purposes for centuries, without computation, for discussions, games involving groups, teaching, design work, and more. Tables are often used in conjunction with objects; for example, scale models for visualizing structures, game sets, or exhibit materials.

Figure 6. Tangible viewpoints system. Adapted from "Tangible Viewpoints: A Physical Approach to Multimedia Stories," by A. Mazalek, G. Davenport, and H. Ishii, 2002, *Proceedings of the 10th International Conference on Multimedia*, (pp. 153-160). New York: ACM Digital Library.

Interactive surfaces, tabletops, and tangible objects have been used in live performances and for storytelling in a variety of domains. *Tangible Viewpoints* engaged users in creating an interactive narrative (Mazalek, Davenport, & Ishii, 2002). Participants using

this system contributed video clips that were assigned to a *character* for the purposes of telling stories. Users accessed the database of clips on a tabletop interface through *character* tokens that triggered the querying, displaying, and further processing of the clips (Mazalek & Davenport, 2003). The *reacTable* (Kaltenbrunner, 2009) and *mixiTUI* systems enabled live musical performances on tabletops by providing performers with both touch and tangible controls; *mixiTUI* viewers reported that tangible user interfaces (TUIs) enriched their viewing of a musical performance because it enabled them to observe how musical content was being manipulated (Pedersen & Hornbæk, 2009). These examples serve as reminders of the importance of visibility of action for tasks involving shared cognition among two or more participants, multifaceted content, and onlookers.

3.3 Tangible User Interfaces (TUIs)

Tangible user interfaces, or TUIs, were defined broadly by Shaer, Leland, Calvillo-Gamez, and Jacob (2004) as

> a set of relationships between physical objects and digital information. These relationships are defined by the TUI developer and may be instantiated by the user. After a relationship has been instantiated, a user may manipulate physical objects in order to access or manipulate digital information. (p. 361)

Shaer and colleagues followed a paradigm established earlier by researchers (Fitzmaurice, 1996; Ishii & Ullmer, 1997; Shaer et al., 2004; Ullmer & Ishii, 2000). TUIs feature objects both as a *control* for digital information and as a *representation* of information. A defining characteristic of TUIs is the seamless integration of the physical with the digital. This is achieved by affording the use of physical controls with direct

manipulation of digital information (Ullmer & Ishii, 2001). Figure 7 shows Ullmer and Ishii's vision of instantiating the digital in the physical as shown in Ullmer's dissertation.

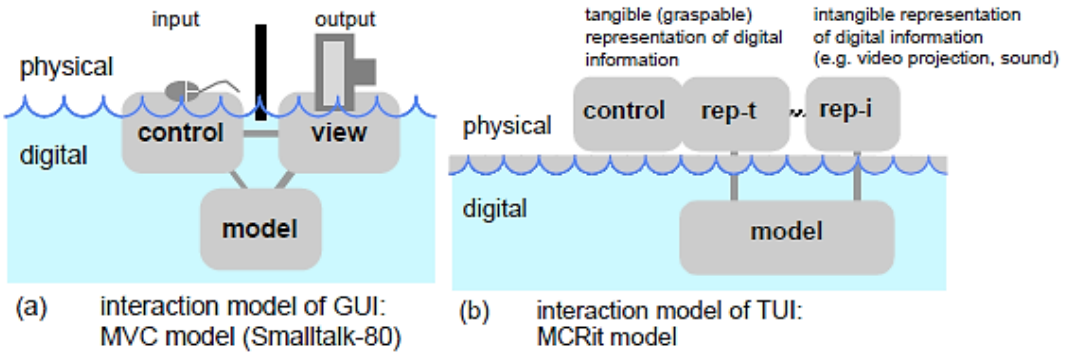


Figure 7. GUI compared with TUI interaction mode. Adapted from *Tangible Interfaces for Manipulating Aggregates of Digital Information* (Doctoral Dissertation, MIT, Boston, MA), by B. A. Ullmer, 2002, p. 58.

Ullmer (2002) discussed the design space for tangible interfaces as including the basic components of interactive surfaces, examples of which could be an interactive table, or constructive assemblies,or token and constraint systems, which consist of tangibles tied aggregates of digital information. Ullmer's design space expanded Holmquist, Redström, and Ljungstrand's (1999) basic categorization of TUI artifacts as containers, tools, and tokens. Containers are defined as "generic objects used to move information between different devices or platforms." Tools are defined as things which "actively manipulate digital information" and lastly, tokens are defined as "objects that physically resemble the information they represent" (p. 234).

It is useful to examine how tangible user interfaces (TUIs) differ from graphical user interfaces (GUIs) to avoid constraining one's approaches to the design. TUIs and GUIs share direct manipulation and continuous presentation features, but differ in two main areas: first, GUI input is serial, i.e., one action at a time. Even if the actions are being undertaken by two users (e.g, using two keyboards and mice) typically these will

be threaded (modern video games are not an example of this). Second, GUIs typically involve discrete interaction—the completion of one action prior to the next. However, TUI interfaces (e.g., multi-touch screens or interactive tabletops that track multiple tangible objects) allow continuous interaction from more than one user. Table 4 presents other comparisons between GUIs and TUIs.

Table 4

Comparison of GUI Features and TUI Features

GUI Feature	**TUI Feature**
Serial input	Multiple users can simultaneously interact with multiple actions; input is logically parallel
Discrete interaction	Continuous interaction and discrete interaction
Standard input/output devices	No standard input/output devices
Each widget encapsulates its behavior	Multiple behaviors: behavior of objects is not determined by physical object alone, but also by that object's interactions with other physical and virtual objects
In an interactive graphical system there are six fundamental interaction tasks: select, position, orient, path, quantify, and text.	In a three-dimensional, physical world, there are numerous activities that can be performed with, or upon, any physical object (e.g., squeeze, stroke, toss, push, tap, pat, etc.). Hence, the designer is charged with selecting and defining which are the meaningful actions
The MVC model highlights the separation of a GUI into a view, (provided by the graphical display), control (provided by the mouse), and keyboard, and (computational) model.	Taking MVC as their basis, Ullmer and Ishii presented an interaction model for TUIs, the MCR, which highlights the integration of representation and control in TUIs.

These comparisons are adapted verbatim from The TAC paradigm: specifying tangible user interfaces, (Shaer et al., 2004), by Shaer, O, Leland, N., Calvillo-Gamez, E.H.,& Jacob, R.)

3.3.1 Interaction Design

Mazalek and Van den Hoven (2009), in their review of tangible interaction frameworks, found little to no frameworks that provided a set of heuristics or guidance to designers on building usable systems, either in a generalizable form or within a particular domain, such as those found for general user interface design, presented by Nielsen and Molich (1990) and later revised by Nielsen and Mack (1994). For the purposes of this study, I created a provisional set of heuristics for design by combining Nielsen's basic user interface design heuristics with those proposed by Gerhardt-Powals (1996): The latter focuses more on general cognitive factors and other guidance from various studies.

The motivation for using tangible user interfaces (TUIs) for the studio presentation system was to add visual interest for audiences and to make actions visible to studio cameras and, consequently, audiences. However, the table our design team used also allowed touch interaction, so we included this action as part of the overall possibilities. Therefore, one issue with the system's design was determining the control functions to assign to tangible versus touch interaction. One research goal was to collect more data about user preferences. Although user preferences and interface conventions are evolving, prior research on touch versus tangibles is available, and hybrid surface systems featuring both touch and tangible controls are discussed (Kirk, Sellen, Taylor, Villar, & Izadi, 2009). In one evaluation, typical functions for which TUIs are used, such as rotation and translation to create spatial layouts, were performed by study participants using both types of controls; performances were timed. Participants reported that using tangibles was easier. Also, tasks were completed more quickly than when using touch controls (Lucchi, Jermann, Zufferey, & Dillenbourg, 2010). This research confirmed

other findings that using real-world metaphors for TUI's made working with tangibles easier. Another study compared touch and tangibles in manipulation and acquisition tasks; users found tangibles easier to use (Tuddenham, Kirk, & Izadi, 2010).

3.4 Information Visualization

News outlets have mainstreamed the use of data visualization for all types of data and new types of journalism are now possible by the availability of large datasets and computational tools. It is common to view opinion data and information about political participation represented online by interactive graphical formats. An example of this interactive graphical format is the Pew Research Center's *Political Polarization, 1994-2014 Interactive,* which shows that the U.S. has become more polarized along political party lines. The Pew's research revealed that the median values selected by persons to identify themselves as either Democrat or Republican on a 10-item scale were moving further apart ideologically with the passage of time, as seen in Figure 8.

A seminal book in the field defined *information visualization* as "the use of computer-supported, interactive, visual representations of abstract data to amplify cognition" (Card, Mackinlay, & Shneiderman, 1999, p. 7), whereas *data visualization* has been characterized as an "umbrella term to cover all types of visual representations that support the exploration, examination, and communication of data" (Few, 2009, p. 12). Both conceptions of using computation to generate views on multivariate data are relevant to design goals of improving both representation and interpretation of public opinion data.

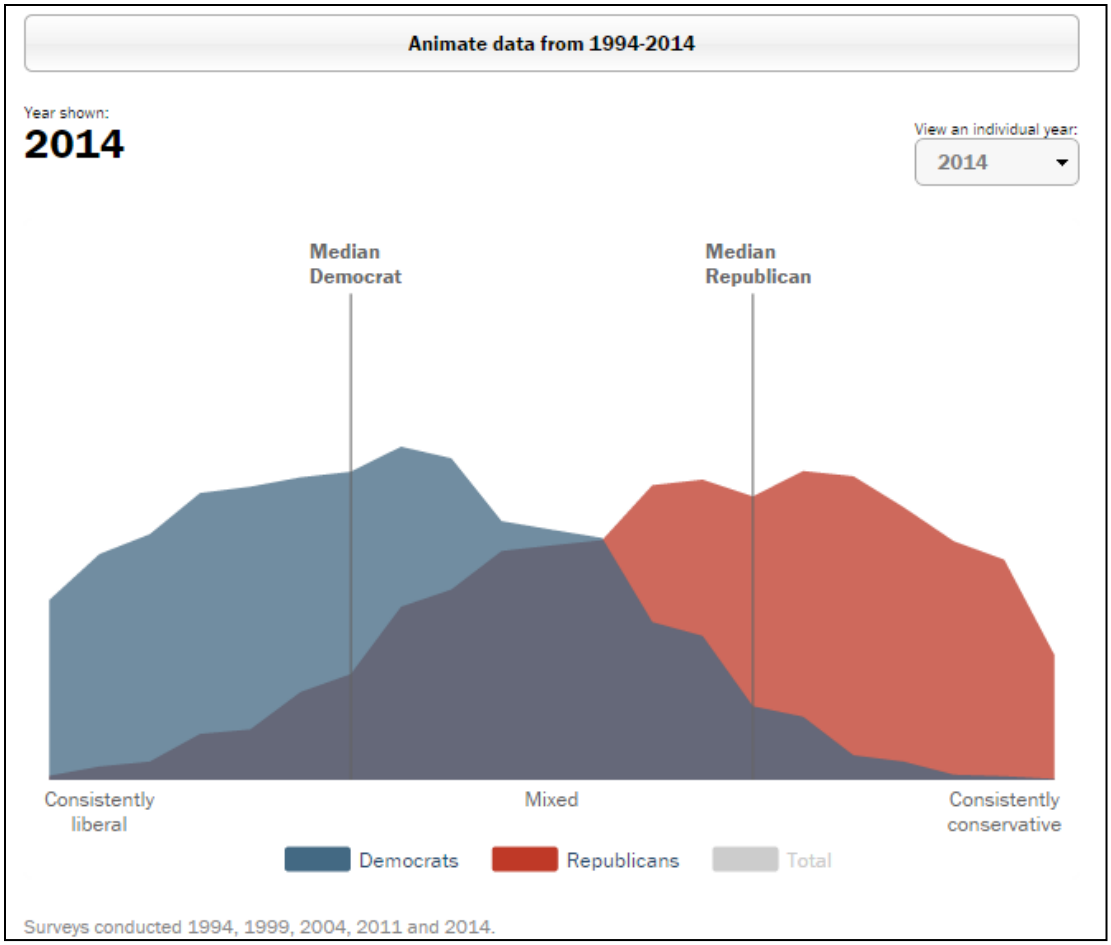


Figure 8. U.S. interactive: Political polarization for selected years from 1994 to 2014. Adapted from "Political Polarization in the American Public," by Pew Research Center, 2014, October 15th. Retrieved from: http://www.people-press.org/2014/06/12/section-1-growing-ideological-consistency/#interactive

Information visualization research has focused on a number of areas, from (a) studying the interplay of cognitive processes, pictures, and interaction that enable the exploration, discovery and analysis of data patterns to (b) how visualizations can be used to communicate insights and to tell stories using data (Segel & Heer, 2010; Singer, 2011). Researchers have noted that past study has largely focused on techniques for representing data in visual forms, with less emphasis on researching the ways in which interaction opportunities or affordances may assist users to generate insights, or ways in which data

visualizations can be and are used to support meaning-making by users or narratives (i.e., data storytelling) by performers (Segel & Heer, 2010; Yi, Kang, Stasko, & Jacko, 2007). Recent explorations have included critiquing information visualizations using theoretical constructs from the social sciences and humanities to explicate message effects of visualizations and potential ways to enhance the communicative aspects of information visualizations (Hullman & Diakopoulos, 2011).

Considering computational media's impact on the presentation of polling data, a number of projects have demonstrated how computation could be used either to represent multiple viewpoints (opinion data points) or to enable viewers to examine bias and analyze opinions to understand the nuances of opinions presented in aggregate. Also, work in the opinion-mining field on visualizing the range of opinions to easily perform comparisons of opinions on a topic has been conducted (Carenini & Rizoli, 2009). Although this work is in the experimental phase, there are many possibilities to augment traditional forms of information dissemination for those institutions with the resources to use computational media to make sophisticated, fully interactive visualizations of quantitative data. An example of this trend can be seen at the on-line newspaper *The Huffington Post*'s pollster web page, http://elections.huffingtonpost.com/pollster.

One national survey indicated that people are interested in interactive graphics on the Web (Purcell, Rainei, Mitchell, Rosenstiel, & Olmstead, 2010). This likely indicates an appetite for the use of interactive visualizations in traditional media programs, but this area needs additional research. One benefit of using interactive graphics is that people become more engaged when they can manipulate data and create their own insights. The implication of these developments is the potential for increased literacy among citizens

with regard to using and interpreting graphic representations of data. Risks include the potential for misleading audiences—a risk inherent in conventional presentations of opinion data (Singer, 2011).

Information visualization techniques can inform the design of presentation systems used by media performers to enhance the representation and interpretation of public opinion data. How this may be achieved will depend on the qualities of the data to be analyzed and the rhetorical goals to be supported (DiSalvo, Lukens, Lodato, Jenkins & Kim, 2014; Kim & DiSalvo, 2010). For example, one may have the goal of representing the diversity of viewpoints in the dataset with an objective of enabling the identification and analysis of outliers. Or, one may want to enable analysts to present public opinion data in a more nuanced and less polarized manner than conventional representations (e.g., graphs or charts); it is the latter goal that I find most appealing. To guide design decisions about information visualization, Few's (2009) comprehensive, up-to-date survey book of techniques and Spence's (2007) more technical treatment are good resources, but must be supplemented with research on designing data visualization for interactive surfaces (Isenberg, Isenberg, Hesselmann, Bongshin, von Zadow, & Tang, 2013) and key findings regarding collaboration and best practices for design (Isenberg, Elmqvist, Scholtz, Cernea, & Hagen, 2011).

3.5 Social Science Theory and Methods for Design and Evaluation

In this section, I present the theory and methods for design and evaluation from the social sciences, which are relevant to investigating the problem space, both in selecting and

designing interventions as well as evaluating them. The evidence base also informed the claims and hypotheses investigated.

3.5.1 Research Design and Evaluation: Relevant Approaches and Methods

In the field of human-computer interaction (HCI), the case study method typically is used to describe an evaluation activity and its results or a research inquiry that has multiple evaluation inputs; for example, a design workshop combined with in-depth interviews. Because I am proposing a technological *intervention*, case study techniques from the social sciences, used for evaluating interventions, for example, education or public healthcare, are relevant. In this work, drawing upon literature from the social sciences, I follow a *descriptive* (versus explanatory) case study approach outlined by Robert Yin (2003). Toward that aim, Yin calls for the identification of relevant theory prior to conducting a case study, so that a model based on prior knowledge of what may be expected during an undertaking may be built, if an intervention of some sort is designed and studied. Therefore, in generating a descriptive case study, the evaluator's first task is to describe what is expected with stated arguments or claims that guide the data collection and analysis. The second task is to collect data against the model created, short of explaining causation. Following guidance from Yin, the overall evaluation design I have selected for my study features two embedded case studies situated within a multi-level model of public opinion processes. The first case study is a field study of the mobile polling application and the second, focusing on the tabletop presentation system and our proposed production model, requires informal and formal studies in a laboratory setting. Both case studies use theoretical constructs in the design of instruments and analyses to

be detailed. Within each case and across the two cases, the goal of the overall study is to (a) determine whether the data collected support specific claims regarding the effects and feasibility of the technologies, (b) outline additional findings beyond specific claims, and (c) note the limitations of the results.

3.5.2 A Multi-Level Case Study

The overall context of this research is the process by which individual viewpoints are gathered and presented in media and public forums as the opinion of the public or of differing publics. To answer my overarching research question, *How can we enhance the expression and representation of public viewpoints using the affordances of convergent digital media technologies in the production of public opinion?,* it is necessary to conduct multi-level research because the problem space spans individual and system (institutional) levels.

To link the different levels of this problem space to specific research questions and design interventions, I used Pan and McLeod's (1995) multi-level model of relationships in public opinion research. Figure 9 revisits this model to show how I situated the research questions and the problem space at two different units of analysis: the individual level, during opinion gathering, and the institutional level, during the presentation of public viewpoints (opinion representation) in mass media. The RQ1, which proposes to enhance how opinions can be expressed, could be evaluated at the individual level. RQ2, which is aimed at shaping opportunities for influencing the framing of issues, could likewise be evaluated at the individual level, but also at the point of interaction between individual and institutional processes. Lastly, RQ3 could be

explored in terms of processes by which media institutions represent public viewpoints using opinion data.

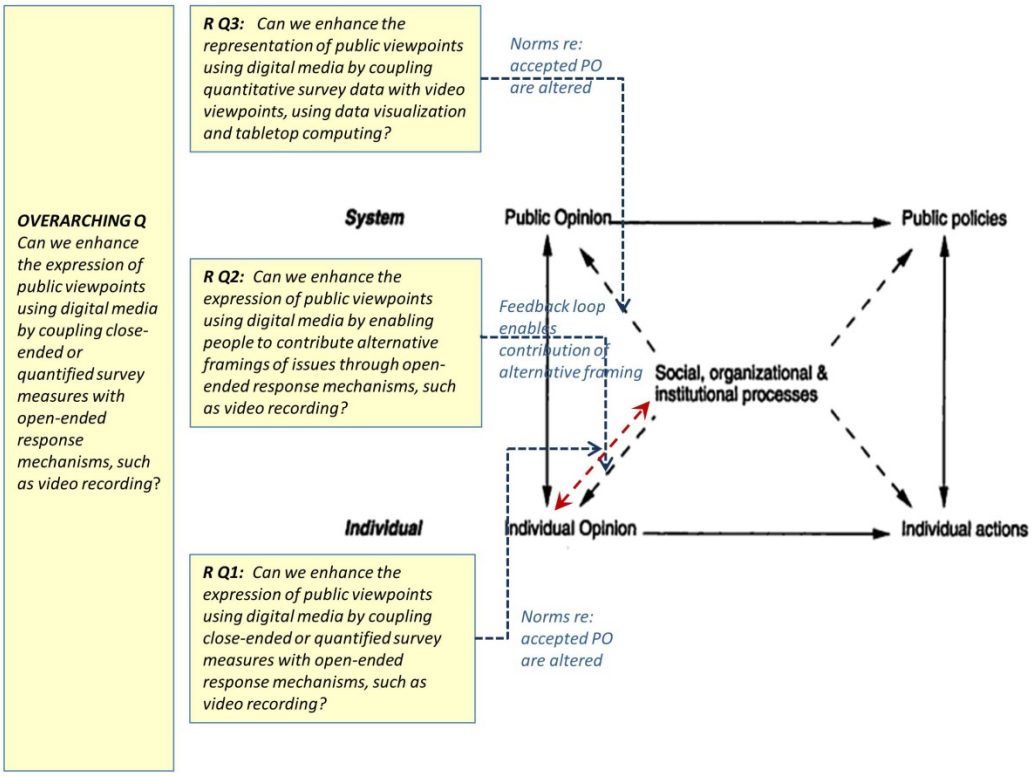


Figure 9. Research questions mapped to the multi-level model. Adapted from "Levels of Analysis in Public Research" by J. McLeod, Z. Pan, and D. Rucinski in T. L. Glaser and C. T. Salmon (Eds.), 1995, *Public Opinion and the Communication of Consent*, New York: Guilford Press, pp. 55-85.

Using this conceptual framework, for the evaluation phase I chose to conduct two complimentary investigations at different units of analysis to inform the case study findings. The first study examined reactions to the mobile polling technology at the individual level, and the other explored how the new type of dataset generated by the mobile application could lead to changes at the institutional level. Figure 10 shows how Pan and McLeod's multi-level model relates to my overall case study design, which features two separate investigations, borrowing from Yin (2008).

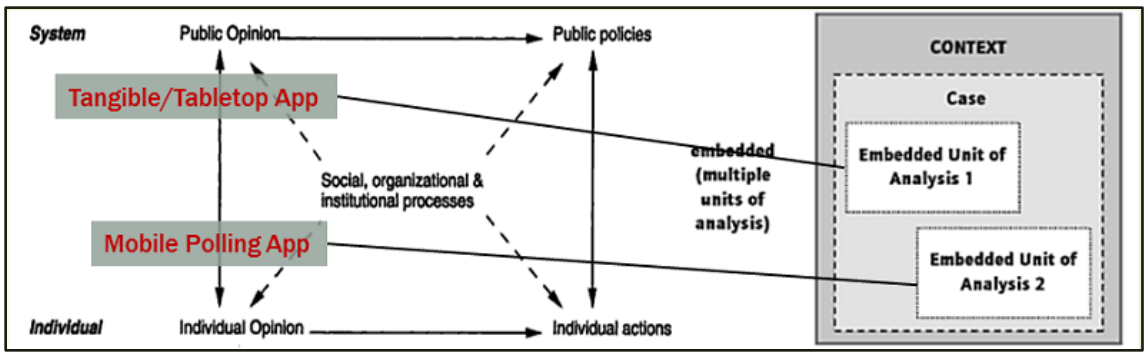


Figure 10. Technologies to be evaluated in the context of the multi-level model through an embedded case study design. Adapted from *Case Study Research: Design and Methods*, 2003, by R. Yin, p. 46. SAGE.

In addition to addressing units of analysis, an important step in the case study design was to model a *scenario of use* that is congruent with current processes by which institutions conduct public opinion activities in which individuals participate. Figure 10 provides a flow model of phases in the process of producing public opinion that was abstracted from a brief review of the literature (Crespi, 1997; Katz, 2000, 2006). In this model, production phases are (a) the representation of the issue, often in the form of questions posed by organizations fielding surveys, the results of which are used in media reports to frame further public issues; (b) the formation of opinions by individuals and groups that may or may not be influenced by exposure to media or deliberative processes or in response to constructed prompts such as survey items; (c) the expression of opinions through various means, including interpersonal channels; and (d) the interpretation of results through media channels (if they are employed) that comprises the representation of opinion in various forms, including visuals, reports, and discussions.

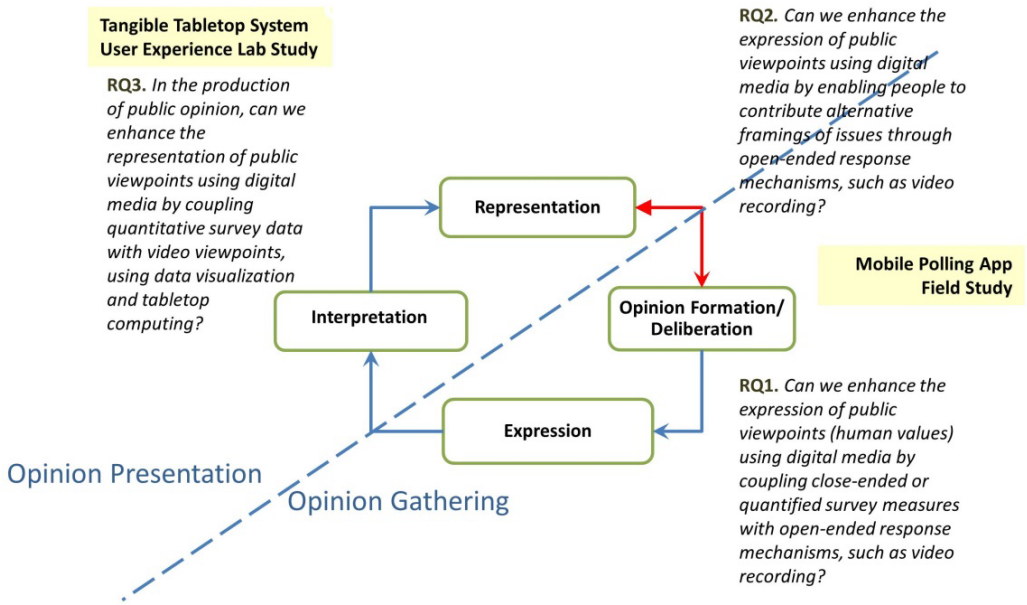


Figure 11. Public opinion production processes and embedded case studies.

Within this production cycle, I proposed a model in which the expression of public viewpoints can be enhanced at the expression phase using the affordances of digital media by (a) providing respondents with the option to add videos to explain their choices when expressing their opinions that also (b) enables them to participate in the framing of issues because they can "talk back" to surveys, or respond to questions explicitly asking for feedback about the survey's contents. Such affordances turn the one-way arrow from representation to opinion/formation and expression into a two-way arrow because people can contribute alternative ways of framing an issue beyond how it is defined by close-ended survey items. I also proposed that adding the video/open-ended data in the data collection phases further enhances the interpretation and representation phases because the process generates a new type of dataset—one that creates novel opportunities for representing public opinion in media channels.

3.5.3 Relevant Theories and Evidence

Applying new technologies to alter well-honed practices in the field of public opinion requires contesting norms regarding what constitutes proper practices in *producing* and *consuming* public opinion data of the institutional or public opinion industry as well as those individuals who respond to surveys. These norms include expectations that public opinion surveys will feature highly standardized and constrained items, large randomized samples, and full anonymity, i.e., individual opinions will not be made "public" (Glynn, Herbst, O'Keefe, Shapiro, & Lindeman, 2009). Given this, I used theory and evidence from communication and social sciences to generate and to test hypotheses pertaining to the acceptability and feasibility of my proposed technological interventions.

To isolate effects that could be directly attributed to the mobile survey and to avoid confounds, it was important to consider the interplay of key variables of interest related to survey participation, regardless of mode, that are attributable to attitudes of individuals and differing social environments. For this study, I relied primarily upon a hypothesized response intention model for surveys proposed by Gordoni & Schmidt (2010) that was adapted from the Theory of Reasoned Action (TRA) (Ajzen, Heilbronner, Fishbein, & Thurow, 1980) to explain variances in survey response intentions among populations who may be reluctant to participate in surveys (see Figure 12).

Key constructs of this model are attitudes and norms toward participating in any survey activity:

> Attitude toward the behavior refers to the degree to which the person has a favorable or unfavorable evaluation of the behavior in question. The subjective

norm, which is a social factor, refers to the perceived social pressure to perform or not to perform the behavior. The attitude is formed by relevant beliefs about the consequences of the behavior, and the subjective norm is formed by the subjective perception of what relevant others think the individual should do. (Gordoni & Schmidt, 2010, p. 366)

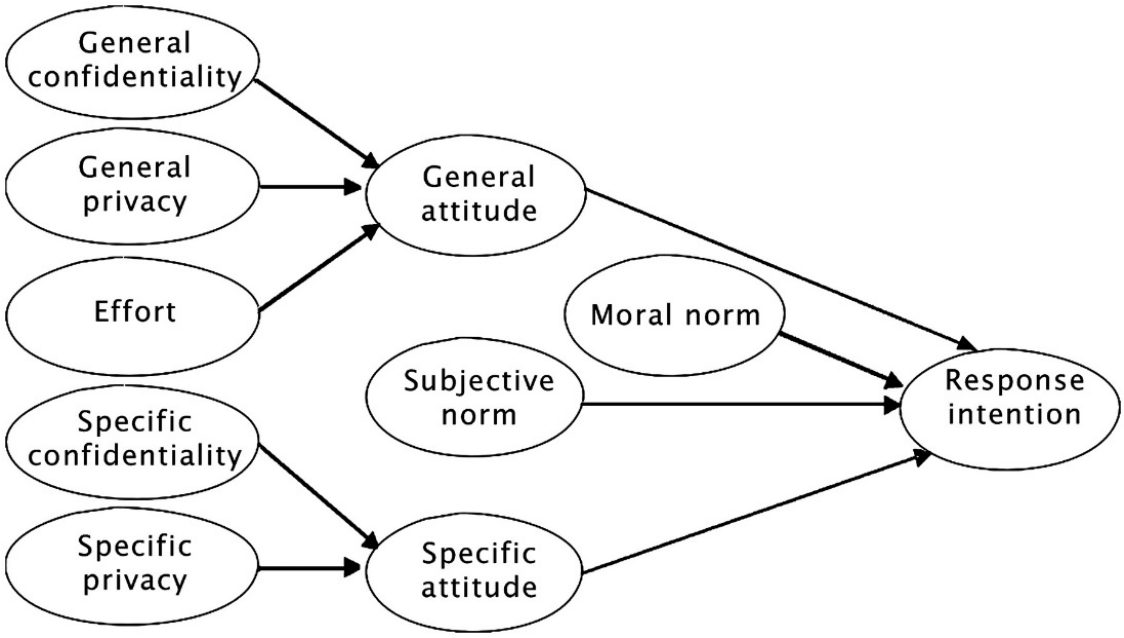


Figure 12. Hypothesized response-intention model. Adapted from "The Decision to Participate in Social Surveys: The Case of the Arab Minority in Israel – An Application of the Theory of Reasoned Action," by G. Gordoni and P. Schmidt, 2010, *International Journal of Public Opinion Research*, *22*(3) , p. 369.

Gordoni and Schmidt (2013) adapted the TRA to measure critical factors affecting the normative expectations of persons responding to surveys. Reasons for not participating included concerns related to privacy, survey aspects (e.g., time burden, sponsor), or lack of perceived benefit to the person taking the survey. For this study, I specifically incorporated *privacy concerns* into my hypotheses and included other constructs into the formal codebook for analyzing interview data and field notes: Privacy is a major theme in

the computing field as it relates to the use of networked mobile technology (Palen & Dourish, 2003; Troshynski, Lee, & Dourish, 2008).

In addition to using the adapted TRA model, I also incorporated the individual's *level of involvement* with current issues since this factor may affect the cognitive cost of responding in depth more than of simply choosing an answer to a survey question. The issue was brought to the fore by Berinsky (2006) who studied how nonresponse rates declined with time for complex issues as positions were articulated by elites and publicized. Berinsky's model of the processes of opinion formation and opinion expression is represented in Figure 13.

Berinsky's model can be linked to Gordoni's hypothesized response intention model because the construct of *effort* in that model is related to Berinsky's question, "Can the respondent easily form an opinion?" The constructs of *general confidentiality* and *specific confidentiality* as well are related to Berinsky's question, "Are there costs associated with the free expression of opinion?" Both models have been of great interest to me as these have revealed that there are many reasons why people may not provide qualitative answers to a survey. I used these models to sensitize myself to these issues in researching survey modes and included some of their operational definitions in the qualitative codebook.

Lastly, I drew upon Roger's diffusion of innovations theory, to highlight a key factor in adoption of new inventions—*familiarity with technology*. I also worked this factor into my hypotheses regarding who might or might not favorably receive the novel survey mode (Rogers, 2003).

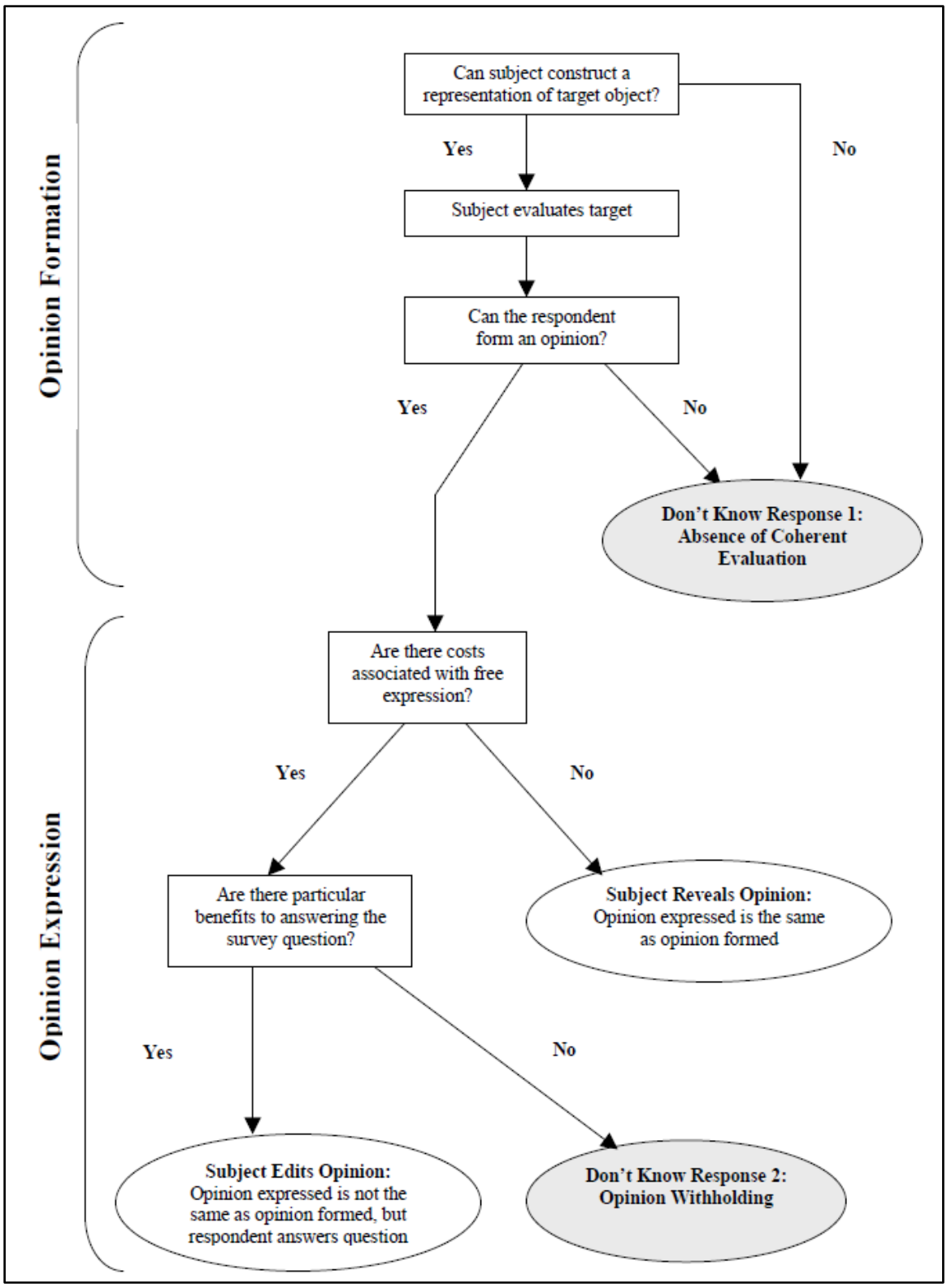


Figure 13. Paths to the Don't Know response. Adapted from *Silence Voices: Public Opinion and Political Participation in America*, by A. Berinsky, 2006, Princeton, NJ: Princeton University Press.

To summarize, the goal of the technological interventions proposed is to remedy current deficiencies of collecting and representing opinions held by diverse public(s) in response to issues. The primary challenge to the success of the intervention proposed is that it would introduce significant changes in current practices at the opinion-gathering and presentation stages for both individuals and institutions. Changes would conflict with the norms for institutionalized methods of measuring public opinion and with individual expectations about participation in public opinion polls; for example, levels of anonymity. In light of this, my review of theory and evidence from social sciences indicates that barriers to the acceptance, adoption, and use of the proposed technologies are likely to be concerns regarding individual privacy; lack of interest or involvement in public issues; and, lastly, cognitive, affective, or motor challenges in using new technologies. These considerations were employed to refine the propositions (i.e., claims) to be tested in the case study model.

Refined Plan of Research

The goal of the technological interventions proposed is to remedy current deficiencies of collecting and representing opinions held by diverse public(s) in response to issues. The primary challenge to the success of the interventions is that they introduce significant changes in current practices at the opinion-gathering and presentation stages for both individuals and institutions. Changes would conflict with the norms for methods of measuring public opinion and with individual expectations about participation in public opinion polls, for example, levels of anonymity. Theory and evidence from social sciences indicate other likely barriers to the acceptance, adoption, and use of the proposed technologies, including concerns regarding individual privacy; lack of interest

or involvement in public issues; and, lastly, cognitive, affective, or motor challenges in using new technologies.

Based on this review of social sciences literature for related theories, evidence, and methods for design and evaluation, I (a) refined the multi-level case study model claims to include relevant variables of interest; (b) considered issues of privacy and cognitive load during design; and (c), selected appropriate evaluation methods for generating evidence regarding the effects of the interventions. For convenience of review, Table 5 presents the case study model claims (propositions), the intervention used to test each claim, and the evaluation methods for each intervention, presented previously in Table 1. Following a chapter on the design of the technological interventions, which drew upon the related work detailed previously, Chapters 5 and 6 present the evaluation of the interventions.

Table 5

Research Questions Mapped to Claims, Interventions, and Evaluation Methods

Research Q	**Model Propositions**	**Interventions**	**Evaluation Methods**
RQ1: Can we enhance the expression of public viewpoints using digital media by coupling close-ended or quantified survey measures with open-ended response mechanisms, such as video recording?	Claim 1: Public opinion-gathering surveys that afford respondents the option to add video viewpoints that explain their choices will have a greater level of acceptance among people who have (a) high involvement in the issues, (b) low concerns for privacy, and (c) high familiarity with technology (i.e., social media).	**Mobile polling application** enabling individual respondents to couple video viewpoints with their numeric responses to explain why they selected a certain answer, e.g., by adding stories, narratives, and testimonials to the opinion data sets.	Field study with lay public and opinion leaders to test feasibility and acceptability of the mobile polling application.
RQ2: Can we enhance the expression of public viewpoints using digital media by enabling people to contribute alternative framings of issues through open-ended response mechanisms, such as video recording?	Claim 2: Public opinion-gathering surveys that afford respondents the option to challenge questions being asked will have a greater level of acceptance among people who have (a) high involvement in the issues, (b) low concerns for privacy, and (c) high familiarity with technology (i.e., social media).	**Mobile polling application** enabling individual respondents to couple video viewpoints with their numeric responses to explain why they selected a certain answer, e.g., by adding stories, narratives, and testimonials to the opinion data sets.	Field study with lay public and opinion leaders to test feasibility and acceptability of the mobile polling application.
RQ3: In the production of public opinion, can we enhance the representation of public viewpoints using digital media by coupling quantitative survey data with video viewpoints by means of data visualization and tabletop computing?	Claim 3: Media professionals will find the scenario of presenting public opinion data containing tightly coupled close-ended and open-ended public opinion using information visualizations on tabletop computing equipment designed for broadcast feasible.	**Tabletop/tangible data visualization platform** enabling performers to present new types of broadcast media programming featuring representations made possible by coupling close- and open-ended data in the public opinion-gathering process.	Laboratory-based study with television professionals to test feasibility of a tangible tabletop system for presenting this new type of opinion data set.

CHAPTER IV

DESIGN

The previous chapters detail the multi-level problem space of public opinion production and discuss how the affordances of networked and computational media provide opportunities to enhance practices in gathering and presenting public opinion. This chapter translates this analysis into design with an underlying assumption that technological interventions in the public opinion problem space must necessarily involve working with media institutions and processes that mediate or translate opinion expression gathered at the individual level. In short, one must design technologies that are feasible for use by media organizations. This is true, even in the age of the Internet, because mainstream media organizations, such as syndicated television news outlets, still perform an agenda-setting function either by creating their own opinion datasets for discussion or by selecting opinion sources to promote widely, thus amplifying them.

Institutional practices, much like the form of public opinion surveys, are easier to criticize than to change, beginning with the difficulty of engaging working professionals in design research. Luckily, the genesis of this study began at the institutional level when colleagues in the television industry from CNN asked the Georgia Tech University's Synaesthetic Media Laboratory (Synlab) research team to investigate new ways of reporting news stories using tabletop computing surfaces (Robinson et al., 2010). Following the initial request, I developed the technologies discussed in this chapter with the Synlab team during a period of three years, from 2010 to 2013. The team used an iterative design process, which required building successive prototypes and incorporating

evaluation results into each iteration. Evaluation inputs included (a) ideas and feedback from media professionals, (b) feedback from experts in tabletop interaction design and information visualization, (c) findings from literature reviews, and (d) observational data and comments received following demonstrations during Georgia Tech open houses. These open houses included three events for broadcast media professionals only.

During the course of the design process, the focus of my investigation evolved from exploring tabletop interaction techniques for data storytelling on television to creating and evaluating an *end-to-end* system to support media-rich data collection and data presentation. This required inventing a new type of mobile survey for data gathering. This expansion came from the realization that if the end-goal was to increase the involvement of audiences with quantitative data on television or in face-to-face settings, one needed a new type of content to engage viewers: data that combined numbers with highly visual information such as video and pictures. I later dubbed this type of dataset *storied numbers* or *storied data*. The domain of public opinion was a natural for this exploration.

4.1 Initial Prototype System

The primary scenarios of use discussed in this chapter emphasize institutional use by media organizations for the gathering and presentation of data in broadcast television programs. However, the prototype system, which encompasses mobile and tabletop technologies, has potential for any type of activity through which people may gather viewpoints (even their own) and present them in a collaborative discussion. Possible contexts for use include (a) gathering viewpoints in advance or in real time in

collaboration with groups and individuals, and (b) analyzing, displaying, and discussing the data for media transmission or in face-to-face settings, such as local public planning meetings.

4.1.1 Formative Research

Formative research began with examining past and current practices of presenting data on television with a focus on the most cutting edge techniques for discussing data. To create an initial scenario of use, I led the design team in conducting a brief review of practices for presenting data in a television broadcast and gathered input from CNN sponsors about potential requirements. In terms of broadcast studio practices, I was able to add firsthand knowledge of television production gained from my 12 years of work in the industry.

As mentioned in Chapter III, Related Work, since 2008 commercial advances in multi-touch technology resulted in widespread use of vertical multi-touch surfaces within broadcast environments. These technologies in the U.S. were notably promoted by CNN mostly due to the unique talents of the political analyst John King. King was so expert in his political analyses that he could handle extemporaneous discussion while manipulating graphical representations of data—primarily coded maps of electoral districts—on what was dubbed the *Magic Wall* during the 2008 U.S. presidential election (see Figure 14).

Our reviews of King's and other on-screen performances revealed producers using touchscreen vertical surfaces similarly to picture graphics keyed over the studio feed (e.g., a graphic adjacent to an anchor's head). (A *key* is simply a video feed cut into another video feed.) An advantage of using in-studio screens is that the natural depth perspective of the studio environment is maintained in a wide shot; at the same time, the television audience can view the added graphics or pictures.

Figure 14. CNN's *Magic Wall* during the 2008 U.S. election cycle. (CNN, 2008)

However, challenges arise when the performer is required to interact with the in-studio screen while trying to maintain eye contact with the viewers. Touch-screen interaction requires using precise movements to manipulate the graphic then turning and looking at the studio camera or another on-screen talent. The performer also can occlude the audience's view of the screen. These problems have long been observed with performers using weather maps keyed into the studio background. To reduce the problem of King occluding the audience's view of the visualization, studio designers augmented a single screen with multiple screens during the 2012 election results telecasts.

A logical step in tackling such basic ergonomic challenges is to move the multi-touch interaction to a surface more naturally suited to the performer, such as a desk or tabletop, which CNN employed in 2014 (see Figure 15) for Christiane Amanpour's set. The benefit of a desktop configuration for touch-screen technology is that a desk is already a studio set appurtenance of most news, talk, or hybrid programs. But in 2010, desks with display surfaces as seen in the 2014 Amanpour set were scarce.

Figure 15. CNN international correspondent Christiane Amanpour on the network's London set with establishing and overhead shots using the tabletop multi-touch technology on a desk.

So to better understand the mechanics of staging programs with anchor desks and displays, I undertook detailed studies of programs such as the CNN-produced *The Situation Room*, which featured a large desk for multiple discussants combined with display screens and multiple camera angles. I observed that table surfaces create social spaces and collaboration, much like they do in a variety of meetings. Further, enabling the tabletop with multi-touch could afford input by more than one person: it is a large surface and at least three sides of the surface can be reached.

Consideration of camera angles confirmed that a main studio camera typically presents a wideshot of the performers set to orient viewers to the overall dynamics of a discussion. However, one disadvantage of this convention is that the camera facing the performers seated at the table does not show the surface of the tabletop graphics, as it is angled to capture body movements and faces, and the plane of the table is perpendicular to the camera view. Another design challenge of using tabletops for data display is the need to orient the viewer to the graphic. For example, an overhead camera can capture action on the tabletop if shot from over the shoulder of the anchor because the viewer is seeing what the anchor is seeing. But if the shot is taken from an angle across the table

from the anchor, then the image will appear upsidedown to the camera and viewers. These studies informed our design scenario detailed in the next section.

4.1.2 Design Scenario: Content and Program

Once the team considered the basic studio production mechanics of using a tabletop computing system for displaying data visualizations, we considered what type of data or content could be featured on the tabletop and how it might be presented in a program. Our analysis led to the practical problem of *how* the content that we envisioned working well on television might be gathered. Our design scenario led to the development of the mobile polling app combining quantitative and qualitative data. This expansion of the problem space was a pragmatic step undertaken to increase the acceptability and feasibility of our proposed presentation technology.

Content

Data consisting of numbers alone does not lend itself well to presentation on television. Data usually represented in detailed static slices are more suited to the print medium. In contrast, television is a temporal medium: the most successful television programs offer suspense and surprise, are visually engrossing, and evoke human emotion to increase salience with audiences. The latter aspect does not come to mind when one thinks of data; numbers are inherently "dry." To enliven data, reporters frequently make the data come "alive" by connecting it to human interest stories. For example, showing a decline in vaccinations over time by itself is somewhat dull. But coupling the decline to increased deaths in toddlers, and featuring a story about a mother who lost her child because the child was not vaccinated can make for riveting television.

This line of reasoning led the design team to the idea of coupling data points with rich media such as video, audio, photographs, and graphics. Live television programs tied to Web-based news sites have demonstrated that such content can be gathered using mobile devices from remote locations by viewer-participants as well as semiprofessional citizen journalists. CNN's *iReport* is an example of the mainstreaming of these practices: the activity invites viewers to contribute photographs or videos of news stories through an on-line submission website. The popularity of *iReport* has been matched by similar cable television initiatives such as MSNBC's *FirstPerson* or Fox's *uReport*.

While thinking about the types of television programs best suited to the injection of enlivened data, the initial design team considered testing the system using data and rich media from a public health outbreak or disaster response. Multiple viewpoints on unfolding events could be gathered through video accounts shot on location, curated using a map-based visualization, presented, and discussed. However, we wanted to test the system with visualizations beyond maps, which have been in common use on television for decades. Data visualizations beyond maps for example, two-dimensional scatterplots with shape and color signifying different aspects of the data, call for faceted or multivariate data. The desire to go beyond map-based visualizations led the team to select public opinion gathering as the focus of design. First, the exploration and presentation of opinions involves analyzing different viewpoints that are associated with multiple aspects of respondents and situations. Secondly, opinion data is often linked with other data sources (such as sociodemographic perspectives from census collection) that add further dimensions to be visualized. And public opinion data is often focused on controversial subjects or divided views; that is, topics on which people disagree, offering

a great match for the medium of television, which is best when showcasing human drama.

Once I chose the domain of public opinion, the use of mobile technology to gather data that was both quantitative and qualitative was an obvious choice. Mobile technology at the time of our initial design exercises in 2010 was quickly emerging as an area of interest for media producers due to the increased number of smartphones in use offering fully functional audio, picture, and video capabilities, through network connectivity.

Program Scenario

Based on the formative research and the decision to focus on public opinion datasets, we envisioned a program scenario featuring a show host (anchor) using an interactive tabletop desk to explore the data, while talking with one to two other discussants. Our scenario called for associate producers and a full television control room crew to support the on-camera performers; for example, a technical director would call the sequence of shots to be seen in the program. Based on formative research, shots would include an establishing wide shot to open the show, close-ups when a discussant is talking, a switch to video feed after a submission is seen on screen, and over-the-shoulder shots to show the host interacting with the tabletop to filter and then select data points.

To solve the need to give viewers a clear line of sight on the data visualization, we designed a screen system featuring three large on-set displays appearing behind the anchor desk, an idea that came from the staging of *The Situation Room*. To add options for viewing the tabletop graphics, we called for the tabletop graphic to be duplicated on the center screen. We also called additional cameras to capture over-the-shoulder and overhead shots. Lastly, to make the tabletop interaction more visible and visually

appealing, we added tangibles to the multi-touch surface that could be seen by studio cameras as markers of the talent interacting with data visualizations. The use of tangibles on the tabletop was a key development that required additional focused design exercises and became a focus of evaluation.

In the envisioned presentation system, the left and right sides of the display system can be programmed to show video viewpoints contained in the dataset with opposing viewpoints shown on opposite screens. The set-up assumes that the output of the anchor desk or any display can be switched to the broadcast feed at any time, a common studio show technique.

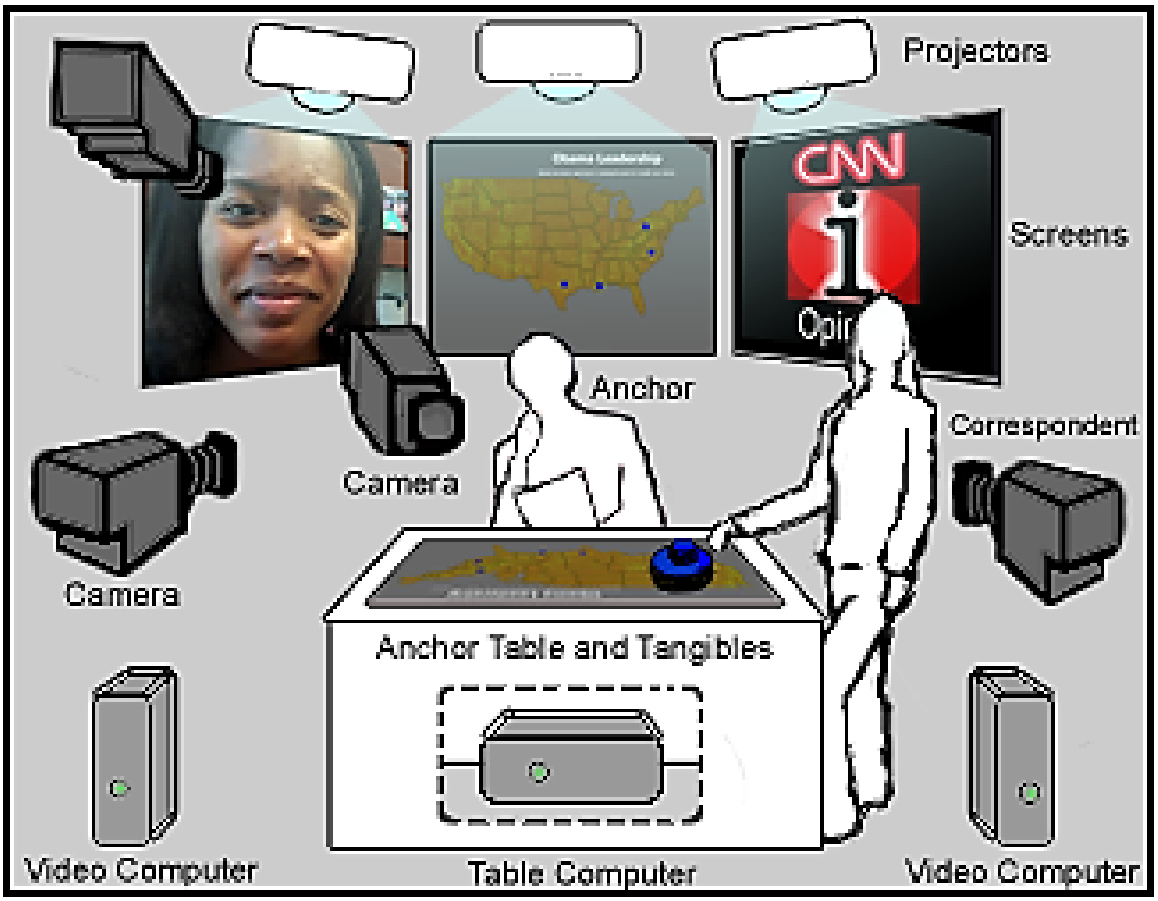


Figure 16. Tangible anchoring broadcast studio configuration.

On the viewer side, for data gathering, we envisioned contributions in the forms of polling data and videos submitted via a mobile phone application, a website, or cable television device either in advance or during the program. The mobile phone became the focus of our design exercises as it allows for individual contributions and use by persons who wish to poll multiple persons.

Based on the use of these technologies for data presentation and data gathering, in our program scenario we proposed a program flow as follows:

> *The program begins with the show host telling viewers that on the program the discussants will be comparing recent national survey data and user self-reported data from selected opinion polls, and that during the show, viewers may participate in the polling using their phone, website, or cable TV application. The anchor begins the discussion by presenting a summary graph (bar chart, etc.) on a particular topic; for example, whether people agree or disagree with the statement, "I approve of the way in which the President is leading the health reform work."*
>
> *Next, the host moves to take a closer look at individual data points across the country that contribute to this overall picture. The host triggers a map-based representation of all data points by placing a tangible control, the Topic Tangible, onto the table. The Topic Tangible features a screen providing a list of survey item titles on its display, legible to the studio camera using an over-the-shoulder shot of the anchor and table. When the host touches an item, the data for that item appears.*
>
> *Data points represent opinion poll submissions from respondents; submissions that include both a completed survey item and a video viewpoint are represented by a square symbol, otherwise the point is represented by a circle. The data points are color-coded as well to correspond to a specific viewpoint; in this case, party affiliation: Republican, Democrat, or Independent, with corresponding data points coded in appropriate colors: red, blue, or yellow, respectively.*
>
> *The host filters the data points on display by adding one or more Viewpoint Tangibles, each representing, in this case, party affiliation. For example, a red Viewpoint Tangible placed on the table subtracts/excludes the yellow and blue data points; only submissions by Republicans remain. To select a video viewpoint to reveal, the host places a finger on the data point to display meta-data (e.g., agree/disagree). For those data points with a square, the host can play videos on the program by tapping the touch screen. Viewpoints play out on different sides of the screen system according to their agreement or disagreement with a polling*

statement; for example, all "yes" responses are routed to the left and all "no" responses are routed to the right.

During this time, the host may discuss with the other on-air guests what the viewers have said. After examining the polling data using a map representation, the host may introduce additional graphical representations such as a Debate Circle. The Debate Circle arranges submissions around the Topic Tangible according to their levels of agreement or disagreement.

Viewers can participate in on-air programming by downloading an application to their mobile phones. They receive invitations to take polls and submit videos about why they hold particular opinions. These polls are pushed to viewers in advance of programs and may be tied to topics for which viewers have indicated they have an interest. The polling application presents simple scales and choices with an interface to attach 30-second videos to any particular item.

We envisioned that the data visualization would be adapted for use on the Web as part of overall user experience with a particular program or channel, such as CNN.

4.1.3 Implementation

The first and subsequent prototype systems encompassed both the remote mobile application for submission of content (public opinion polling in the chosen scenario) and the television studio presentation environment.

Mobile Survey Application Prototype

The first mobile application prototype for coupling survey questions with video viewpoints was developed on the Android operating system for a Motorola Droid phone, circa 2010. These early technical approaches were updated in the final mobile survey application for testing. On the phone (client) side, the mobile application was coupled with a PHP database on the server side to perform a number of operations. After an initial greeting screen, the mobile application registered new users or retrieved existing user profiles. The application also checked the server to see if the phone was in *single-user*

mode (surveys pushed to the phone were to be administered only once), or if the phone had been designated as *reporter* phone, enabling the user to administer the same survey multiple times. For survey administration, the team created a PHP application for creating surveys. The PHP application allowed for the creation of different types of questions (Likert, multiple choice, multiple answer, etc.), the sequencing of questions within a survey, specification of the duration of time in which the survey would be active, and other standard survey functions. In the first prototype, we used a *Wizard of Oz* technique to demonstrate the concept of attaching videos to questions.

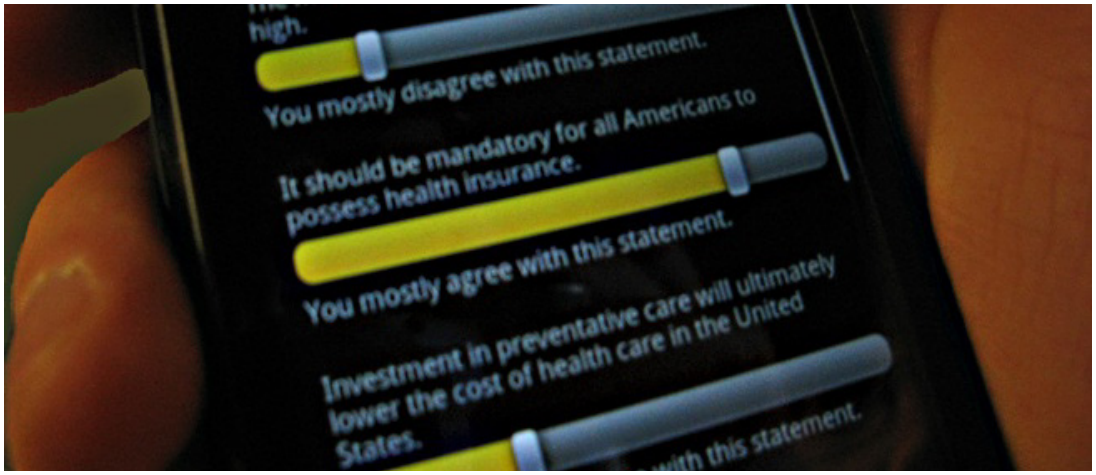


Figure 17. Early prototype of the mobile survey application.

Tangible Tabletop Prototype

The first tabletop prototype employed the hardware set-up of the Tangible Tracking Table developed at Synlab (Wu & Mazalek, 2008) and featured a multi-touch surface, tangible and finger-touch inputs, and multiple display screens as envisioned in the broadcast studio configuration and program scenario. Based on the program scenario, we created a low-fidelity prototype of the visualizations, the tangibles, and a dummy dataset for demonstration and feedback purposes from television industry experts.

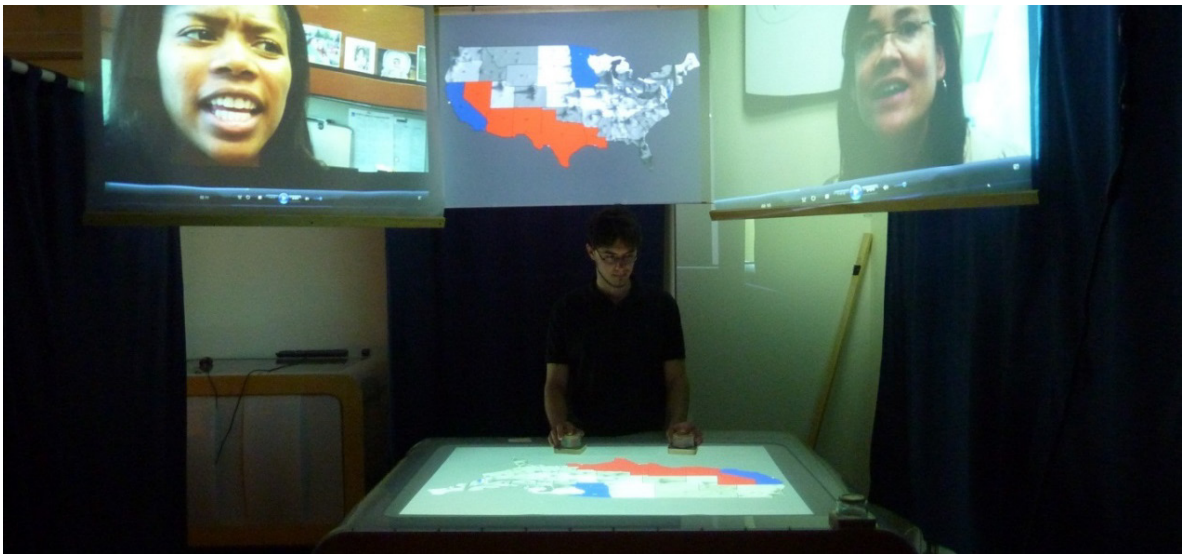


Figure 18. Screen display system with table output to center screen and viewpoint

The prototype featured two information visualizations: a familiar map-based representation, which we called the *Map Scene*, and an unconventional visualization, dubbed the *Debate Circle*. The decision to incorporate tangibles into the tabletop interaction design was initially motivated by the request from our industry partners to think broadly about what new types of performance could be supported in the studio. However, tangibles also offered specific benefits in terms of television performance: first, the use of tangibles reduces the amount of fine motor movement required on the part of the performer; second, tangibles have the potential of increasing visual interest and performance values (e.g., they may be lighted, three-dimensional); and last, tangibles had the potential to make the data manipulations more visible to viewers through movement.

We created three different types of low fidelity tangibles (see Figure 19) for interaction: a *Topic Tangible*, *Viewpoint Tangibles*, and a *Mode Tangible*. The Topic Tangible, implemented on the same Motorola Droid phone used for the survey, offers topic choices by touch screen: short titles for each survey item in the data are displayed.

For example, “Indicate your level of agreement with the statement: “Obama has provided strong leadership as President” became “Obama’s Leadership.” One could select to pull up the data for each item using the Topic Tangible with a finger touch. The Viewpoint Tangibles enabled the anchor to filter the resulting data points (submissions) by the respondent’s political party affiliation: Republican, Democrat, or Independent. The Mode Tangible, when placed on the table, toggled the visualization between the Map Scene and Debate Circle graphic representation modes.

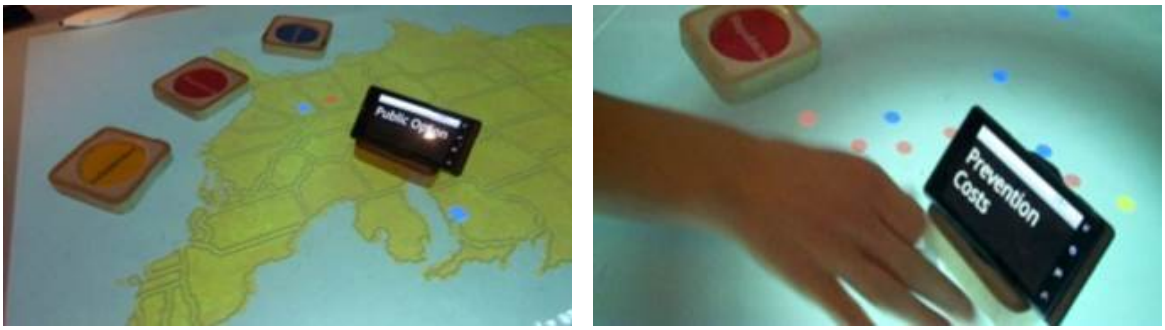


Figure 19. Map View showing prototype viewpoints (political parties) and Topic Tangible.

The map scene, shown in Figure 19, displayed the submissions from viewer participants on a geographic map in the form of colored graphic markers, representing party affiliation, according to the latitude and longitude from which they were submitted using location data from the mobile application.

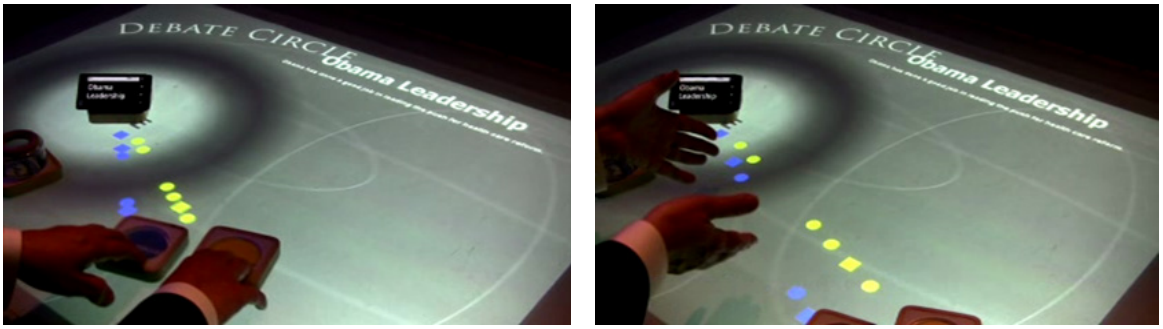


Figure 20. Topic Tangible prototype on a mobile phone, Debate Circle visualization.

For the Debate Circle visualization, shown in Figure 20, submissions were rearranged into concentric circles around the Topic Tangible according to the degree to which the polling respondent agreed or disagreed with the item, with agreement closer to the center. When discussants at the table dragged a Viewpoint Tangible closer or farther away from the Topic Tangible, the responses appeared in a stretched line, allowing a comparison of the range of responses by viewpoint when two or more Viewpoint Tangibles were moved side-by-side. The idea behind the Debate Circle visualization was to allow for interesting comparisons of public opinion, such as agreement between persons of differing political stripe (e.g., a Republican and a Democrat agreeing on fiscal policy).

The table's graphical display was output onto the center screen above the anchor, so that it was easily visible to studio cameras, therefore to program viewers. The two side screens received output projection from separate computers that housed viewer-submitted video content. To explore various broadcasting perspectives, we positioned four PS Eye cameras on key angles in the studio and a computer with an off-the-shelf application to create a composite of the different camera angles.

Software

The prototype tabletop system software application, dubbed the *Tangible Anchor Engine*, was initially built on the *KinoPuzzle* story engine (Robinson, Razza, Christensen, Wu, & Mazalek, 2009) and was programmed in Java. The Tangible Tracking Table used the reacTIVision computer vision framework to detect finger touches as well as fiducial markers attached to the underside of tangible interaction objects and communicated with the tabletop surface via UDP messages using the TUIO protocol (Kaltenbrunner, 2009).

This enabled the TUIO client component of the tabletop system to receive information about the position and orientation of the tangibles on the table as well as the position of the finger touches.

The engine contained an XML reader class that processed a stored a list of individual polling responses, or *submission objects*, from the survey database. The XML file was served to the tabletop application from a static IP address; individual polling submission data were stored in a relational database that utilized MySQL as its querying language. The XML reader also parsed a separate file containing the parameters of a *scene* that established different types of information visualizations to be displayed and handled by a scene manager module in the table application. This facilitated switching between types of scenes.

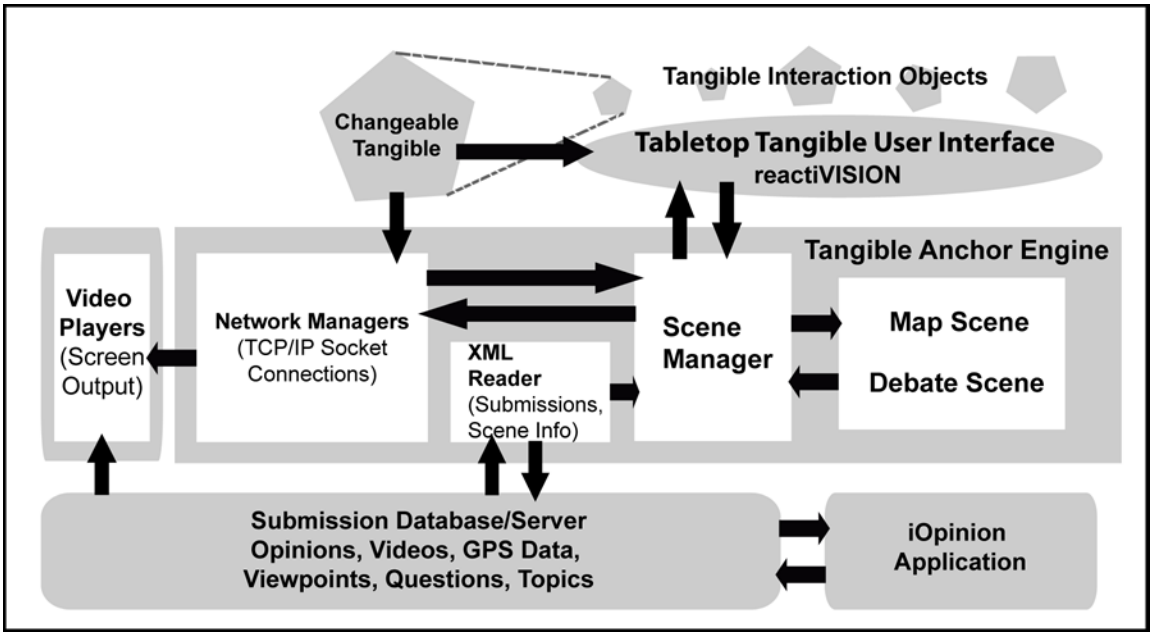


*Figure 21.*Tabletop system software architecture. Adapted from "Tangible Anchoring: grasping news and public opinion," *Proceedings of the 7th International Conferences in Computer Entertainment Technology*, November, 2010, by S. Robinson, S. Mendenhall, V. Novosel, & A. Mazalek. Diagram by S. Mendenhall.

In the Map Scene mode, submission positions are fixed on a geographic map based on their attached GPS data (dummied for the demonstration.) In the Debate Circle mode, each submission moves to a position within a radius around the Topic Tangible, once a particular Viewpoint Tangible is placed on the table. A line appears on the table between the Topic Tangible and the Viewpoint Tangible with its length determined by the distance between the two tangibles. Data points are displayed on the radius according to the opinion value associated with individual submissions, using Likert scale values (ranging from a -5 indicating strong disagreement to a +5 for strong agreement).

The network manager component of the engine handles connections to the video playback computers and to the Topic Tangible, using socket connections to establish TCP/IP communication between the table computer and the video computers. Another component sends messages through this protocol indicating which videos to play when a submission marker is activated from the tabletop. In the prototype software, video playback uses the Java Media Framework.

Feedback

In April 2010, we demonstrated the tabletop prototype system in two separate sessions to more than 100 television industry guests and to an equivalent number of academic and high-tech industry guests and colleagues, including professors and students. We presented the design scenario and demonstrated the system functionality and fielded questions and comments. In addition to receiving positive feedback on the overall configuration of the table and screens, industry professionals encouraged us to continue refining the tabletop interaction techniques using both multi-touch and tangible controls. Visitors confirmed our thinking that surface tangibles would be more visible to the studio

cameras and consequently to viewers than finger touches alone, and, potentially would be easier for performers to work with than only finger-touches. HCI experts noted that to make full use of the affordance of tangibles, it would be optimal to supplement the rotation of objects for filtering with the use of movement to manipulate data, such as dragging or sliding the tangibles. During three separate demonstration sessions in the research laboratory in 2010 and 2011, professionals working in audience research, television program production, and operations at Turner Broadcasting/CNN provided additional feedback. Additional detail on the formative evaluation is provided in Chapter Six, which discussed all evaluation results for the tabletop system.

4.2 Second Prototype System

Between the completion of the initial system prototype and feedback in April 2010 and May 2012, I directed a series of research/design/build exercises to improve the system through iterative enhancements. The exercises were informed by (a) a literature review of the public opinion problem domain; (b) in-lab design/feedback sessions with professional and academic visitors and Synlab researchers (detailed further in Chapter Six); (c) pilot field tests of the mobile application; and (d) review and feedback from experts in tangible user interfaces, information visualization, public opinion polling, and broadcast news television, for which I will provide a summary in the chapter on the tabletop evaluation. Graduate student teams who worked on the project continually incorporated findings from ongoing reviews and analyses of current mass media news and opinion practices, on both television and the web, and the academic literature pertaining to public opinion polling. During this period I refined the description of the problem space and research questions presented in this dissertation.

The second prototype system enhancements comprised five categories:

1. Refinement of usage scenarios for both the mobile polling and tangible tabletop applications;
2. Technical implementation of desired functionality in the mobile polling application, specifically the tight coupling of survey items with video and the development of a robust back-end database to support data collection;
3. Redesign of tangible tabletop interaction techniques in tandem with improved information visualizations and graphic design;
4. Design, prototyping, and refinement of tangible controls for the tabletop in direct response to feedback sessions; and
5. Recoding of tabletop application for the Microsoft Surface II to improve reliability of application for user testing.

In addition to these enhancements, we also added a component to the system. One of the last development activities was the creation of a website on which to display polling results to serve as a proxy for making opinions public on television (we did not have a broadcast partner for testing) during the mobile application field testing.

4.2.1 System Architecture

Using input from our formative evaluation sessions with broadcast professionals and other experts, I invited a professional software engineer with expertise in database design and the use of UML diagrams to work with the Synlab team to refine the *use case* for the system. The term, use case, is defined by (Richter & Flückiger, 2014) as “a system’s

(planned) functionality and thus how it will interact with the outside world" and further "a functional procedure from an actor's perspective."

The resulting diagram is shown in Figure 22. This use case helped the team generate more detailed requirements for both user-interface refinements on the front end and back end database configuration. It shows a range of actors from a single data gatherer to individual users who receive surveys to the *investigator* and *data analysts*, who, in the broadcast scenario, would be associate producers working to support content production in advance of data storytelling in a broadcast program. This use case diagram also informed the production model we constructed for assessing the feasibility of our system in our formal evaluation with television and news professionals.

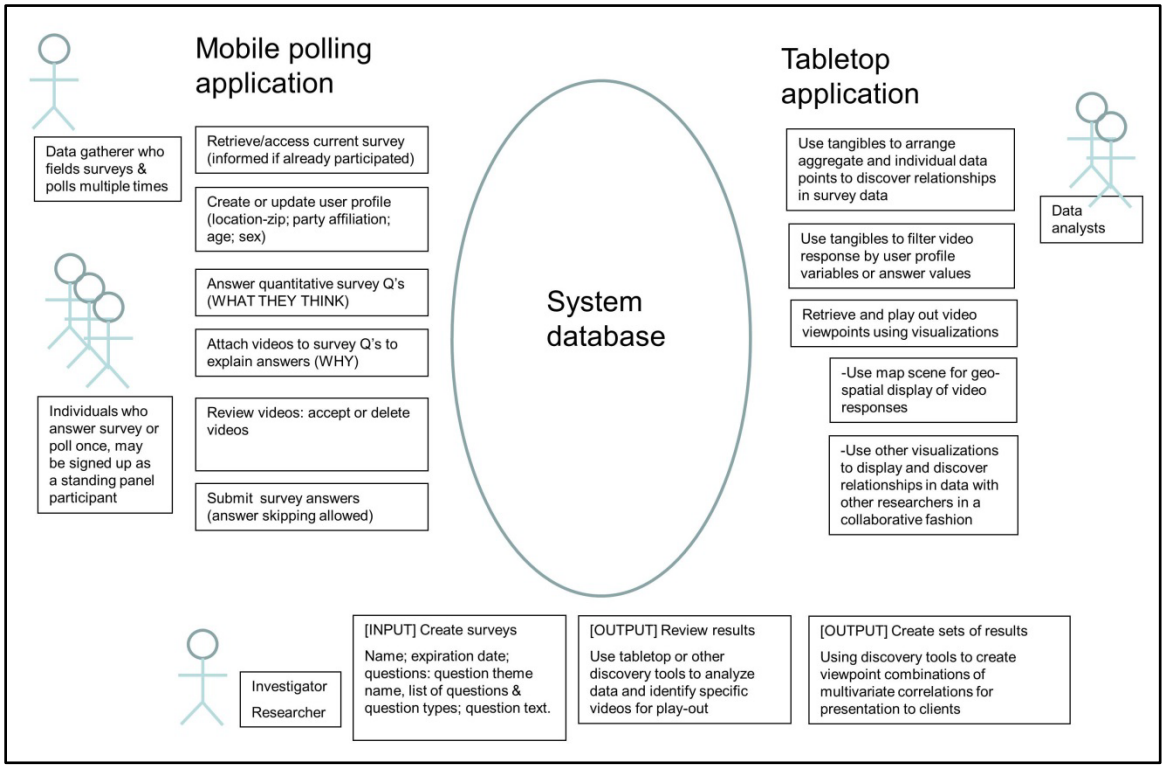


Figure 22. Refined system use case diagram (U.S. patent application 13/439,584).

4.2.2 The SayWhyPoll

During 2010 and 2011, the television professionals' overall reaction to the proposition of gathering video viewpoints using mobile technology was mixed. They considered the mobile form factor, particularly smartphones, to be bleeding-edge technology and voiced the opinion that the current market was centered on web-based user-content submission through mechanisms such as YouTube or the simple uploading of video to the CNN site. (At that time addressing phone-specific camera hardware with a third-party application, particularly using Android OS, was a non-trivial task.) However, when probed about a scenario for mobile opinion-gathering, professionals confirmed that if mobile phones were to be used for gathering opinions, it would be desirable to have options for fielding surveys in a single-user or pollster mode. In the use case, this called for an application that could be (a) set to Individual Mode for use by subscribers (unique ID login) that presented a single survey only once, or (b) Reporter Mode (e.g., CNN *iReports*), enabling a survey to be fielded multiple times (multiple ID numbers) for use in situations such as exit polling during an election.

After considering this feedback and refining the use case diagram, the team undertook a brief review of the literature related to mobile user interface design to identify best practices in design of graphic elements, security, and attention to human values in design that included respect for privacy. The latter concern resulted in adding the respondent's option to decline the use of location data. The team created an animation of professional quality for display during the loading of the program and refined the sequence of screens to collect basic demographic data and administer polls. At the time, the evidence regarding presenting one question at a time or as a series of questions in a

scrolling page was mixed, so scrolling was selected as the method for presenting questions. Critical work included refining the user interface design to support adding videos. The resulting user interface elements were informally tested on friends and family for learnability and ease-of-use. The final application was dubbed the *SayWhyPoll*, and final screens can be seen in Figure 23.

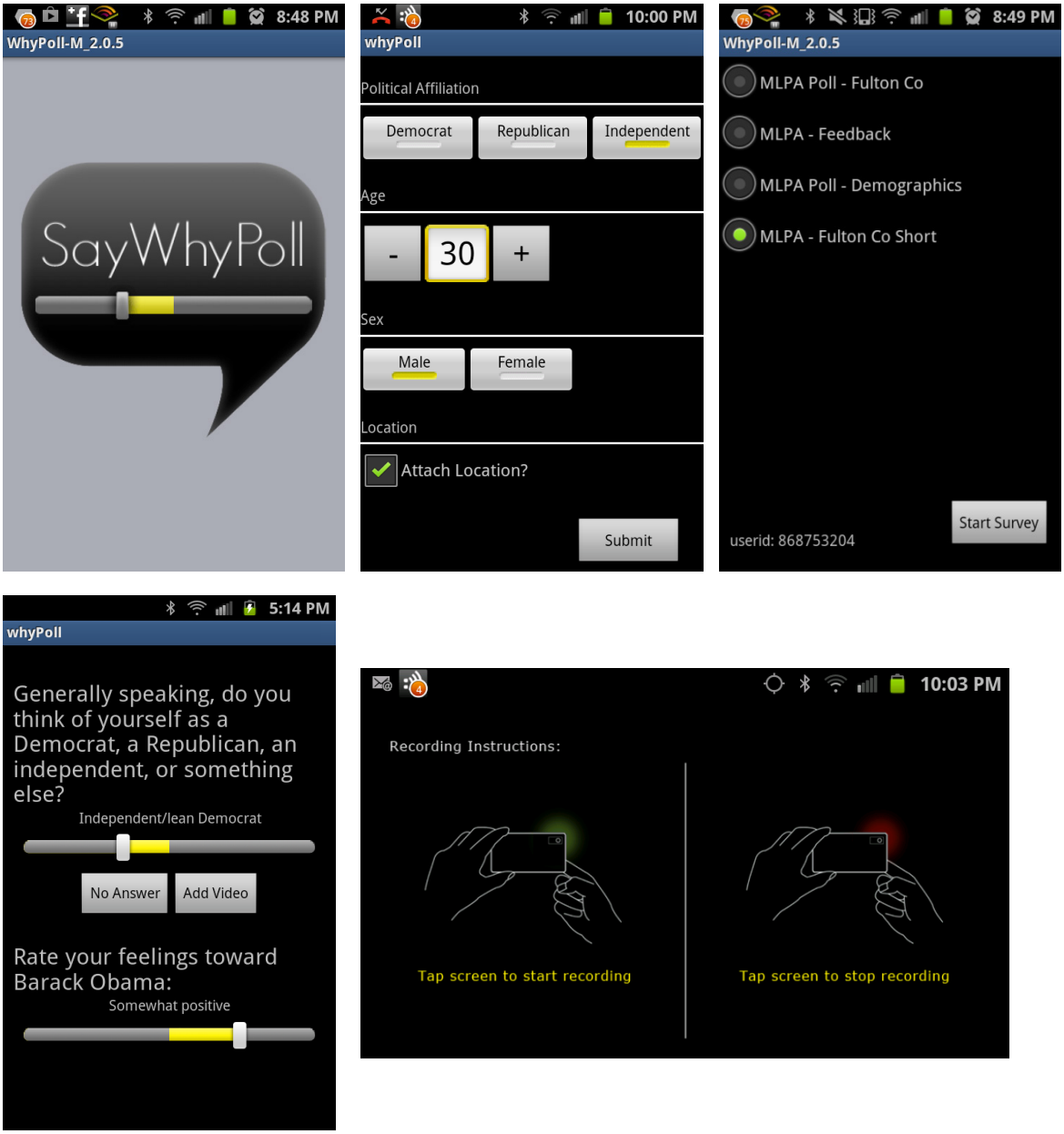


Figure 23. Final *SayWhyPoll* mobile polling application screens (U.S. patent application 13/439,584).

4.2.3 Tangible Anchoring

We dubbed our tangible tabletop system and novel interaction practices *Tangible Anchoring*. Work to refine the second prototype focused on better supporting data storytelling, refining strategies for tangible interaction, creating a more robust data visualization for formal evaluation, and refining the look and feel of the tangibles. We cycled back and forth among these considerations in an interactive fashion to arrive at our second and final prototype tabletop presentation system.

Data Storytelling for Public Opinion

To improve support for data storytelling, I researched public opinion data presentation practices in the broadcast, print, and on-line domains as well as the critical perspectives about these practices. My research resulted in an inventory of (a) types of survey questions asked and their typical use; (b) the types of datasets generated in public opinion survey; and (c) the tasks of public opinion analysts in the analysis and presentation of data. From this research, I added to the overall design scenario specific goals to address critiques of public opinion practices. New design goals included enabling discussants to manipulate data visualizations drawn using the media-rich public opinion dataset to:

1. Go beyond common practices of representing opinions solely as differences due to party affiliation or by labels placed on respondents, such as “liberal” or “conservative”;
2. Explore multivariate aspects of opinion data to find unexpected combinations of responses, such respondents selecting the same answer but for different reasons;

3. Combine lay opinions with expert commentary in collaborative discussions;
4. Find ways of examining an issue such as health care reform using different frames; and
5. Increase the articulation of nuanced aspects of opinions.

Next, I led the team in a series of brainstorming exercises to explore how these data storytelling design goals could be supported using the affordances of tangible user interfaces and information visualization techniques on a tabletop surface. Figure 24 represents one of the design session artifacts from Spring of 2011; these exercises resulted in a refined representation of the problem space, shown in Figure 25.

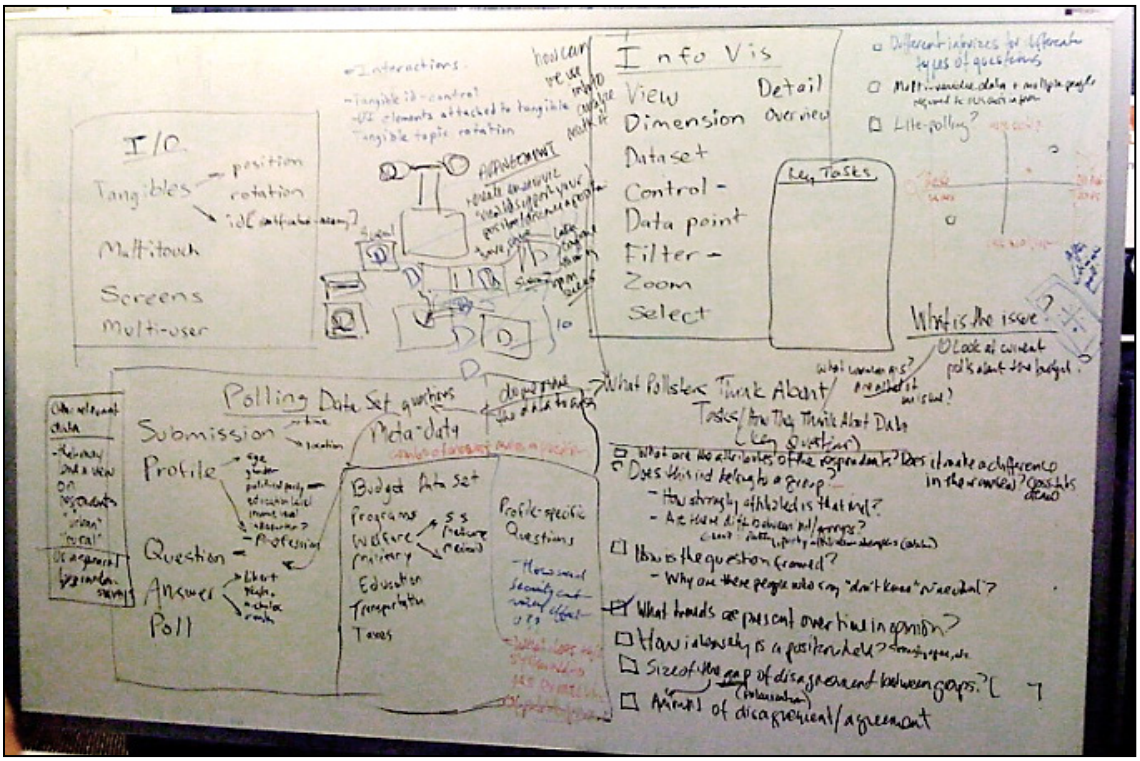


Figure 24. Public opinion domain: Tangible interaction design inputs.

Tangible Interaction

In design phase feedback sessions, reviewers expressed divided opinions regarding the value of using tangible controls for the data visualization interface. Television professionals were more likely to affirm their use, citing the value of adding visual interest to the scene and visible actions for performance, while eliminating the need for precise figure touches. HCI professionals were more skeptical, concerned that the use of the tangibles was gratuitous, given advances in multi-touch. Their concern was in part prompted by the limited use of the tangibles in our first prototype, which relied primarily on using the tangibles as filters alone. Filtering in the first prototype was achieved either by the placement of a tangible on or off the table or rotating the tangible.

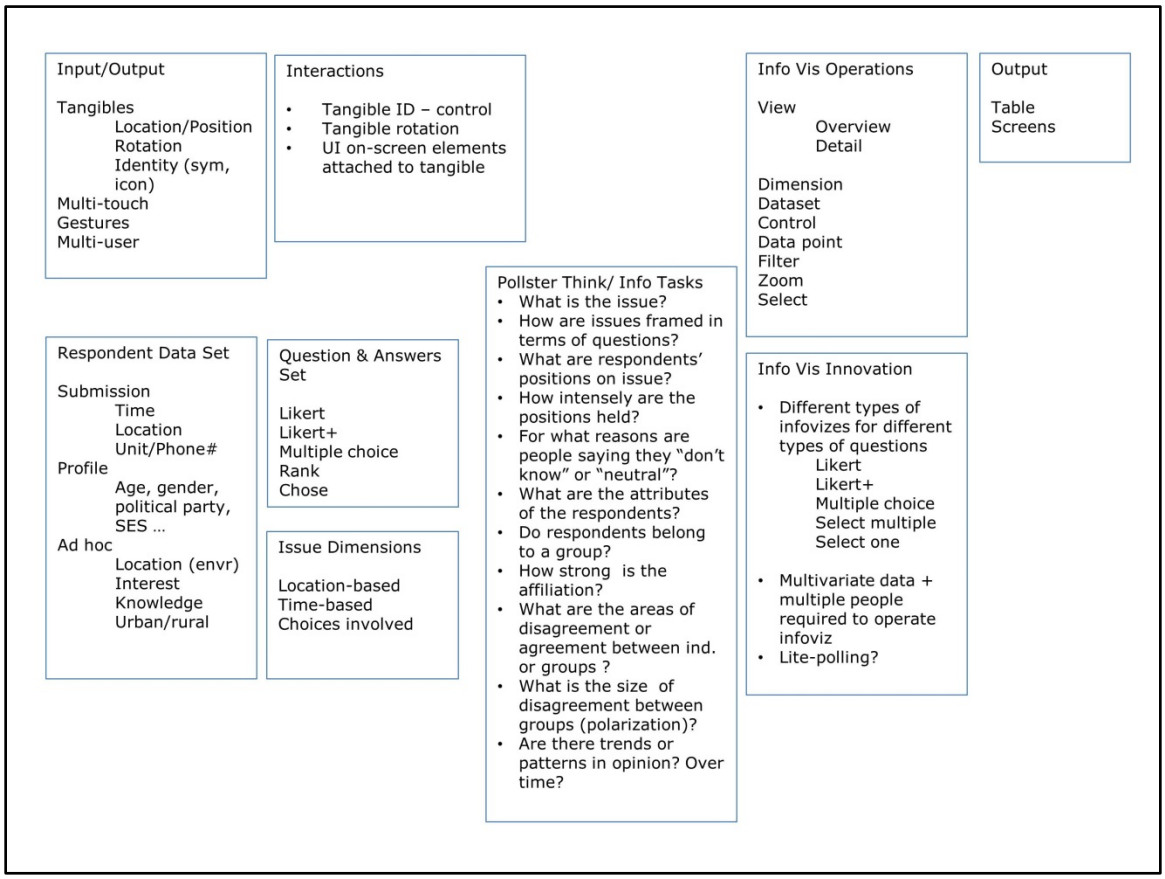


Figure 25. Refined problem space for presenting public opinion data on tangible tabletop.

Figure 25 details the team's thinking regarding the actions that could be taken using tangible controls in the direct manipulation of visualizations on the tabletop. Meaning could be created first in the look of the tangible: It could be highly iconic (such as the shape of an animal associated with a political party in the U.S.) or symbolic, using shapes to indicate function (to be used to filter viewpoints, or change topics, etc.). Second, the position or movement of tangibles provide meaning: Tangible controls can be rotated, placed in a particular part of the table, and moved. We noted that on-screen elements should enable translation of action using the tangibles to be seen visually on the display screen, so we opted for graphical feedback at the site of the tangible placement, both in mirroring the tangible on the interface and providing selection feedback (for example, showing a dial that indicates which value had been selected, such as *Strong Democrat* versus *Weak Democrat*).

Against these considerations of how one may create meaning with tangibles through look and movement, I revisited the possible interactions or operations one can perform on data summarized by Few (2009) as: comparing, sorting, adding/changing variables, filtering, highlighting, aggregating, re-expressing/visualizing, zooming and panning, re-scaling, accessing details on demand, annotating, and bookmarking. Then, I (a) compared these operations to the information tasks pollsters performed, as detailed in our refined problem space (Figure 25), (b) prioritized which data visualization operations were most important, and (c) considered how the affordances of tangible interaction might support these operations.

These tasks and operations emerged as most critical and also feasible to support:

1. Exploring questions and answer sets across respondents: Filtering and question/answer sets using *rotation* of tangibles
2. Exploring characteristics of respondents and their answers: Adding/changing variables for analysis (age, gender, etc.) using *rotation* or *placement on/off the table* of tangibles
3. Rescaling dataset if large to best display it on television and to focus discussion: Zooming and panning of dataset using *movement* of tangibles

Data Visualization

With these considerations in mind, after three to four rounds of sketching and analyzing the refined problem space, the team chose two visualization strategies to implement. The first was an enhanced map visualization, which was implemented by a visiting doctoral student. The second visualization I directed in collaboration with two graduate students who were studying information visualization. For both visualizations, I created large dummy datasets using national polling data available from the Roper Starch Center for Public Opinion Research at the University of Connecticut (www.ropercenter.uconn.edu/). To test the desired functionality, I recorded video viewpoints to supplement the numerical survey data and added latitude and longitude data for the map visualization.

Map Visualization

The map visualization, which used a novel technique for exploring Likert data, is shown in Figure 26. While it needed more work than could be performed in a semester to be fully functional, the development helped the team analyze a number of design

possibilities arising from the mechanics of using tangible controls. For example, we enhanced the Viewpoint Tangibles with rotation to show "intensity of loyalty" to party affiliation and we created a *Compare Tangible* to enable comparison between groups of data points. The left side of Figure 28 shows the overview view of the visualization with all data points color-coded according to the response values. Those data points having video viewpoints attached are indicated by a cartoon speech balloon. The right side of Figure 28 depicts a detailed view of data points from two different states that were selected for comparison.

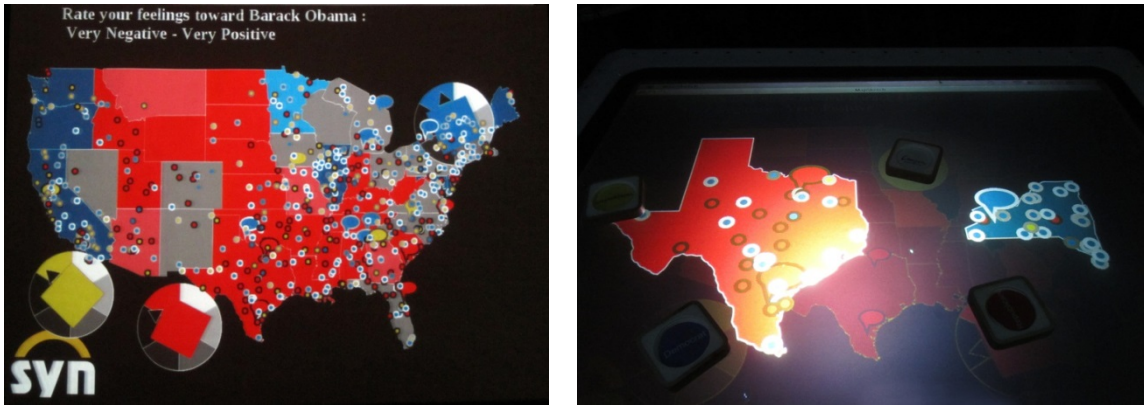


Figure 26. Map visualization of Likert scale data.

Scatterplot Visualization

For the scatterplot visualization, I worked closely with the students on the scenario of use and interaction design as I anticipated using this visualization for evaluation studies of the system. Drawing upon my analysis discussed earlier, the students' ideas, and input from John Stasko, our team included in the design of this visualization key information visualization techniques such as the provision of an overview of the dataset and a detail view; data filtering, zooming, and panning; and details-on-demand. This optimized the visualization for use with large datasets. The students coded a rough demonstration of the

system in the Processing language based on storyboards of a proposed television program flow and corresponding interaction techniques to support data storytelling.

Figure 27 shows the storyboard used for plotting how tangible interaction techniques would support data storytelling. The scenario called for three actors: a show host and two discussants. While the host could manipulate the visualization using tangibles without the help of others in this scenario, we scripted the use of the tangibles for six-handed interaction, assigning tangibles to each actor. (For the evaluation, I opted for the host to control all tangibles to streamline and focus the protocol.)

We envisioned that the data storytelling would start with a static overview graphic: a bubble plot representing what type of respondents answered the survey: 45% Democrat, 40% Republican, and 15% Independent, for example. (Although overcoming simple analysis according to party was an objective of the design exercise, party affiliations were used for design because it is familiar to most people.) This simple bubble plot of respondents color-coded according to party affiliation then animated into a scatterplot as seen in the storyboard in Figure 27.

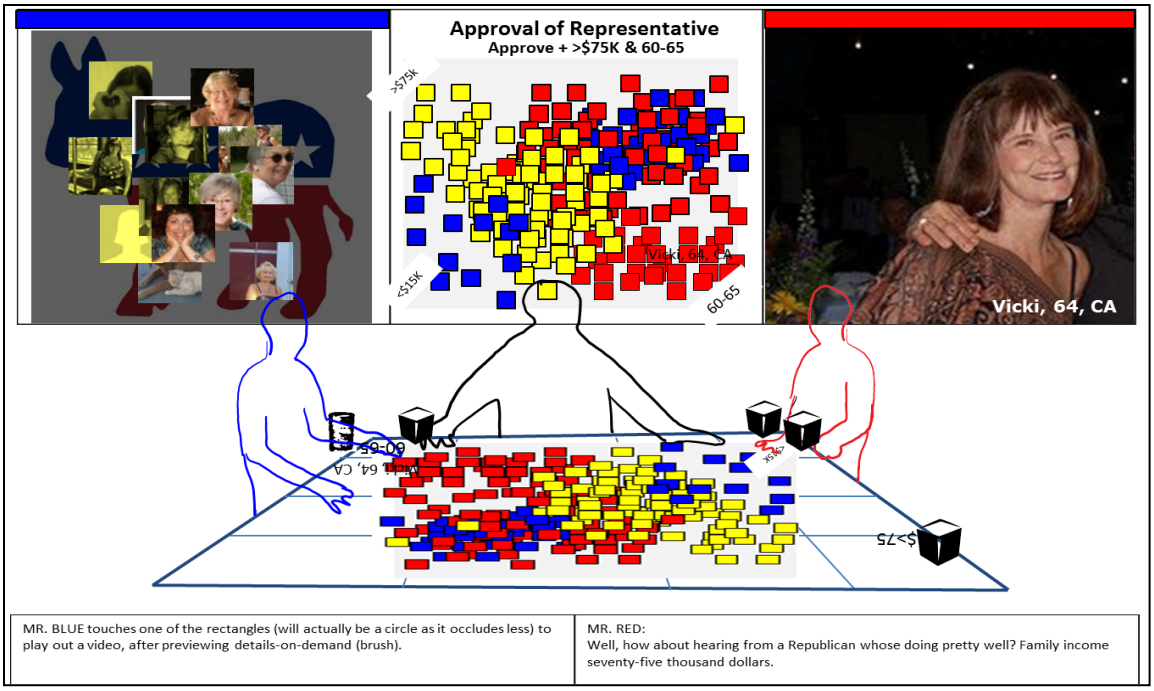


Figure 27. Storyboard for data storytelling using scatterplot visualization.

To control the scatterplot's x- and y-axes, we called for square tangibles along the edges of the table that a performer could slide to zoom in and out or pan the data points on the scatterplot; the side of the table served to constrain the movement. The interaction was much like using slider bars on traditional graphic user interfaces (GUIs). These slider tangibles on the sides of the scatterplot could also be rotated to change the variables of interest. Variables could be rational (age), ordinal (strength of approval of a candidate), or categorical (lives in or outside affected area, etc.). (See Figure 28.)

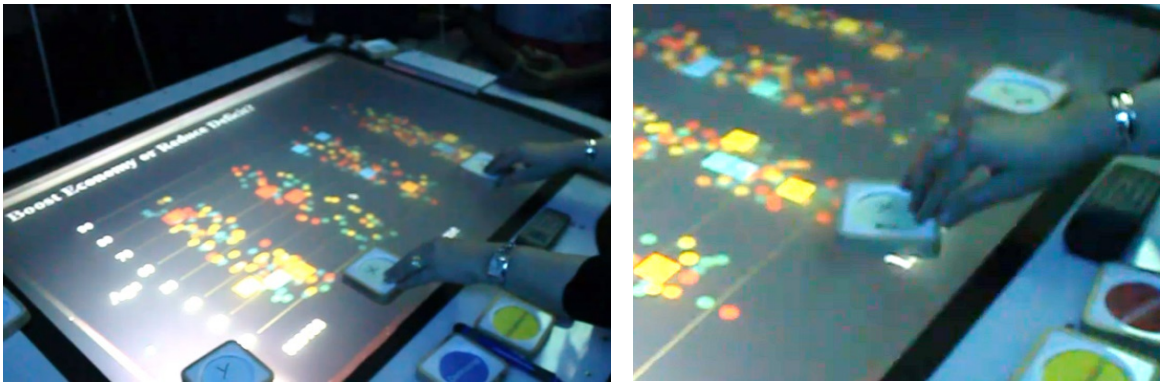


Figure 28. Scatterplot showing tangibles for the x- and y-axes used to zoom and pan (left) or change variables shown (right).

Further, the data could be filtered using the Viewpoint Tangibles; for example, adding the Independent tangible alone filtered out data points tied to Republican and Independent respondents. Questions and answers were to be selected using a set of Question and Answer tangibles, which, when rotated, scrolled through the items available. Finally, we called for a Compare Tangible for use in marking specific data points using the Compare Tangible for retrieval during presentation.

Tangibles Design

Following the development of the scatterplot interaction for evaluation, another critical step toward completing the prototype was the improvement of the *look-and-feel* of the tangible objects. An industrial design student on the team led the design exercises; he provided the team with options on sizes, a range of materials, and possibilities for the use of LED feedback (see Figure 29).

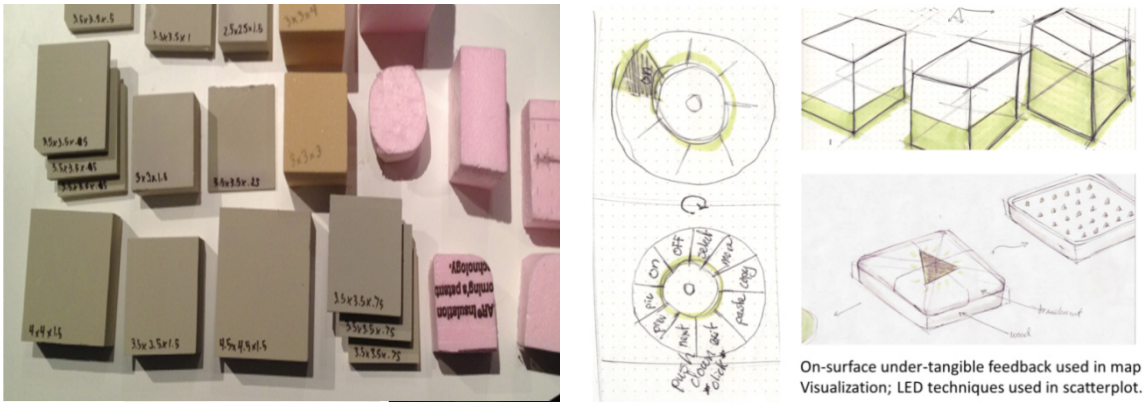


Figure 29. Size and shape choices for tangibles; feedback using LED lights. (Drawing credit: Basheer Tome, 2011)

Under my supervision, the team analyzed the functional roles of each type of tangible and proposed and developed a taxonomy for each tangible type across both the map and

scatterplot visualizations. According to a schema developed by Holmquist, Redström, and Ljungstrand (1999), the Viewpoint Tangibles used to filter data are *tokens*; the tangibles for the x and y axes are *tools*; and the Compare Tangible, used to select states in the map visualization and for tagging data points on the scatterplot is a *container*. This analysis of functional roles was helpful for recognizing that we could characterize the x and y tangibles as using a *token-and-constraint* technique (tangible and table edge) (Ullmer, Ishii,. & Jacob, 2005). Sketching exercises as well as an in-lab design session with the entire Synlab team were used to explore possibilities. We used our sketches to fabricate the final tangibles for evaluation seen in Figure 30. We determined the appropriate final sizes for the tangibles using camera tests of the studio environment for both the second tabletop prototype and the final.

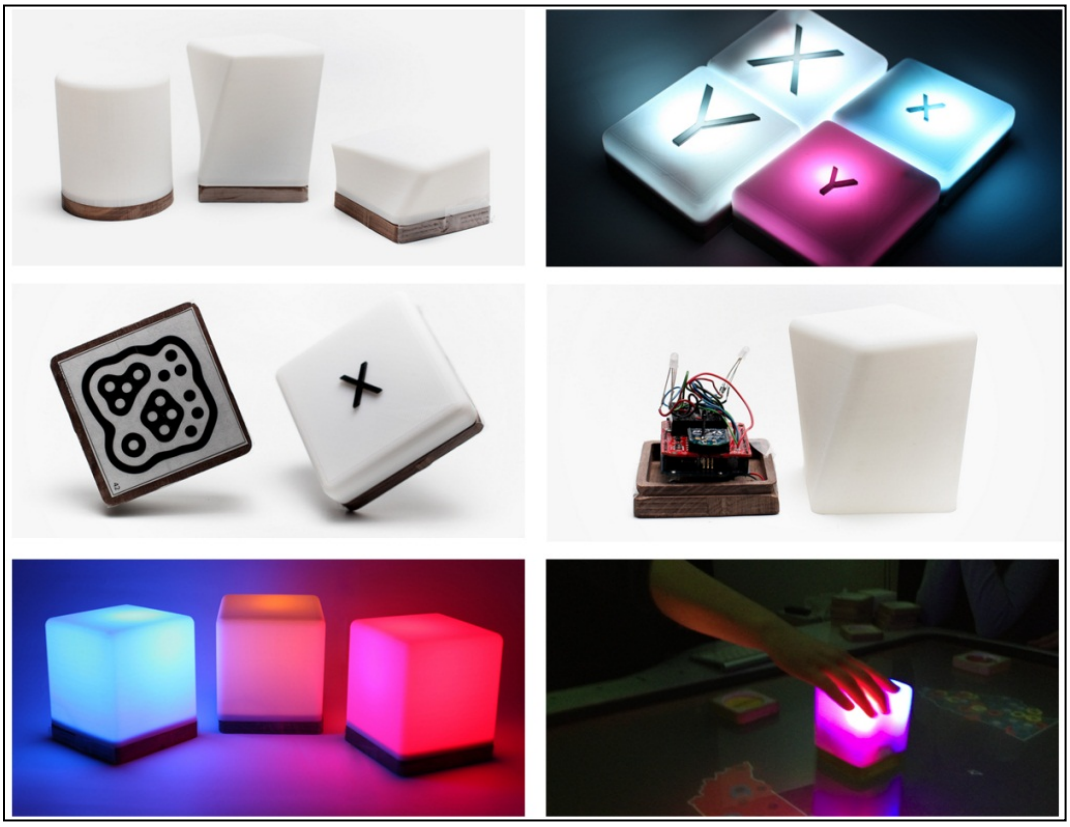


Figure 30. Final tangibles for different functions. (Photography credit: Basheer Tome, 2011)

Final Tabletop Prototype

To increase the reliability of the scatterplot application, I worked with a fellow lab member to redesign the code and re-engineer the scatterplot visualization in the C# programming language using the Microsoft Surface software development kit, in order to optimize the visualization for the Microsoft PixelSense Surface II interactive table. We networked the table to Windows machines to control the output of videos to the display screens. The Surface II was a commercially available device, rectangular in dimension and spanning 40 inches diagonally, running Windows 7, capable of multi-touch input, tangible object tag pattern recognition, and output to projectors. A custom set of tag patterns, *ByteTags*, were supplied for use with tangible objects on its surface. We installed the table at a height that allowed users to operate it while standing or sitting on high stools. Our mock set allowed the anchor and discussants to sit around three sides of the table with the unused side facing studio cameras.

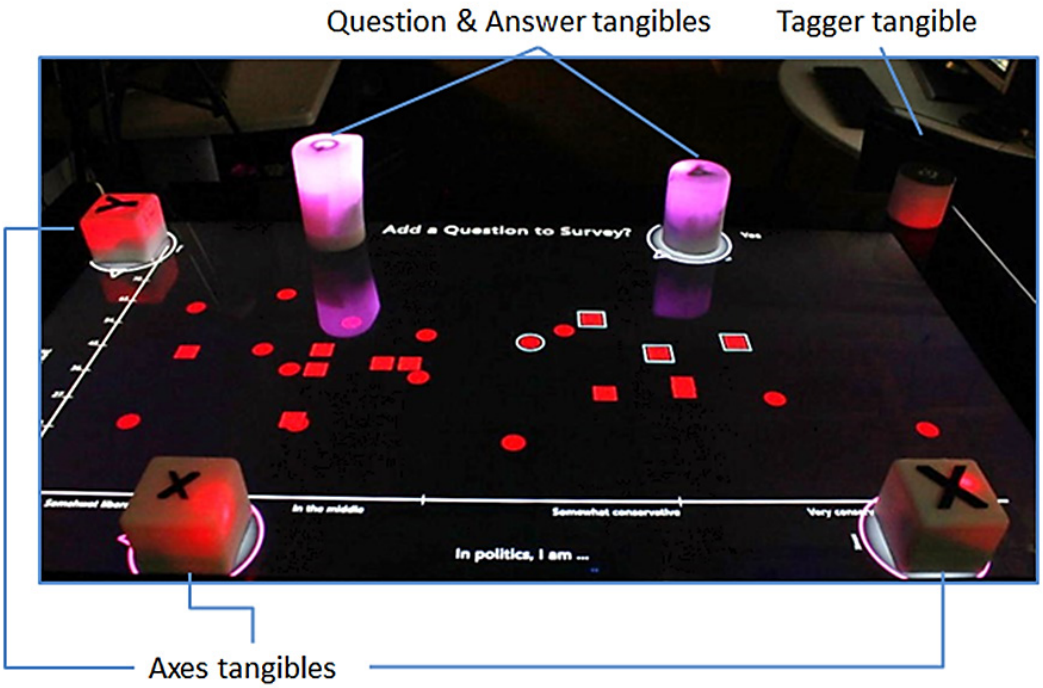


Figure 31. PixelSense interactive tabletop with scatterplot and tangible controls.

Figure 31 shows the final tabletop for testing as seen from the host's point-of-view. Colors and sizes of the visualization are set by flexible XML configuration files. As discussed, the tangibles for the x- and y-axes are used to zoom and pan data on the scatterplot and can be rotated to change the variables featured along each axis. Question and Answer Tangibles, shown in purple, are used for selecting or filtering different question and answer choices. The Tagger Tangible (top right), replacing the Compare Tangible in the previous prototype, enables the producers or performers to highlight data points of interest. In Figure 31, these highlighted points are outlined in white (top right data points). The prototype used in the evaluation studies used a blue color for the Tagger Tangible and a green color for the Question and Answer Tangibles, seen in Figure 32.

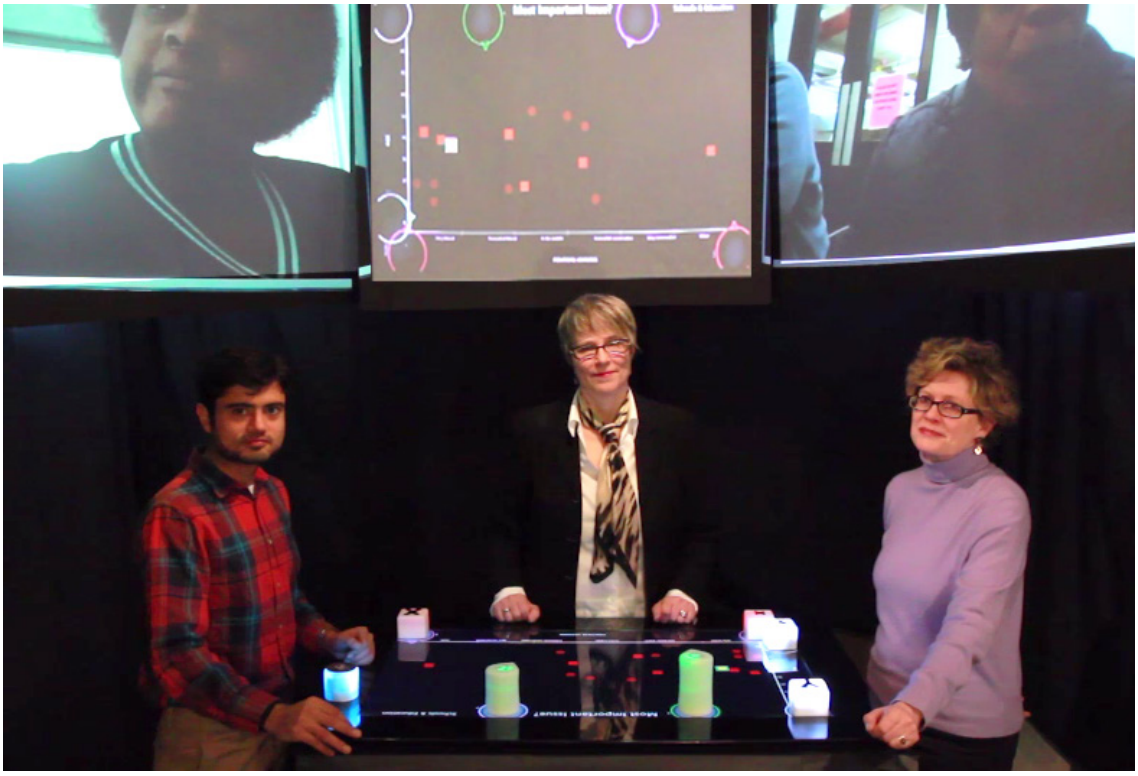


Figure 32. Interactive tabletop with scatterplot and tangible controls used in testing.

Using these tangible controls, users can explore data trends and play videos to create a narrative about a topic of interest. For example, the host could choose a question and examine the pattern of responses. Each question and answer presents individual survey responses with visual markers. In the prototype, these markers are in the shape of a square if a response has a video associated with it or a circle if not. To reveal meta-data about the responses such the name and age of persons featured, performers can drag a finger over markers to reveal meta-data about the responses such as the name and age of persons featured (see Figure 33). To play out the corresponding video on one of two overhead screens as determined in the configuration settings, performers tap on a square video marker. In a studio television production setting, the finger tap could also signal the control room to switch the video selected to the program feed.

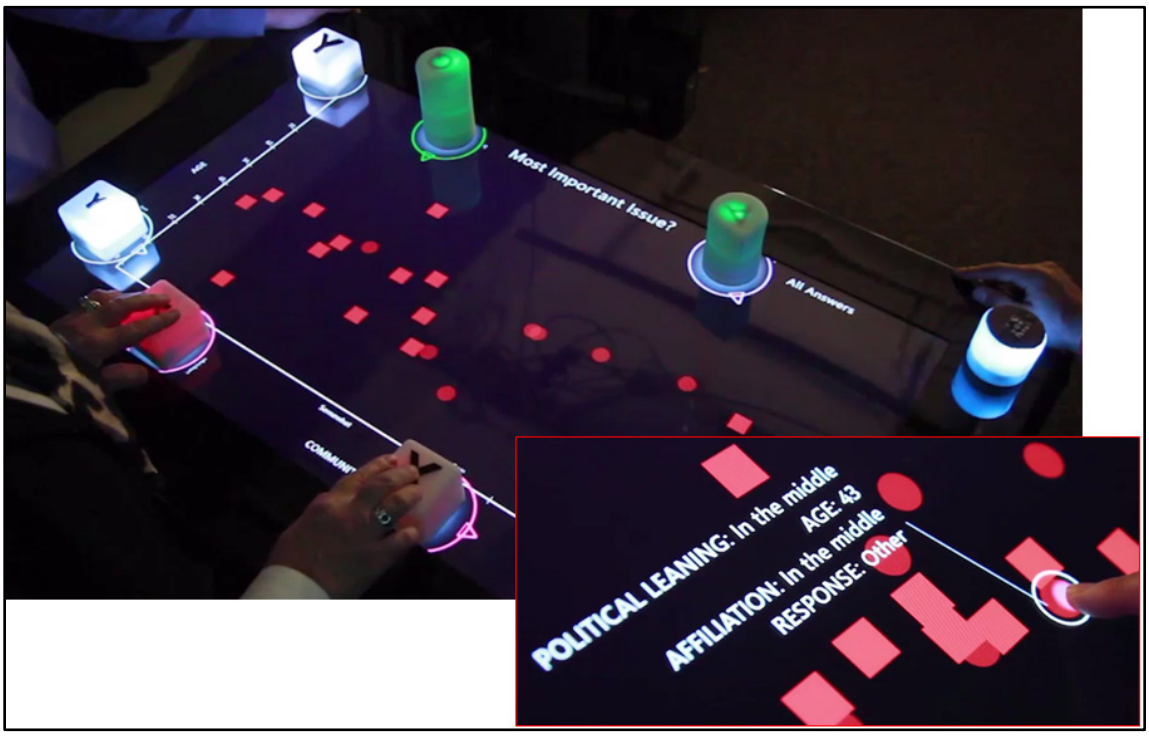


Figure 33. Using tangible controls to zoom the data (left) and preview meta-data related to viewpoints (right).

4.3 Web Proxy for Making Opinions Public

Given the technical limitations of producing a television show from our laboratory or taking the set-up to a television studio, I decided to create a public website for displaying the results of the surveys as a proxy channel for the implementation of the system with a broadcast partner. This supported investigating the research question regarding people's willingness to make their video viewpoints public. The design and development process took several months.

Our most important design consideration was the issue of privacy with regard to location data. The team created an algorithm for suppressing interview location data for individual respondents (which might occur in the individual's home); the team aggregated the responses into a wider, geographically bounded area such as a neighborhood. Figure 34 shows the implementation of this proxy mechanism for making the opinions public.

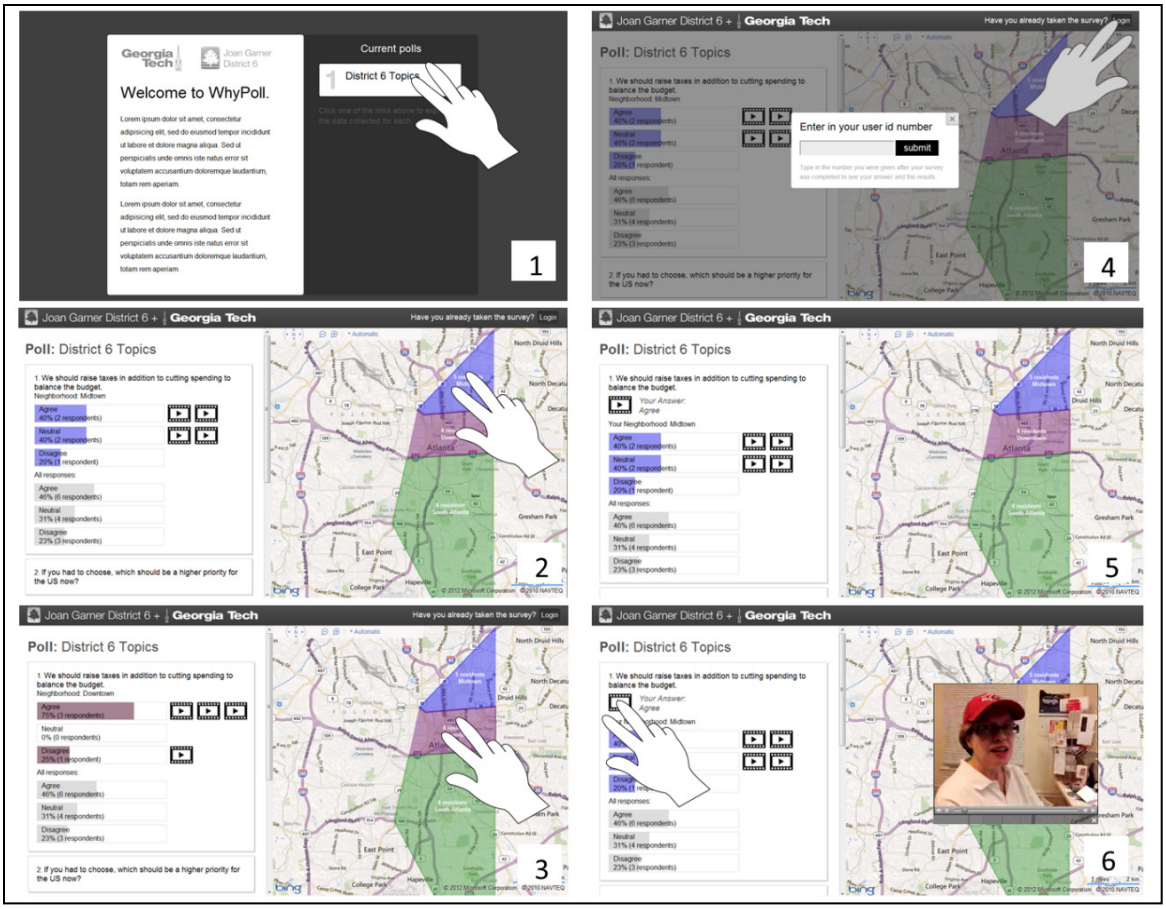


Figure 34. Website proxy map for displaying data by geographic area and associated videos.

CHAPTER V

SAYWHYPOLL MOBILE SURVEY

To support a claim that a technology has the potential to improve a practice that stakes its reputation on reaching a representative sample of the population, I needed to achieve a higher degree of naturalism with the mobile study than is possible with a laboratory-based study and using university-based (student subjects) sampling. Toward this end, working with a team of graduate students as one of the sponsored research projects of my research laboratory at the Georgia Institute of Technology, I collaborated with an elected official (Fulton County, Georgia Commissioner Joan P. Garner) of a major U.S. metropolitan area. After I explored how the components of the mobile study could provide her with useful information while fulfilling the study needs, the team was granted access to deploy the mobile polling application in her district with constituents. Our purpose was to (a) gain a better understanding of their viewpoints and (b) gather data from their perspectives regarding the feasibility and acceptability of the proposed survey method. The geographic area that is her district met the important criteria of featuring a socioeconomically and ethnically diverse population.

Working with a local elected official offers advantages in the evaluation of survey technology. A primary advantage is that participants view the activity as a legitimate effort rather than a hypothetical one. That aspect assists with enrollment and presents a real context in which to explore the issue of trust. Using the data gathered for something other than a student study also signals a practical purpose, especially for vulnerable populations who often have been unduly studied: The collected data have real meaning

because they will be given to a public policy maker, in contrast to data collected for a purely academic effort, which might impact public policy.

During the time of the data collection, (2012 and 2013), the offical was serving her first elected term as one of seven commissioners for Fulton County, Georgia. She was responsible for District 6, the county's largest and most wide-ranging jurisdiction that includes areas in the City of Atlanta and unincorporated Fulton County. The Georgia State Legislature redrew the district in 2013 to form two districts and Ms. Garner still serves as a county commissioner in one of the redrawn districts after winning a special election in 2014. An advantage to working with this specific public official during that time was the access given to the research team to most of the neighborhoods in the City of Atlanta, which are well-stratified demographically, permitting a range of diverse participants to be included in our sample. We were able to reach lay constituents *and* opinion leaders because the city has a well-established system of citizen-led neighborhood planning units (NPUs) with which local elected officials and government employees work closely.

5.1 Field Study

Aspects of the field study were designed with input from Commissioner Garner and core members of her staff including her Chief of Staff, a project manager for the county, and a staff member whose primary role was to field constituent inquiries. These professionals provided invaluable insight into the interests and sensitivities of different interest groups and neighborhoods in the Commissioner's district. It was helpful, too, that I have been an Atlanta area resident for more than 30 years and have been actively involved in a number of public projects and debates during many of those years.

When I began meeting with the Commissioner and her team in April 2012, it was immediately clear that the team was committed to on-the-ground activities to meet and understand the needs of its constituents. Commissioner Garner offered her expectations for the overall effort and provided specific objectives that she wanted to achieve: She and her staff were specifically interested in gaining additional clarity into the various concerns and priorities among the different communities-of-interest in her very diverse district.

Following our initial meeting, I worked primarily with the Commissioner's Chief of Staff, an expert in the district's public issues and population. We began by researching the district boundaries, neighborhoods, concerns from public inquiries, salient issues, and demographics. The first decision was whether to field the application in *Remote Mode* with a small sample of lay public members and opinion leaders (the size of the set/sample was dictated by limited resources) or to test the application face-to-face, i.e. in *Street Intercept Mode*. Because the application was coded for selected Android smartphones only and we would need to provide these phones to every participant, fielding the survey face-to-face (Intercept Mode) was most feasible.

Canvassing the neighborhoods also satisfied a concern I had about reaching populations that could be deemed "hard-to-reach"—a distinction that has been wryly referred to by health communicators as "hardly reached" (Rubin, Freimuth, Johnson, Kaley, & Parmer, 2014). Although many people perceive the Internet and social media as great panaceas for public participation, others are skeptical and note that "digital inequalities" continue to exist for numerous reasons and factors (LeDantec & Edwards, 2008; Lilleker, Pack, & Jackson, 2010; Wei, 2012). Also, talking with people in the

places where they live, work, and play better enabled us to reach lay constituents, such as older adults and lower-income residents who do not have familiarity or access to technology or have security issues safeguarding expensive smartphones. Visiting neighborhoods brought us in contact with people who do not have the means to attend public meetings and who are less involved in issues debate, both of which are variables of interest in the propositions to be tested.

5.1.1 Sampling

Given that we chose to use the mobile application in a face-to-face mode, I studied a number of potential sampling strategies. My aim was not to achieve a statistically valid survey based on the demographics of constituents found in District 6; rather, to reduce bias in the selection process of respondents that exists with simple convenience sampling, which is used in many technology and communication studies. An interest in exploring the potential of generating neighborhood-level insights led me to examine different random sampling techniques for geographic areas. One possibility that seemed to be a natural fit with the technology was area probability sampling. In this type of sampling, the researcher selects a geographic area of interest and randomizes data collection; for example, interviewing a resident of every seventh household within an already randomly selected geographic sub-area. (Haner & Meier, 1951).

A promising approach to randomizing places to sample was cluster sampling using randomly selected census blocks or tracts within the district with further sample stratification by SES to ensure a range of respondents across SES levels (Henderson & Sundaresan, 1982; NCCPHP, 2014). However, during the initial pilot study in November 2012, the team went door-to-door to discover that some people were not at home, others

requested interview rescheduling, and potential crime issues in distressed neighborhoods indicated that we lacked the required resources to employ this type of sampling.

Venue-Based Sampling

As an alternative to area probability sampling, I investigated sampling techniques that had been specifically developed for such hard-to-reach populations. Public health researchers at the Centers for Disease Control and Prevention and colleagues in the field of HIV prevention had pioneered techniques that they designated Time-Space Sampling (TSS) or Time-Location Sampling (TLS) (Semaan & DiNenno, 2013). Rather than sampling probability relying upon population estimates within geographic areas, in (TLS) a sample is drawn from a universe of locations, days, and times in which a population of interest is available (Muhib et al., 2001). Further, the venue of recruitment may matter to a behavior of interest (such as alcohol use) or intervention to be designed (e.g. delivery of health messages) (Grov, 2012).

Involvement in issues was a key variable of interest in this study and likely to co-vary with neighborhood or community leadership. I decided to create a universe of venues that included two types of places, one in which we would encounter opinion leaders; the other in which we would encounter lay citizens who were likely to be less involved in local issues (although if we met opinion leaders at the latter sites, they would not be screened out). For issues of equity across constituents, it was important that the selected venues be geographically located throughout the district.

Venues

I drew upon HCI literature while investigating possible venues for reaching the lay public. I discovered that coffee shops had been used for what I would call participatory

discount design; in particular, a report in which a team designing a mobile application had elicited input from the public at such locations. Coffee shops are places in which people are readily available and have time to participate in studies; further, in a pilot of the survey instruments, we found recruitment in coffee shops to be relatively easy. A list of coffee shops in the district seemed a natural choice or, at least, a good starting point from which to randomize center points on a map to establish street intercepts. However, research revealed that coffee shops and close proxies, for example, diners, were not evenly located across the district and were absent from areas of poverty.

Given that we were administering a survey for the county government, I explored government facilities within the district as potential venues for conducting the study. I discovered that 12 county libraries were located throughout the district and served demographically diverse populations. To determine the feasibility of the libraries as a venue, we conducted a windshield survey of all locations to identify places where we could sit with people and to determine the type of foot traffic at these locations (see Figure 35). During our drive-about we discovered that one location had suffered a fire; another had virtually no foot traffic and limited hours; a third was a reference library, not open to the public. This reduced the number of locations to nine; however, the whole district was adequately covered. I asked the Commissioner's staff if they thought using the libraries as a place to meet residents was a good idea; they concurred and cleared the activity with the Atlanta-Fulton County Library management.

Figure 35. Windshield survey of libraries: lobby (left); closed library (right).

The libraries had greatly varying amounts of visitation. The procedure for drawing a sample using TLS when venues have differing numbers of potential respondents is to weight the venues during the randomization process (Karon & Wejnert, 2012). Data on total visits for 2012 to each library were used to assign weights to each location; more heavily visited locations were given more chances to be selected. For example, the Ponce de Leon Avenue branch, which had 329,385 visitors in 2012, was roughly 18 times more likely to be selected in random picks than was the Georgia Hill Branch, which had only 18,507 visits per year. However, because I wanted to visit all available locations to cover the district geographically, I drew selections randomly until I had at least one visit per location.

In terms of scheduling the days and times to conduct interviews, it was not feasible to randomize fully those elements. Instead, I scheduled locations randomly on the Wednesday, Fridays, or Saturday that my research assistants and I could meet. If the weather was unfavorable or a last minute scheduling issue arose, then the venue visit was rescheduled as soon as possible. I planned sixteen visits; time constraints reduced the actual number of visits to nine. The team visited each location once; two locations were visited twice.

For the venues in which we could reach opinion leaders, we reviewed a list of 68 neighborhood organizations found in District 6 provided by the Commissioner's office and 13 Neighborhood Planning Unit (NPU) meeting sites. Given that the NPUs and their meetings are populated by neighborhood organization leaders and located throughout the entire district, I chose the sites of NPU meetings as the venue. When we completed sampling of lay public members, there were only three months remaining for data collection. I immediately began attending NPU meetings by first available date to introduce the topic and recruit participants. Venue selection was not fully randomized as a result, but venues were selected based upon the order in which they appeared on the list and meeting times vis-à-vis our data collection schedule.

5.1.2 Method

A team of two persons, one serving as interviewer and the other as assistant and note taker, went to each venue. We wore lanyards with the name of Georgia Tech and school colors clearly displayed and our student IDs visible during each visit. For lay participants at the library venues, the team approached patrons to ask them to participate in the study as they entered or exited the library. We intercepted people as they crossed the interview area when we were not conducting an interview. Once a patron agreed to participate, we took him or her to an interview area at the side of the library's entrance or, if away from the entrance, on the library property. For opinion leader participants, we met individuals at places that they specified, which ranged from a county facility to individuals' homes and worksites, or local coffee shops and restaurants.

We used a special two-part process to obtain consent for the study and to release opinion data. I explained to each participant that consent for the study was limited to

agreeing to take (a) an opinion survey and (b) a user experience survey that included a demographic section, but that the decision to share responses publicly required a separate signature. I designed the protocol in this way because of the novelty of the survey format. First, I was concerned that participants would not understand the parameters of the consent if there was only one form for all aspects of the study, including making results of the opinion survey public. Indeed, a number of participants were surprised about the video option even after it was explicitly described in the consent form. For example, one participant expressed concern about using video, saying

> Well, I guess I didn't know it [video recording] would be a part of it [the survey] when I first started. But once I knew that this was going and I knew that I could walk away, I was fine with it. (P24-LP-M-30's)

Also, I wanted to enable the participants to interact freely and to become familiar with the technology before they made the decision to publicize their respective comments.

Participants received two surveys, the opinion survey, and a two-part user experience survey. The latter survey separated participant data, i.e., demographics, from the opinion survey and user experience survey as a precaution. During the interview, the primary task of the interviewer was to establish rapport and to handle the mechanics of administering the survey. This included demonstrating the process of adding a video to the survey item response on the first question and then actively soliciting videos thereafter on those questions most suited to being supplemented by them. For both surveys, we used a qualitative interviewing style: Participants are regarded as active meaning makers and the technique emphasizes close listening and responsive follow-up to understand meaning within changing contexts (Clark, Creswell, & Green, 2008;

Turner, 2010; Warren, 2001). The note taker was charged with taking detailed notes on the interactions, including actions, non-verbal behavior, and verbatim comments from the interviewer and interviewee and other observational data such as field conditions.

Measures

In the design of the instruments, I incorporated theoretical constructs of the Diffusion of Innovations Model (Rogers, 2010) and the Theory of Reasoned Action/Hypothesized Response Intention Model (Gordoni & Schmidt, 2010). I supplemented these theories by a review of usability and user experience instruments for both mobile form factors and mobile surveys (Kaikkonen, Kallio, Kekalainen, Kankainen, & Cankar, 2005; Lewis, 1992, 1995; Perlman, 2011; Tarkus, 2009).

Opinion Survey

The opinion survey consisted of 12 questions that I devised in collaboration with the Commissioner's staff (see Table 6) and one additional item. The questions asked about current topics in the news and items regarding county services. I designed the set of questions to ask both non-sensitive and potentially sensitive topics and to provide opportunities for respondents to engage re-framing issues. For example, the first two questions forced respondents to identify and choose those responses from a list of issues facing the county that they believed to be singularly important. The intent of the forced-choice response format was to determine if any respondent would "push back" against the forced choice format. In addition, a question invited participants to add their own question for the commissioner to ask of others on future surveys. The potentially sensitive question for opinion leaders was whether Atlanta should build a new stadium, a hotly debated, controversial issue for which neighborhood economic impact is at stake.

We considered questions regarding the library services as potentially sensitive for lay participants because they might have to face the librarians they were rating. One additional question, which was extracted from national surveys (NBC News / *Wall Street Journal*, 2011) asked participants to categorize themselves in terms of politics.

Table 6

Public Opinion Survey Questions

By Phone – All Questions Are Coupled with a "Why" Video Question

OpinionSurvey-01 [*Framing: forced-choice*] From this list: What do you think is the most important issue in Fulton County today?

- Housing issues
- Health issues
- Population, growth, and development
- Immigration, legal and illegal
- Drugs and drug abuse
- Poverty, homelessness, social welfare
- Other

OpinionSurvey-02 [*Framing: forced-choice*] Of this list, what is the most important issue facing Fulton County today?

- Traffic and transportation
- Schools and education
- Crime and gangs
- Environment and pollution
- Jobs and the economy
- Other

OpinionSurvey-03 Disagree or agree?: I have a good understanding of the services that Fulton County government offers versus the City of Atlanta.

Strongly disagree Disagree Neutral Agree Strongly agree

OpinionSurvey-04 Check all the local government services you think are provided by Fulton County versus the City of Atlanta.

- Health clinics and services
- Providing economic and financial assistance to eligible residents
- Operating area transit, such as buses, light rail, and the airport
- Repairing streets
- Library Services

- Operating detention facilities
- Homeless shelters

OpinionSurvey-05 Have you visited a Fulton County Library in the past 12 months?
- Yes
- No

OpinionSurvey-06 [*Self-Monitoring – Lay Persons*] Think about the library you visit most often. Check the things that met your expectations:
- Staff was helpful to your problem/concern
- The library hours of service were good for me
- The computers for public use were available
- The books and other resources I needed were available
- The library's buildings and grounds were good
- Other

OpinionSurvey-07 How would you rate accessibility to programs for senior citizens in your area of the County?
- Poor
- Fair
- Good
- Excellent
- Is it not applicable to you
- DK/REF

OpinionSurvey-08 [*Self-Monitoring – Opinion Leaders*] Does Atlanta need a new stadium for the Falcons?
- Yes
- No
- Maybe

OpinionSurvey-09 Oppose or Support? [*Self-Monitoring – Opinion Leaders*]
Using hotel/motel taxes in Atlanta & Fulton Co to help finance a new stadium?
Strongly Oppose Oppose Neutral Support Strongly Support

OpinionSurvey-10 [*Framing*] If you could add a question to this survey, what you do think would be an important question to ask residents of your community?
- I have a question I'd like asked.
- I don't have any questions I'd like asked.

OpinionSurvey-11 [*Framing – Opinion Leaders*] Do you have specific community perspectives you would like to offer?

- Yes
- No
- Maybe

OpinionSurvey-12 [*Involvement*] Neighborhood issues include local school decisions, services to the community, zoning and planning decisions, and neighborhood association actions. Would you say that you are

- Not very much involved
- Somewhat involved
- Actively involved
- Leading action

OpinionSurvey-13 I would consider myself in politics to be

- Very liberal
- Somewhat liberal
- In the middle
- Somewhat conservative
- Very conservative
- Other

The user experience survey (see Table 7) presented a series of Likert-type items that targeted user experience rather than usability because the opinion survey was delivered by the interviewer and the interaction with the respondent was yet to be determined. We repeated a user characteristic question from the opinion survey for validation purposes.

Table 7

User Experience Survey Questions

By Phone – All Questions Are Coupled with a "Why" Video Question

UserEx-01 The mobile application seemed easy-to-understand and use.
Strongly disagree Disagree Neutral Agree Strongly agree

UserEx-02 This would be a good way to gather people's opinions on local issues.
Strongly disagree Disagree Neutral Agree Strongly agree

UserEx-03 I had some concerns regarding having my video taken.
Strongly disagree Disagree Neutral Agree Strongly agree

UserEx-04 I had the following concerns regarding having my video taken (mark all)

- No concerns
- My appearance
- My identity being known
- Other
- Not sure

UserEx-05 I think I could easily use the video attachment feature.
Strongly disagree Disagree Neutral Agree Strongly agree

UserEx-06 To explain why I chose answers to the questions in the survey, I would be comfortable with the following (check all):

- My video
- My voice
- Text
- My voice only
- Text only

UserEx-07 I was interested in answering the questions presented.

- Yes
- No
- Maybe

UserEx-08 I thought the number of questions being asked was

- Not enough
- Just right
- Too much

UserEx-09 I would be interested in seeing the results of the poll.
Strongly Disagree Disagree Neutral Agree Strongly Agree

UserEx-10 Would you like to use this app again?

- Yes
- No
- Maybe

UserEx-11 Do you have any additional comments on the mobile application?

- Yes
- No

UserEx-12 Neighborhood issues include local school decisions, community services, and planning choices, and neighborhood associations matters. Would you say you are

- Not very much involved in neighborhood issues
- Somewhat involved
- Actively involved
- Leading action

UserEx-13 Please check all that apply:

- I post on Facebook less than once a week
- I post on Facebook several times a week
- I have a Twitter acct I tweet on less than once a week
- I have a Twitter acct I tweet on several times a week
- I watch news or public opinion shows less than once a week
- I watch news or public opinion shows several times a week

UserEx-14 What is your education level?

- Grade school
- High school
- Some college or training
- Vocational training/2-year degree
- 4-year college/bachelor degree
- Post-graduate study
- Post-graduate degree

A separate set of questions to collect demographic data was presented after the opinion and user experience surveys and can be found in Appendix A.

Lay Public Data Collection

The team collected lay public data from early March 2013 through May 2013. At each location, we recorded the number of people who (a) were asked to participate, (b) accepted an interview, and (c) completed the procedure. The sampling data are presented in Table 8. Our final sampling frame consisted of 10 different library venues from which we completed interviews with 51 respondents. The overall rate for responses used was

55% (*n* = 51 of 92). Of those 51, only 47 fully completed responses were achieved, resulting in a response rate of 53%.

Table 8

Lay Public Response Rates

No.	Date	Venue Code	Day	#Intercepted/ Approached	#Accepted	%	Complete Interviews	Complete Records
1	3/8/13	WE	F	8	6	.75	6.	0
2	3/9/13	ST	S	10	6	.60	6	6
3	3/13/13	CA	W	9	6	.67	6	6
4	3/15/13	CN	F	9	5	.56	5	4
5	3/16/13	MK	S	8	5	.63	5	5
6	3/20/13	PT	W	15	6	.40	6	6
7	3/27/13	PT	W	12	7	.58	6	6
8	4/5/13	PO	F	14	7	.50	6	6
9	4/6/13	WE	S	8	3	.38	3	2
10	4/10/13	MEGH	W	7	6	.86	6	6
Subtotals of All Intercepts				*100*	*57*	*.57*	*55*	*47*
Completed Lay Public Surveys*				**92**	**57**	**.53**	**55**	**47**

*One person intercepted during lay public surveys was an opinion leader.

Opinion Leader Data Collection

For this study, opinion leaders on local issues are defined as people who are in positions of recognized leadership in formal organizations or who have previously held such positions and are currently active in local organizations (Katz & Lazarsfeld, 1955). Recruitment of opinion leaders was conducted by making in-person visits to Atlanta neighborhood planning unit (NPU) meetings. Three visits were made during the second week in April 2012, and a fourth visit was made during the first week of June 2013 after possibilities for interviews with the first three meetings were exhausted. At each meeting, I introduced the project and remained after its conclusion to gather names and emails of potential interviewees. Then, each potential respondent was emailed a standard letter and further follow-up was conducted by email and telephone call if a phone number was obtained. I contacted thirty-three (33) potential participants at least twice, with 17

accepting the invitation, resulting in a 52% response. Response rates varied widely among the NPU venues. We were able to schedule and complete only 14 of 17 interviews within the time allocated for the study, resulting in a 42% overall response rate (Table 9).

Table 9

Opinion Leader Response Rates

No.	Date	Venue Code	Day	#Intercepted/ Approached	#Accepted	%	Complete Interviews	Complete Records
1	4/8/13	NPU-1	M	9	2	.22	1	1
2	4/9/13	NPU-2	T	5	4	.80	4	4
3	4/10/13	NPU-3	W	10	5	.50	4	4
4	6/04/13	NPU-4	T	9	6	.67	5	5
Subtotals of All Approached				*33*	*17*	*.52*	*14*	*14*
Completed Op. Leader Surveys				**33**	**14**	**.42**	**14**	**14**
Completed – All Surveys					**61**	**.48**	**69**	**61**

In addition to the persons who were recruited in this process, during data collection one additional person who we interviewed through the lay public intercept method met our definition of opinion leader and was included in the final count of 15 opinion leaders. Further, during the field study we were able to develop an additional category of person, by combining the results of survey and interview data. This category, which I named *Highly Involved*, comprises opinion leaders and persons who are not currently serving as designated leaders for neighborhood organizations, but who have a high degree of involvement in their neighborhoods, including engagement with formal organizations. I identified nineteen (19) persons to place in this category.

Analysis

This case study design employs mixed methods: Quantitative and qualitative data were collected, analyzed, and then triangulated to form the set of results. Although the user experience survey measured respondents' perceptions of the process and attitudes toward

the survey method, I was able to use the field notes to verify responses and, in some cases, to furnish missing data points or identify contradictions or other conditions relevant to understanding the dynamics of the survey method. Interactions during the opinion survey data collection were particularly helpful because respondents were encouraged to talk aloud about their reactions to the different types of questions.

Quantitative Analysis

The survey data passed through an initial data-cleaning process to insure complete records and to correct any obvious errors; for example, when the item asking if the respondent wanted to add a question remained unmarked or was marked "No", but the respondent had, in fact, added a question. I also was able to add missing values on several occasions when the field notes had answers noted, but those answers were missing in the data. I added additional fields to the survey data derived from the field notes, including (a) the category of lay and opinion leader, (b) a "level of involvement" index based on combined findings, (c) whether the person gave permission to make their videos public, and (d) privacy concerns data to supplement the question about concerns with recording a video. All statistical analyses were performed with either IBM SPSS 21.0, EXCEL, and web-based tools, with most correlations and logistical regression calculations generated using SPSS.

Qualitative Analysis

For qualitative analysis, members of the field study team transcribed field notes and all videos from the user experience study. The team created an initial codebook that included relevant constructs from the literature review on public opinion polling noted as relevant in Chapter 2, codes for usability and user experience, and feasibility. Then the interviews were divided among the team for double-coding using a form that included a column for

the field notes and transcripts and coder reflections to be captured for two coders. Additional codes were added as themes or aspects of the data emerged, such as [TRUST], used when respondents talked explicitly about trust, and [EXPRESS], used to note high levels of displayed emotion in the responses.

I completed the majority of the second cycle of coding that, for the most part, was simply adding rather than revising codes, although I did some recoding. (Most of the team members had not conducted qualitative analysis previously.) The codes were reviewed by the team collectively to ascertain any disagreements in interpretation; if agreements were reached, then codes were annotated and revised. After coding was complete, one of the team members loaded the coded data into the textual visualization software package, Jigsaw, created by Georgia Tech's Information Interfaces Group, which conducts visual analyses of code patterns, counting of occurrences of codes, and rapid review of individual transcripts (see Figure 36).

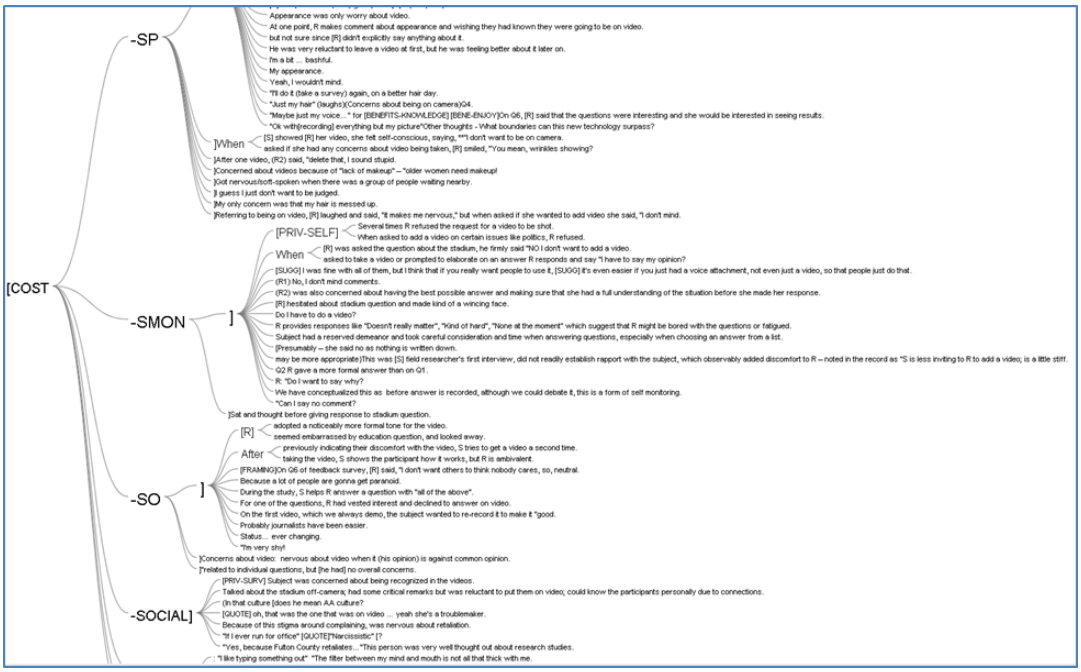


Figure 36. Screenshot from Jigsaw.

Trends in the qualitative data did not often reach statistical significance due to the sample size. As I compiled the results I noted majority patterns; for example, an *n* of 15 of 19 for a subset of 62 respondents. I gave special attention to outliers—cases not adhering to the overall pattern—in this example, the 4 of 19 that were not in the majority. Although this introduced complexity in presentation and analysis of the results, these cases provided important clues and foundational platforms for future investigations (Mcpherson & Thorne, 2006).

5.1.3 Results

In this section, I provide a description of the sample and its characteristics. I transpose the case study model propositions (i.e., claims) into hypotheses and examine whether these hypotheses find support from either statistical or qualitative analyses. I note other findings such as significant themes, including those related to theoretical constructs used in the field study instruments or those that emerged solely from open coding of the interview data and field notes. Finally, in addition to the case study model findings, I provide the insights gained regarding the mobile applications overall usability and user experience, and I note limitations.

Demographics

Records from 61 participants in the sample are analyzed: 60 fully complete records consisting of the opinion and user experience surveys (including demographics) and 1 record that is missing demographic data, which was included in the qualitative analysis. Table 10 summarizes the demographic characteristics of the 60 complete demographic records. We did not collect ethnicity, but nearly two-thirds of the sample was not of

European descent. We found no association among key demographics and our dependent variables.

Table 10

Sample Demographics

Aspect		Number	Percent
Gender			
Female		29	48.3
Male		30	50.0
Couple (M&F)		1	1.7
Generational Age Groups (as of 2014)*			
Millennials	18-34	19	31.7
Gen X	35-50	19	31.7
Boomers	51-69	17	28.3
Silents	70+	5	8.3
Education			
High school or GED/or less		9	16.7
Some college < 4-year degree		19	31.7
4-year degree (Bachelor)		17	28.3
Advanced degree (Master, PhD)		14	23.3

*Generational schema from Pew Research (Pew Internet & American Life Project, 2012)

Variables of Interest

Four variables of interest (opinion leader, involvement, privacy, and social media use) were captured in both survey measures and coded in the qualitative interview data. Table 11 shows the frequencies and percentages of these variables of interest.

Table 11

Frequency of Variables of Interest within Sample

Involvement in Issues, Privacy Concerns, Technology Use (Social Media)				
All respondents (n=61)				
	Yes	**% Yes**	**No**	**% No**
Opinion Leader (OP)	15	25	46	75
Highly Involved (HI)	19	31	42	69
Had Privacy Concerns (PC)	17	28	44	72
Used Social Media ≥ 3 x week	19	31	42	69

Opinion Leader	=	Currently sits on formal community organization
Highly Involved	=	NPU member, neighborhood leader, works in planning or community, attends/involved in formal meetings regularly
Privacy Concerns	=	Indicated on survey or was coded for privacy concerns
SM Use ≥ 3 x week	=	Uses Facebook or Twitter three or more times a week

Involvement

Opinion leaders and people with high levels of involvement in community issues were recruited from Atlanta neighborhood planning unit (NPU) board meetings. Also, during interviews we noted in the field notes if the respondent indicated that he or she held an elected position in a neighborhood organization or provided other data to indicate involvement. To measure involvement for all participants, the following item was duplicated for both the opinion and user surveys and checked for consistency between the two surveys and the field data:

OpinionSurvey-12 Neighborhood issues include local school decisions, services to the community, zoning and planning decisions, and neighborhood association actions. Would you say that you are

- Not very much involved
- Somewhat involved
- Actively involved
- Leading action

After concluding respondent recruitment with attendant interviews, I analyzed the qualitative data and developed a scale representing the range of involvement defined by behaviors to supplement the involvement survey item (see Table 12). If a person

exhibited several behaviors such serving as a neighborhood leader (e.g., homeowners' association president) and as a Neighborhood Planning Unit (NPU) member, I assigned the higher value of involvement.

Table 12

Involvement Index from Survey Items, Transcripts and Field Notes

Involvement Index	
Description	**Scale (1-9)**
Neighborhood Planning Unit (NPU) member	9
Neighborhood Leader/NPU attendee	8
Job involves community planning	7
Work tied to community issues	6
Attends/involved in formal meetings regularly	5
Attends meetings some	4
Demonstrates knowledge of issues	3
States interest in issues	2
No time spent or interest in issues	1

Note: For statistical analysis, I defined *more involved* as a score of 5 or above and *less involved* as a score of 4 or below.

Privacy

Concerns with *privacy* were captured in two user survey measures:

UserEx-03 I had some concerns regarding having my video taken.

- Strongly disagree
- Disagree
- Neutral
- Agree
- Strongly agree

UserEx-04 I had the following concerns regarding having my video taken (mark all)

- No concerns
- My appearance
- My identity being known
- Other
- Not sure

Responses were coded for the qualitative interview data. The codebook for the qualitative analysis includes definitions of privacy concerns excerpted and combined from privacy issues described in the theory of reasoned action (TRA) in survey participation as cited by Gordoni & Schmidt (2010):

> [PRIVACY IN GENRL RELATED TO ONESELF] refers to concern about privacy, which is the desire to keep information about oneself from the hands of others altogether (Singer, Mathiowetz, & Couper, 1993), and
>
> [PRIVACY-RELATEDTOTHIS SURVEY] refer to concerns specific to the survey undertaken (Hox, de Leeuw, & Vorst, 1995).

The qualitative data proved invaluable during analysis because several people who were coded in the field notes as expressing concerns with privacy either did not mark "My identity being known" or only marked "other" or "appearance" on the survey items. In other words, the item, "I had the following concerns regarding having my video taken" did not reliably measure concerns with privacy, although it was pilot-tested before data collection.

To remedy the discrepancies between the qualitative data and the survey item, I created a new bivariate variable from the data that indicated a concern with privacy based on whether privacy concerns had been documented on the survey or in the qualitative data. Therefore, the numbers of participants who are noted as having privacy concerns was derived from a combination of those persons who explicitly marked "My identity being known" and of those participants who were coded for privacy concerns from the field notes and transcripts.

Technology (Social Media)

Familiarity with technology was a challenging construct to operationalize because it could be measured in many ways. A common way to measure it is to inquire about the

types of devices an individual uses and the frequency of their use. I was concerned about the bias this type of measure could introduce into a sample that included vulnerable populations such as the homeless, and persons with low income. Therefore, I selected social media as an indicator of familiarity with technology to include Facebook and Twitter because these technologies are currently achieving active adoption by people of all ages and income in the United States. The item measuring familiarity with technology was as follows:

UserEx-13 Please check all that apply:

- I post on Facebook less than once a week
- I post on Facebook several times a week
- I have a Twitter acct I tweet on less than once a week
- I have a Twitter acct I tweet on several times a week
- I watch news or public opinion shows less than once a week
- I watch news or public opinion shows several times a week

Although it would have been optimal to include additional questions to probe more deeply into technology or digital media use, a constraint of mobile surveys is length: 15 items are recommended as a best practice (Macer, 2011). Consequently, this was a fortunate constraint: It focused the inquiry on a specific aspect of familiarity with technology that revealed experience and attitudes in disclosing personal information in digital media channels.

In these next sections, we examine three variables of interest (level of issues involvement, privacy concerns, and social media use) as they relate to the case study model's claims about the advantages of using video in a mobile public opinion survey format. For the purposes of preserving confidentiality, study participants are identified by the following schema in the qualitative results: random participant number (1-61) either as an opinion leader (OP) or lay person (LP) by gender (M or F) within an age range by

ten year increments (20's, 30's, etc.); for example (P61-OP-F-20's). In some instances, I have left the respondent identifier off as a caution to insure confidentiality of data.

Use of Video in a Mobile Survey Format

In effect, the *SayWhyPoll* is a new survey mode that has as its novel component the making of videos by participants following closed-ended opinion survey items. One of the central research questions probes the respondent *acceptability* of this method: What downsides do they see? How might reactions to the technology and experience differ among respondents? And the bottom line, Will people go public with their video viewpoints or chose anonymity? Based upon literature review and expert input, I made the following claim:

> Claim 1: Public opinion-gathering surveys that afford respondents the option to add video viewpoints to explain their choices will have a greater level of acceptance among people who have (a) high involvement in the issues, (b) low concerns for privacy, and (c) high familiarity with technology.

Transposing the double-faceted claim into null hypotheses results in the following formulations:

> H01: Levels of use of involvement in issues, privacy concerns, and familiarity with technology (social media use) will have no impact on *whether people think the practice of using mobile surveys that enable one to add video viewpoints to explain their choices is a good way to gather opinions.*
>
> H02: Levels of use of involvement in issues, privacy concerns, and familiarity with technology (social media use) will have no impact on *whether people are willing to make their opinion public using video.*

To test these hypotheses, there are two primary measures of acceptance in the study: (a) a user survey question asking for the respondent's opinion about the method—is it a good way to gather opinions? and (b) an action to be taken by respondents after the survey is completed; that is, whether to *go public* with responses.

Findings from both the survey question and the action are supplemented by qualitative data. The next section examines the findings for H01, followed by a section on H02.

Acceptance of the Use of Video Viewpoints

Quantitative Findings

To measure whether people thought the mode of data collection was acceptable, the following Likert-type item was included on the user experience survey that was administered after the respondent completed the opinion poll. For variables of interest, means and standard deviations for the item are presented in Table 13. Also presented are the percentages of respondents agreeing that the method is a "good way to gather people's opinions on local issues." An answer indicating "neutral" is counted as disagreeing with the statement.

Table 13

Acceptability of Method and Variables of Interest

This would be a good method to gather people's opinions Strongly Disagree (1) Disagree (2) Neutral (3) Agree (4) Strongly Agree (5)					
			Mean (SD)	%Agree*	% diff b/w
All Respondents		**61**	**4.18 (.76)**	**88**	
Opinion Leader (OP)	Yes	15	4.20 (.75)	93	
	No	46	4.17 (.76)	87	6
Highly Involved (HI)	Yes	19	4.05 (.83)	89	
	No	42	4.24 (.72)	88	1
Had Privacy Concerns (PC)	Yes	17	3.94 (.73)	82	
	No	44	4.27 (.75)	95	-13
Social Media $\geq$ 3 x week	Yes	19	4.21 (.77)	89	
	No	42	4.17 (.75)	88	1

Opinion Leader	=	Currently sits on formal community organization
Highly Involved	=	NPU member, neighborhood leader, works in planning or community, attends/involved in formal meetings regularly
Privacy Concerns	=	Indicated on survey or was coded for privacy concerns
SM Use > 3 x week	=	Uses Facebook or Twitter three or more times a week

**Note.* Answers marked "Neutral" are counted as "Disagree."

Overall, survey participants (n = 61) responded favorably to the option of adding a video viewpoint. The statement, "This would be a good method to gather people's opinions," garnered 88% (*n* = 54) agreement among participants: mean = 4.18 (.764) with 1 = Strongly Disagree, 5 = Strongly Agree.

Although some differences across groups of respondents with differing attributes (variables of interest) are apparent in the descriptive statistics, these differences are not statistically significant for acceptability regarding individuals' level of involvement, privacy concerns, or familiarity with technology (social media.) The largest difference in mean scores exists between those with privacy concerns, which supports the hypothesis.

Table 14

Participant Preferences for Adding Explanations for Their Choices Arranged in Order of Increased Privacy of Response

	Video, Voice, Text (*n*) *%* *p	**Video & Voice** (*n*) *%* *p	**Video Only** (*n*) *%* *p	**Voice & Text** (*n*) *%* *p	**Voice Only** (*n*) *%* *p	**Text Only** (*n*) *%* *p	**Total**
TOTAL SAMPLE	(21) 34	(6) 10	(8) 13	(11) 18	(8) 13	(7) 11	(61)
Opinion Leaders (OP)	(8) 53	(1) 7	(0) 0	(4) 27	(1) 7	(1) 7	(15)
Highly Involved (HI)	(9) 47	(1) 5	(1) 5	(4) 21	(1) 5	(3) 16	(19)
Privacy Concerns (PC)	(3) 18	(2) 12	(1) 6	**(6) 35 *.029**	(2) 12	(3) 18	(17)
SM Use ≥ 3x a week	**(12) 63 *.003**	(1) 5	(1) 5	(3) 16	(1) 5	(1) 5	(19)
Had a Q to Add	(18) 41	(5) 11	(6) 14	(7) 16	(6) 14	**(2) 5 *.015**	(44)
Made Video Public	**(20) 43 *.011**	(5) 11	(7) 15	(7) 15	(7) 15	(0) 0 *.000	(46)

Note: **p* < .05 for proportion of respondent type preferring specified modality as compared to proportion preferring that modality in the remainder of the sample.

Although nearly everyone agreed that "the method was a good way to gather public opinion," their personal preferences were better revealed by asking, "To explain why I chose answers to the questions in the survey, I would be comfortable with the following. . . ." The results are provided in Table 14. Of note, as expected, people with privacy concerns chose those inputs that conceal identity ($p = .029$), whereas people who made their videos public did not chose text input, the most private input. However, these interpretations should be qualified with the consideration that in our small sample we may have encountered people who prefer not to write.

Qualitative Findings

Across All Respondents

Across both leaders and lay respondents, the overall attitude about the upsides/benefits of the survey method is well-expressed by this quote:

> I think any means to reach out and get opinions are good. I think it's better, you use new technology, and allowing the video to clarify answers is really a good thing. It all depends what you do with the data and you have to go through and process it all. (P26-OP-M-40's)

The analysis of interview data indicated overall that respondents believed the addition of video viewpoints was, in general, a positive development. Of note, opinion leaders thought it would be a better way to gather others' opinions than to gather *their* opinions, with more than one person noting that she had many opportunities to voice her opinions through decision-making power in formal settings. Another opinion leader noted, "*We usually do this behind closed doors*." In the upcoming sections, my analysis will center more on detailing concerns related to the variables of interest, as this information provides critical perspectives for future development of this survey mode.

Involvement in Issues

In the field, we noted how people reacted overall to the concept of taking videos *and* how they reacted to having their videos taken for different questions. Although the quantitative analysis did not indicate differences in acceptability by variables of interest, a critical examination into the field notes that were taken as the opinion survey was administered revealed differences between people who are heavily involved in local issues and in the public eye vis-à-vis members of the lay public.

To determine if people would react differently to having their videos taken relative to the sensitivity of the question, I included two questions that could be sensitive for a highly visible opinion leader, but not very sensitive for the average citizen. Those questions asked about the proposed construction of a new stadium for the Atlanta Falcons, which was being hotly debated during the data collection. At issue was (a) the burden borne by in-town neighborhoods surrounding the construction site, in terms of losing historic structures, affecting businesses, and creating traffic problems; and (b) stadium financing and taxpayer burden. The questions asked were as follows:

OpinionSurvey-08 Does Atlanta need a new stadium for the Falcons?

- Yes
- No
- Maybe

OpinionSurvey-09 Oppose or Support? Using hotel/motel taxes in Atlanta and Fulton Co to help finance a new stadium?

Strongly Oppose Oppose Neutral Support Strongly Support

We included a third question to determine how people might react to a potentially sensitive topic—one that asked the respondent to declare his or her political stripe. It was as follows:

OpinionSurvey-13 I would consider myself in politics to be...

- Very liberal
- Somewhat liberal
- In the middle
- Somewhat conservative
- Very conservative
- Other

While coding the transcripts and reviewing video viewpoints, among other areas of interest, we coded separately for privacy concerns and for explicit and implicit costs related to the effort of forming an answer (Berinsky, 2006). Costs were defined as relating to (a) forming the opinion, such as cognitive effort, but also those related to (b) expressing an opinion, with a focus on concerns about the presentation of oneself. The latter costs include concerns about looking foolish or worries about appearance and stated fears about the social costs of being truthful. Further, we looked for and coded evidence of self-monitoring; for example, taking time to formulate answers, so that what is said will not be used against oneself in those cases that did not appear to be related to being undecided.

Self-Monitoring

> The Falcons stadium is one of those things in which I am sure I am in, I think, they call it the silent majority or what, but most of the people I talk with are not convinced that we need it, but that we are going to get it anyway. (P60-OP-M-30's)

Our qualitative analysis indicated that there were differential perceived costs of recording one's opinion between opinion leaders and the lay public. Not surprisingly, with regard to the stadium questions, we observed a higher degree of self-monitoring among opinion leaders than the lay public. It was as though the leaders understood that they were *on the*

record from the start; therefore, their strategy was to avoid videoing anything that they did not want to make public. For example, when one leader was asked about the stadium, he firmly said "NO, I don't want to add a video." Similarly, he did not want to add a video viewpoint to the hotel/motel tax question because he did not want his answer to affect future, potential partnerships. In the user survey, he also stated that any concerns he had about having his video taken were "related to individual questions, but [he had] no overall concerns" (P2-OP-M-30's).

Body language was another indicator of self-monitoring. One respondent, a highly visible leader in a downtown community, hesitated about the stadium question and made a wincing face. While he answered the question, his response was measured and he declined to add a video on the second question about taxes. Another leader laughed when asked if she wanted to add a video, touching her face and deliberating for a long time. These observations could be translated as the higher cognitive costs of answering this type of survey for leaders because they must formulate their answers carefully. Self-monitoring behaviors among the lay public arose more from concerns about privacy than social costs per se and from attempts to present the best possible answer. Several lay public respondents, when asked to make a video, stated that they were shy. However, we observed that as people became more comfortable with the novel method and rapport with the interviewer increased, their attitude toward providing videos became more relaxed. For example, after reviewing her first video answer, one person said, "You can keep that one! You are not getting another one though" (P12-LP-F-30's). However, she continued to record videos and eventually made them public. She did note on the survey

that she preferred voice and text to video, which was consistent with her initial reaction. One man, in his twenties, suggested that it was important to have a choice:

> I was fine with all of them [the videos], but I think that if you really want people to use it, it's even easier if you just had a voice attachment, not even just a video, so that people just do that. Because a lot of people are gonna' get paranoid. So they might wanna' use their voice. And you still get the same results. (P15-LP-M-20's)

The question about one's "political stripe" provoked responses from people from all levels of involvement indicating that it broached a sensitive topic. One lay person, when asked if she would like to add a video to supplement her response, refused. Her answer revealed the strategy of being selective in adding videos: "Information could be intercepted. It could be shared with other people without your consent. If you don't want to share it… Just be quiet" (P5-LP-F-30's). (This respondent did not use social media and wanted a voice-only option, but she did not mark privacy per se as one of her concerns.)

Privacy Concerns

> Once your video or photograph goes viral, it—it's there. I mean, there's no taking it back, and, you know, who knows where it goes after that, and, you know, you have no control. (P4-OP-F-40's)

<u>Control of One's Image</u>

The most notable theme that emerged from the sample population regarding privacy was concern about the lack of control one has over their name and image once either has been recorded. Opinion leaders had a higher degree of privacy concerns (7 of 15) than did the lay public (11 of 46). That finding is not quite significant, but would be if the sample size

were doubled and the ratio of leaders to lay respondents was kept constant. One opinion leader, who was an advocate of community outreach, was frank about what he perceived as the danger, “I don’t know who’s going to see it.” He elaborated that he was contacted by a journalist and was disturbed at how much they knew about him just from internet search engines. The subject (P33-OP-M-40's) was concerned that some people data-mine for malicious purposes.

The idea of losing control of one’s personal information on the Internet led some respondents who, although they agreed to make videos, later decided against publicizing them; this appeared to be a greater concern to adults 50 years of age and older. One (P19-LP-F-50's) said, “I don’t care if you keep it, but I really don’t want it posted.” An octogenarian was concerned with video being shown publicly, “I don’t mind [you] having my voice. Text is fine.” However, the respondent later signed the consent form for the video to be shown, which was likely a mistake given what she said. This demonstrates a potential hazard of the method that administrators should control. Another respondent in her seventies noted, “[This] is a good method to gather info, but also one that needs to be controlled,” and added, “It’s the sign of the time[s] . . . You’re out there in the public and don’t have any control.” She perceived that video in general was being taken and being posted for public consumption without permission, citing that she was startled to learn that someone knew information about her from an interview that she did not know was posted on YouTube.

As they proceeded through the survey and interacted with the interviewer, most people gained confidence that the benefits of giving more detail in their answers was worth the risks to privacy. Although ambivalence toward the method was observed in a

number of respondents, people moved from a higher level of concern to a lower level about making videos as they actually made them. They were encouraged during the process by the interviewer's positive attitude toward their efforts to express their opinions as a feature of the qualitative interviewing process. For example, one highly educated lay public member in her fifties (P19-LP-F-50's) adamantly refused initially to make a video after seeing the feature demonstrated, but later requested one be taken.

Of Note: Cultural Values

One respondent alluded to our need to pay attention to cultural values while recording images:

> You know, some people out there who, believe it or not, think that if their image is on the internet, that someone could pray evil on them. And so they have an apprehension towards their voice or likeness or whatever, being out there in social media or whatever that looks like. (P33-OP-M-40's)

Social Media Use

Whether respondents used social media several times a week or not at all had little effect on how people answered the question about the method being a good way to gather opinions. When the single Likert item was converted to a *bivariate* answer, there was only one percentage point difference (approximately 88% approval), even though when calculating the mean using values across the entire scale the mean was lower for low users of social media (4.17) than high users (4.21).

This would be a good way to gather people's opinions on local issues.	NO			YES	
	1	2	3	4	5
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree

Social Media Use > Three Times a Week

Six of 61 respondents were heavy users of social media, posting to both Facebook and Twitter several times a week. All of these *power social media users* made their videos public. Three participants marked "strongly agree" that videos would be a good way to gather public opinion, one marked "agree," one marked "neutral," and one disagreed with the statement.

These six respondents were very comfortable in front of the camera with varying degrees of *performative* participation from being *on stage* to a casual disregard for one's appearance. At one end of the performative extreme the individual played to the camera, *calling out* a particular politician on an issue that had received recent national media attention; i.e., the regulation of drinking cup size of soft drinks by the mayor of New York City. Of note, this respondent's *performance* extended to all aspects of the data collection; she provided her given name as a famous country music star and reacted negatively to having to state her income, offering to answer, but not truthfully. At the other extreme of *performing*, we had an interview during which the subject had little regard for his appearance on camera, slouching and talking offhandedly, although he was clearly very well-informed and knowledgeable.

The single heavy social media user who marked that he disagreed that this would be a good way to gather opinions believed that the method might be a good supplement *only in conjunction* with to other forms of opinion gathering:

> If you're on the side of wanting to get people's opinion, then you have to knock on doors and engage people. . . . You cannot leave information just out there if you truly want a great opinion on something. You have to bring it to people. To

> where they can understand it, to where they can utilize it, and always in layman's terms. (P11-OP-M-30's)

In his thirties, he uses social media often. He seemed to be expressing that the digital method might be seen as not trying hard enough: "I just think, to the laymen, and to the uh, you know, to our generation, that it may not be the most engaging way. "Convenient, but not [compelling]."

Social Media < Three Times a Week

Roughly two-thirds of the respondents used social media less than three times a week. Overall, most (37 of 42) agreed or strongly agreed with the statement that the method was a good way to gather opinions. Here I will take the opportunity to discuss aspects of the method that participants found favorable. Looking at those who strongly agreed revealed a number of respondents' answers that supported the claim that adding video enables people to better express themselves *and* allows people to understand how others are feeling about an issue. One respondent noted, "Because you can see the emotion. You can see how they really feel, how they really think. A lot more so than reading answers on a piece of paper" (P9-OP-F-60's). And another stated, "You can see what other people think about in the community and what government is doing in the first place" (P27-LP-F-20's). Others felt that the use of video was a convenient way for officials and community members to learn about what is important in the community:

> Strongly agree. People have had up to the gazoo [sic] with surveys and questionnaires and the time it takes to transcribe the information. So, yeah, the phone is great for, you know, uh, MOS's—I have a background in news media, so

> it's "Man On the Street—hey, let me ask you a question," take the phone out of your pocket and… bam-shaka-laka. Absolutely. (P4-OP-F-40's)

And,

> I think it's better, you use new technology, and allowing the video to clarify answers is really a good thing. It all depends what you do with the data and you have to go through and process it all. Um, I just think the difficulty is always getting people to actually take the survey and get their opinions. (P26-OP-M-40's)

One respondent, an older man, noted that the quality of the conversation and the willingness of people to express their opinion were highly dependent on the skills of the interviewer:

> I think it depends on people like you two [the interviewers]. You put people at ease, so it is easy to answer your questions. Anybody could hold a phone up into your face, but people, you show that you care about what you are doing, then that I appreciate … if you [were] in doing this [on] paper, you wouldn't probably get the important things that people say …you are not gonna do an essay. But right now, on the phone, you got it. You can go over it, you can see, and you can use it, what you need. (P21-LP-M-60's)

<u>Dissenting Voices</u>

Of those who had low social media use, two respondents disagreed that this would be a good way to gather opinions. It is important to note that we had significant technical problems with the phones with both respondents (trouble connecting to the network that required restarting the survey), and both respondents were more than 60 years old. The

first of these two respondents, on the intercept, expressed an interest in responding to the survey for money, asserting that he was an experienced survey taker for Emory (a local university). Our phone failed multiple times when attempting to begin the survey, but he waited patiently. When we displayed the video viewpoint taken after the first question, he was surprised and slightly taken back by what we were doing, but became comfortable with time and made his viewpoints public. He noted during the interview that people might not even have opinions, but would give opinions anyway because they needed the money:

> You know, you have to look at it like this. In any of these areas [inner-city Atlanta], you know, people going to um, well, 1 or 2 dollars isn't a lot of money but a lot of people are just goin' to do it straight for the money and really don't have any opinion about nothin', you know. (P39-LP-M-40's)

His opinions, however, were detailed and informed, relative to others we interviewed.

The second respondent with low social media use who disliked the method repeated the criticism voiced by the one person with high social media use who disagreed that the method was good. Both of these respondents were very familiar with local government operations and issues. As did the other respondent, she wanted the elected official we were working with to come to the neighborhood, face-to-face (P47-LP-F-60's). Her chief complaint with the method was that it provided, in her opinion, a shallow solution. Receiving any sort of depth on an issue with the app was out of the question, especially when compared to a face-to-face interaction with the elected official. She explained,

> The questions were kind of . . . they really weren't very meaty. They were kind of (Synlab: Fluffy?) Yeah, all over the place. What was the one about transportation? Something about transportation. (P47-LP-F-60's)

Like other respondents, she did not like the video-taking function at first, but warmed to it. In the end, however, she still explicitly stated a preference for text only. The field observer did document in the field notes that the respondent was very wedded to the idea of publishing newsletters on-line and considered herself an expert, but had not adopted mobile technology or social media. She voiced objections several times to the size of the text on screen and the difficulty she had using the touch screen.

Themes and Observations

Although the focus of this inquiry is acceptability and feasibility of the experimental survey mode proposed, a number of themes and observations emerged from the open coding of the interview and the field notes. As mentioned in the Methods section, I used a qualitative interview approach for recording video viewpoints, taking a constructivist stance: the interviewee is a co-creator in the meaning-making process, which eschews a rigorously controlled, standardized set of questions. This likely supported the expression of the range of perspectives and behaviors we observed.

In this section, these additional themes and observations are organized according to the way the interview process typically proceeded. Overall, the flow of encounter followed the pattern illustrated in Figure 37. Some of the themes are expected regarding participants' attitudes toward field surveys in general, but others are more specific to the

experimental mode, including a theme external to the rubric in Figure 37, which is respondents' perceptions about the quality of the resulting data from the method.

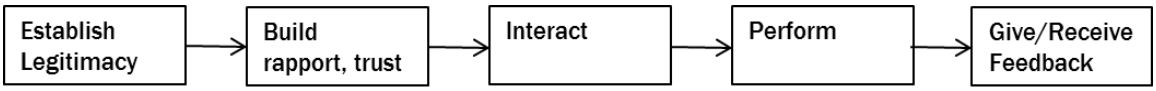


Figure 37. Flow of interview process during the field study.

Establishing Legitimacy

> A relationship trust factor has to be in that conversation. The fact that you identify yourself as being a citizen of this area—that builds the comfort level. And then you mentioned that you were in some way representing an institution [Georgia Tech]. I'm familiar with that institution. Ms. Garner and the fact that you mentioned her. . . . And that, so, I could open up to you. I would not have, if you had just walked up and said, "I'm so and so (looks forward and gestures as though holding a microphone outward) and I want to know." I probably would have told you what you wanted to hear. (P32-OP-M-60's)

As mentioned previously, when I began the study I assumed that working with a local elected official to field a survey of current issues in her district would increase the legitimacy of the effort and provide a practical outcome to residents. Comments from participants during the study mostly confirmed this assumption. More surprising was the trust and legitimacy conferred upon our team from our affiliation with Georgia Tech and our status as students; people more often expressed positive regard for our academic institution than for the county government.

Opinion leaders were more explicit about the importance of legitimacy of the survey effort; lay persons often expressed surprise that such an effort to survey them would be made. A number of the opinion leaders had met Commissioner Garner and were interested in helping advance ways to have voices heard from their community. At least three or four addressed the camera directly, making arguments directly to the

Commissioner; a number of lay people also directly addressed the camera. One did so in response to the stadium question, “Now, are you a Falcons fan, Commissioner?”

A number of lay people noted that although it seemed like a good idea, the value was in having the opinion heard directly, as one person stated,

> When we give our opinion to the survey, if it actually changes some of the things that are going on in Fulton County, then I want to know, because it means that, the individuals in Fulton County are actually making a difference, their voices are being heard, and the people who are in government are actually listening to the people that they govern. (P34-LP-F-30's)

Not everyone was convinced that their videos would be seen by the elected official; when asked if she wanted to make any additional comments, one person (P9-OP-F-60's) said, “I think it’s a great idea!” and then added wistfully, “I hope Commissioner Garner will really look at it.” She stated that in her video while looking directly into the camera as if she were addressing Ms. Garner personally. Another leader (P9-OP-F-60's) said wryly and with some affection, “I just hope Commissioner Garner, whom I respect (smiles, puts hands to her heart), really does look at these videos and get back to us.”

Legitimacy of effort also factored into whether individuals considered taking the survey again. Many indicated that the purpose of the survey as well as the sponsor would be deciding factors in their future participation even if the mode was acceptable. One person (P48-OP-F-40's) stated her intention to respond to another mobile survey like ours in the future, “If there are legitimate questions, I would take it (the survey) again.” I encountered skeptics whose stance I appreciated. One leader (P1-OP-M-40's), when asked if he could add a question to the survey stated, “Decisions are made on the city

level and they don't listen to the NPUs." His motivation was centered on helping us as students complete our study. He said that he would not be motivated to take another survey of this type "

One concern I had regarding our student team was its lack of African-American and black researchers because the majority of our neighborhoods (research areas) were predominantly African American. Our team consisted of five white students and three Asian students. For the most part, my concerns were allayed in the field as we took considerable care to convey respect and genuine interest in respondents' comments. On two occasions, I observed reactivity in our participants regarding our race; these participants confirmed general guidance that this is always an important consideration in data collection efforts. For example, one participant (P44-LP-F-40's) stated that the ethnicity of the interviewers has an effect on the comfort level of the interviewee and that she would feel more comfortable talking to someone of her own ethnicity. "Age, gender, um, even the way you're dressed, you know what I mean? All of that says . . . people are comfortable with people who are like them."

Building Rapport

> I think it depends on people like you two [the interviewers]. You put people at ease, so it is easy to answer your questions. Anybody could hold a phone up into your face, but people [like you], you show that you care about what you are doing, then that I appreciate. (P21-LP-M-60's)

As with all interview methods, the ability of the interviewer to establish rapport and trust was critical. If this condition was met, then the interaction unfolded much like a conversation, as with qualitative interviewing techniques. In keeping with best practices

of interviewing to increase participants' comfort with the method and to encourage them to record videos, we provided verbal and non-verbal signals confirming to them that their comments were valuable. In one case, when the interviewer took a clinical approach to presenting the questions, its immediate effect was evident as an increased level of discomfort in the interviewee. We were lucky that—as students—we were not seen as authoritative and that our academic institution is respected. As one interviewee put it,

> I would never talk to people like that who act as though they have some kind of authority over me because I am doing an interview. You asked me to do this interview, were very polite about it, and you go to Georgia Tech where my son graduated. And I am a student. (P38-LP-M-80's)

Our prototype for testing used the back side of the camera for recording; this proved important in establishing rapport (see Figure 38).

Figure 38. Respondents' preferred way of recording videos.

In our initial field tests in 2012, we discovered that we received very different reactions from people regarding the adding of video responses if we pointed the camera at the subject versus inserting ourselves in the picture by taking a shot with the subject. Pointing the camera at the respondent alone had the effect of *othering* the respondent, whereas including the interviewer in the shot created connection.

Interacting

> I think the telephone is becoming an everyday useable device (and) that I found this conversation or interview to go much easier because there wasn't a camera there. It's just a phone, something I see all the time, and it's not making any sound, and, you know. (P4-OP-F-40's)

A mobile phone is an everyday object to people, and the informality of the format helped foster conversations. Thus, the survey we fielded became, in practice, a semi-structured interview instrument and, in some cases, facilitated an in-depth interview. Participants expressed that they found the interaction pleasurable; one participant said that the phone was "comfortable, unobtrusive" and noted that it was less intimidating than a camera.

The predominant style of interaction was the interviewer presenting the question, often reading it, and the respondent taking the phone to answer, then handing it back to the interviewer. A practical reason for passing the phone back and forth was the need to record a video. After the interviewer demonstrated the video function for the respondent on the first question (the interviewer selecting it and using the back of the camera to take the shot), interviewees seemed to expect the interviewer to continue the practice. A number of respondents said either directly or implicitly that were not self-motivated to

take videos: “I wouldn’t have done it [shared his video responses] if you hadn’t been pushing the buttons and we were just talking, . . . It was easy” (P2-OP-M-30's).

We observed that if we gave the phone entirely to the respondent, then it was difficult for the interviewer to encourage adding videos since the person would progress to the next question. For example, one opinion leader took the phone and operated it in gloved hand, as he was at a work site. He was silent while responding, but then asked, “And just keep hitting ‘next’?” When the interviewer tried to take a video, the respondent said he wanted to change his answer, and said that he did not want a video. For the next question he asked again about pressing “next” (P1-OP-M-40's). Several respondents were impatient with the technique. One said, “That whole interaction thing, no offense – you’re lovely, but it’s a drag” (laughter) (P44-LP-F-40's).

One observation we made is that the pace of the interview should be dependent on the personality of the interviewee. In the field, I was reminded of caveats for communicating with people who are not extroverted (as I am); they may take longer to formulate answers. One subject was well-considered and articulate, yet projected a reserved demeanor. He took care and time when answering questions, especially when choosing an answer from a list. “Oh my, what a list….What isn’t an issue?” he said. His slowness to respond was not an indicator of any cognitive challenges in formulating an answer, rather it indicated the level of precision he wished to provide in parsing his response (P2-OP-M-30's).

There was a great variability in the lengths of recorded video viewpoints. We discovered that constraining the response to 20 seconds was too short, but when the video recording was open-ended, some respondents continued for several minutes. A drawback

to a more conversational approach to interviewing is that people forget about the camera: a number of older participants started explaining their answers before the interviewer could get the phone ready to record. This was particularly noticeable in one interview in which we recorded audio only at the participant's request. The interaction became even more free-form because the implicit assumption seemed to be that we were recording the entire interview; she spoke before we could activate the recording feature for most questions (P10-LP-F-40's).

Performance

We observed that holding the camera to capture the interview led most respondents to think about where to look when answering questions; we did not direct the responses either way. When asked, we said, "Up to you, however you would like!" This led to a variety of behaviors. One respondent (P48-OP-F-40's) began by looking directly into the camera, but appeared conflicted between addressing the camera and talking with the interviewer. The arrangement of interviewers to the subjects also made a difference in self-presentation, particularly if we were seated. For example, if the subject was placed between the person asking questions and the one taking notes, then some respondents were unsure where to direct their responses. A number of respondents maintained eye contact with the note taker. It was noted that one respondent (P9-OP-F-60's), when giving responses, made eye contact with the interviewer, the note taker, and also looked directly into the camera at times. The best arrangement was to have both interviewers on one side so that the respondent did not have to shift his or her gaze from side to side.

People adopted a delightful variety of performance styles in voicing their opinions, from highly informal to theatrical. Most talked more to the interviewer than to

the camera (P4-OP-F-40's), with some people ignoring the camera altogether (P1-OP-M-40's). One respondent (P8-OP-F-70's), in her seventies, began by addressing the camera formally as in a public statement. After reviewing the first video, she gave a big sigh as though she was not pleased with the result. On the second question, she began by addressing the camera, but then began speaking to the interviewer. She took off her glasses and abandoned all pretense of performing for the camera. It was perhaps then that she decided to keep the videos private, since later she did not sign the public release form. At that point she addressed the interviewer and became increasingly more informal. Many respondents were informal in their responses because the style of interaction we fostered was relaxed and conversational.

Still, other respondents performed for the camera—raising eyebrows, leaning in, making dramatic statements, etc. The most expressive participants would combine directly addressing the camera and speaking to the interviewer to enhance the dramatic effect of their statements. An exemplar of this was a respondent who gave a very spirited answer directed at the interviewer and directly addressed the camera when she wanted to add emphasis to her statement. She said,

> I'm VERY UPSET that people do not take in their trash cans! It makes the neighborhood nasty, it invites people picking through the trash, people put in their doggie-poop bags, it's disgusting! (Addressing the camera) And I <u>call</u>, and I <u>write</u> and I <u>email</u>! . . . They (Atlanta City) did distribute many, many, many recycle Herbie Curbies with no house numbers on them so they are all floatin' around the neighborhood. (P61-LP-F-60's)

One set of respondents, who themselves were performance artists, commented on whether people would be truthful on camera, or in their opinion, simply perform. They talked at length about how people might just "carry on" for the camera:

> [R1] When they [people] get on camera, they perform for the camera. [R2 nods in agreement.] [R1 continues]: And so I don't think they're being honest. I did something that I wouldn't normally do. I don't care about none of y'all. And so what I think and normally don't bother to share 'cause y'all ain't worthy of hearing my opinion anyway. So. But most people wouldn't do that. Most people will perform and (makes quotation in air with hands) "say what they think is popular and accepted." [R2 nods in agreement] "And they want to be liked – I don't care whether I'm liked or not, I love me, so I don't care – most people perform for other people so I think once you turn the camera on people, I don't think they're gonna' be really honest. I think they're gonna' say what they think sounds good, to get a sound bite, and maybe not what they really feel. And as a performer, I know that to be true. Because when we get real people in front of a camera, they usually do exactly that. They – quote –"perform" instead of being truly honest. (P44-LP-F-40's)

We did observe this in the field, in response to being videotaped. One woman, who gave very flamboyant, but informed answers tied to current events, provided her name as a famous white country music performer from South Georgia on the consent and video release forms. (She was not white per se and in our field notes we noted that she mentioned she was visiting Atlanta from another state.) We also observed responses that could be interpreted as insincere or less considered. This occurred with couples and in situations in which there were onlookers. One couple provided very offhand answers, performing with great amusement for each other, and playing to the camera. The irony is that videos in which respondents are performing for others or the camera make for better television material, since the opinions are lively, even if these are not completely sincere or thoughtful.

Several female respondents stated that it would be good to give people advance notice that videos would be taken. Two opinion leaders, in particular, wanted to be able

to apply makeup and jewelry. One woman deleted her initial video and added earrings and changed to a different blouse. “Nice video, nice and discreet,” she said of her repeated performance. Another said, “Older women need make-up!” (P36-LP-F-70's). (Other older respondents said they didn’t care how they looked.) One male opinion leader, who had very thoughtful and detail responses, did not have concerns about his identity, but stated, “I’m not photogenic right now,” and noted he preferred voice and text only.

Taking the extra step of reviewing recorded videos with respondents, although important for conveying control of one’s image, had a hazard: Several respondents, after viewing their first video, did not like the way they looked on camera or they became more self-conscious. Those persons either did not take additional videos or said that they wanted audio only. When the subjects seemed to be self-monitoring, the effort appeared tiring. One respondent (P8-OP-F-70's) went from talking directly to the camera to just speaking with the interviewer and her body language indicated more fatigue as the interview continued. Interviews of two people together, either on or off camera livened the performance since the respondent was performing not for us and the camera only, but for his or her companion. This happened when two people were being interviewed together, or when one person was being interviewed with a companion off-camera.

Stories and Arguments

One part of the claim regarding the benefits of video was that people would use the medium to tell stories to support their opinions; that is, the format would enhance possibilities for expression. The code [STORY] was added as an emergent code in first-cycle coding and only nine of the 63 transcripts were coded for stories, although the use

of stories was not rigorously checked in second-cycle coding. One explanation for the lack of stories is that we were careful not to prompt people to "tell me a story." As the primary interviewer, I observed that people told a number of stories in the course of the interview, offering personal details usually between questions and off camera. For example, two separate respondents digressed on the subject of their faith, with one adding the question, "Has America taken God out of this country?" Another, in response to the question about political stripe, talked about growing up on the south side of Chicago and how that meant he was most certainly a liberal.

However, the stories told on camera without prompting were full of rich details that anchored the opinions in day-to-day realities. Those who told a story tended to tell more than one. Stories provided an outlet for expressing emotions and values. For example, when asked about which library services met her needs, one person talked about the differences between two locations vis-à-vis the way the librarians made her feel:

> We're at the library every Monday through Saturday, we're college students so we're always at the library. Anywho [sic], we're going between Ponce library and Martin Luther King branch library. The people at Ponce they usually can't help you find what you're looking for and they're not that patient, but here at the MLK location they always come help you find exactly what it is what you're looking for, whether it is a book or video … it is just a total difference between someone who genuinely cares and people who are just doing it because it's a job. Just nicer people, who care about the stuff they're doing, you can tell the difference. (P53-LP-F-20's)

Another woman (P61-LP-F-60's) who told a story talked about her frustrations. She said she "had tried to get through" to county officials through email, written letter, and phone calls, but never heard back (the previously quoted garbage cans story.) Other stories gave practical details of service needs. Most of the responses regarding library services were straightforward, noting the lack of computers. One respondent provided storied insight on how he used the library to support his needs as a person with limited sight:

> I'm taking a course on Eudora Welty right now. And I have to write a paper about it, so I need to reference page [numbers] and stuff like that . . . [So] I get the books from the library, but I don't get audio books here, I buy the books, and download them, because it's easier to put them on an iPod and listen to them. (P38-LP-M-80's)

People also provided stories about their personal struggles in response to the first two questions that asked them to pick a top issue. To explain why he picked poverty, one respondent explained,

> I have a son who is schizophrenic and homeless . . . so having someone in my family who has actually been homeless and living through that it gives me a huge different perspective on the value of government . . . my personal off-the-charts experience . . . when you have to call the police and you're just desperate. (P30-LP-F-50's).

Another participant offered the following as the reason she picked education as a top issue:

> I went to school in 2001; I graduated as a medical assistant. I like working in that field, but I haven't worked in a long time, so it's kind of hard. So I want to get

> back to education, but there is no money out there to get for college, because the school I went to changed their name, and they want to try to get money I don't have . . . but I want to go back to school and my counselor motivated me to go back to school, while there is still a chance. (P12-LP-F-30's)

A drawback to allowing these stories to be told is that personal experiences are not easy to generalize and are labor-intensive regarding the translation of such accounts into reports. We found that allowing stories also invites digressions, which can quickly consume allotted interview time. The field note taker noted for one respondent that she was very long-winded and tended to digress greatly by talking about her own history of political organizing. This forced the interviewer to coax her back to the subject of the survey. Enabling storytelling is an aspect of the survey method that needs further exploration.

Mode-Specific Feedback

> UserEx-06 To explain why I chose answers to the questions in the survey, I would be comfortable with the following (check all):
>
> - My video
> - My voice
> - Text
> - My voice only
> - Text only

In addition to the survey input preferences noted at the beginning of this section, more than one-half of the respondents, 35 of 61, marked that they would be comfortable using video in the mobile survey, and 21 (34%) said that they would be comfortable with video, voice, and text. However, 26 of 61 respondents (43%) did not select video as a comfortable choice; 18% (11 of 61) chose voice and text, 13% (8 of 61) chose voice only, and 11% (7 of 61) chose text only.

Of those who chose text only, one respondent (P60-OP-M-30's) said, “I like typing something out,” and added, “The filter between my mind and my mouth is not all that thick with me.” A young woman who was very tentative and concerned about saying the right thing said that she was shy and liked to write; a young man said he had no problem with videos, but that text was easier for him because he was “not a talker.” Two of our respondents who were motivated to take the survey, in part because we offered three dollars, expressed that recording videos took too long. One man put it bluntly:

> You know, you have to look at it like this. In any of these areas, you know, people going to um, well, 1 or 2 dollars isn’t a lot of money but a lot of people are just goin’ to do it straight for the money and really don’t have any opinion about nothin’, you know. I think the camera is the only thing that maybe could be a little faster. Like, you know, because, I’m not slow. [Interviewer: So, actually, having to stop to take the video slows it down?] Yeah, I mean, if you’re gonna’ do it like that, at least give me a bigger incentive, you know what I’m sayin? (P39-LP-M-40's)

Concern with the time taken was echoed by a *former* opinion leader with a completely different demographic. Like other respondents, she did not like the video at first, but warmed to it. However, at the conclusion of the interview she stated her preference for text only, because she thought that survey took too long with the addition of taking videos (P47-LP-F-60's).

Some people who marked that they were okay with videoing also noted that they liked other modalities, specifically text. For example, one opinion leader said, “Essentially, people are in different ways, some they hear it (and) they didn’t exactly get

it, but if they read it and hear it, they get it" (P8-OP-F-70's). We did observe some reluctance on people's parts to record videos because of the novelty of the format. For example, on the stadium question, when asked if Atlanta needed a new stadium, one respondent (P51-OP-M-60's) said, "I would say yes," but when prompted by the interviewer, "Can we add a video?" he responded without much enthusiasm, "If you want." This could indicate a feasibility barrier if the survey was self-administered or if the interviewer did not have good rapport with the subject.

We coded when respondents expressed advantages or disadvantages to the method. A number of the opinion leaders thought that it was important to offer a method like this, but only as part of a set of outreach activities to involve the public. That was illustrated in a previously cited quote about the importance of "high-touch" as well as "high-tech" by a respondent in his thirties who noted, " To our generation, that may not be the most engaging way. Convenient, but not [engaging]" (P11-OP-M-30's). However, adults of the baby boomer generation believed overall that the use of digital media was expected by younger generations, best expressed by the following:

> Well, of course, the younger generation, I mean, (rolls eyes) they're on Instagram all the time. They're on Facebook all the time—well, right now. Um, so I think that the advantage of, by virtue of being connected from a digital perspective, it allows you to evolve. Because, you know, two years ago, Facebook didn't exist; the big thing was Myspace. And now there seems to be a movement towards Google+ and a movement towards LinkedIn. . . . So, I think it's important for it to be out there as a potential tool for people to use. (P33-OP-M-40's)

Resulting Data: Seeing is Believing

> Because people can really feel, you can really feel, if it's going to be on video, they can really see and feel the passion, how the person really feels, more so than just writing on the paper. (P23-LP-F-50's)

One other theme captured through open-coding involved people's perceptions that quality of the data would be enhanced by this novel method vis-à-vis traditional survey methods. First, people perceived that it might be more democratic in terms of who could be reached, but, second, being able to see the person who was interviewed would allow an assessment of whether the people reached were similar to the participant. One man, who was African-American, put it this way:

> Everyone has a mobile phone, so once again if you are doing a poll and you're getting a sampling of people . . . lots of times when we see a poll on TV, my wife and I look at each other and are like "well, they never ask me. They are never interviewing anyone like us." (P59-LP-M-50's)

This idea of being able to see who is providing the opinion may have been more important to our African-American participants, who were more likely to voice appreciation that they had been contacted: "This is the first time I've been asked for my opinion."

One gentleman said that the method implied that it was helpful to have the interviewer on camera as well as the person answering:

> If necessary you can identify the source. That is one of the things that will add credit and credibility to it as we're going more and more digital. For years, if we saw the person we were surveying, shook their hand. That added a comfort level

> that it was a human-to-human interaction. As we get more and more digital, we will find people more comfortable operating with the sight of person-not-seen, which leads to people being able to twist and construe the information, just like they twist and construe or misconstrue identity. You can twist and construe answers as well as opinions. (P32-OP-M-60's)

Making Opinions Public Using Video Viewpoints

An important aspect of the model proposed for enhancing public opinion practices is featuring video viewpoints in mass media channels, specifically television. Although being able to enrich public opinion gathering by the coupling of open-ended qualitative data to closed-ended question of itself is innovative and potentially helpful to opinion researchers, public viewpoints have more impact when featured in the mass media. This section presents the findings of whether people are willing to "go public" with their views, which is a separate question from their initial willingness to record a video. The hypothesis to test this aspect of the method, incorporating variables of interest, is as follows:

> H02: Levels of use of involvement in issues, privacy concerns, and familiarity with technology (social media use) will have no impact on *whether people are willing to make their opinion public* using mobile surveys that enable one to add video viewpoints.

Because I anticipated that the sensitivity of the questions asked would make a difference in the effects of these variables (for example, privacy concerns will increase with a more sensitive question), I designed the study to allow for the analysis of behavior at both the survey level and question level.

Quantitative Findings

The best indicator of the acceptability of the method in its most expansive role of providing media-rich, qualitative opinion data from individuals for presentation in mass media is if the participant signed the video release form to allow his or her videos to be put on the survey results Web site following the study. Although there was no statistical significance between this indicator and being an opinion leader or not or having stated privacy concerns, the social media use variable of interest was strongly correlated with making one's opinion public. Table 15 shows no statistical significance regarding being an opinion leader or having privacy concerns for the rates at which participants made their videos public when compared to the overall rate for all participants. However, if someone used social media more than three times a week, then s/he was much more likely to make his/her video public.

Table 15

Characteristics Related to Making Video Viewpoints Public

	Overall	**Made Public Yes (n) %**	**Made Public No (n) %**
All Respondents	**(61) 100**	**(46) 75**	**(15) 25**
Opinion Leader (OP)	(15) 25%	(10) 22	(5) 33
Highly Involved (HI)*	(19) 31%	(11) 24	(8) 53*
Had Privacy Concerns (PC)	(17) 28%	(10) 22	(7) 47
Social Media $\geq$ 3 x week**	(19) 31%	(18) 39	(1) 7**
Had a Q to Add	(44) 72%	(35) 76	(9) 24

*p = .0527; Fisher's Exact Test **p = .0237; Fisher's Exact Test

Opinion Leader	=	Currently sits on formal community organization
Highly Involved	=	NPU member, neighborhood leader, works in planning or community, attends/involved in formal meetings regularly
Privacy Concerns	=	Indicated on survey or was coded for privacy concerns
SM Use > 3 x week	=	Uses Facebook or Twitter three or more times a week

Highly involved individuals were less likely to make their videos public; however, these findings were not quite statistically significant, so additional study is recommended with larger samples.

Qualitative Findings

Across All Respondents

Given that the study introduced people to an innovative survey method, which included having the experience of providing one's opinion using mobile video and then providing feedback, a time interval was interjected between the beginning of the interview and the interviewer's request of the respondent to "go public" with his or her video. The time interval allowed for the respondents to try the format in the manner in which it would be fielded before they were offered the choice of opting for privacy or "going public." This option is critical for researchers working with vulnerable populations or persons who may be sensitive to scrutiny. Separating participation from going public also enabled participants to experience the novel method with less personal risk than an up-front commitment to making their responses public in the face of an unknown procedure.

As noted previously, I separated the study participation consent and video release into two forms: (a) the consent to take the survey and give feedback and (b) a standard release form for the video. This proved to be advantageous. A number of respondents said that when they agreed to take the survey, they planned *not* to make their responses public, but after the interaction, they decided to do so. For example, when one respondent was asked at the end of the procedure if he was agreeable to the sharing of his videos, he said, "Yeah, that's fine," and he added that when he read the consent form, he had decided, "No, I won't do that," but changed his mind after taking the survey (P2-OP-M-30's).

Another likely factor in this change of heart among participants was the benign nature of the majority of survey questions. Our qualitative data showed that some respondents made the choice not to go public at the question level when presented with a sensitive topic. Their strategy was to refrain from adding video to questions that made them uncomfortable, yet were able to consent to go public at the survey level. We observed that others sensitive to controversy were more frank on every question, but kept their entire contribution private. This has important implications for how the survey may be used. Finally, we received feedback from many participants that the perceived validity of the effort (i.e., the results would be provided to a County Commissioner) and trust by community members in our academic institution, Georgia Tech, contributed favorably to the decision to go public.

Involvement in Issues

High Involvement

> I don't want to be on someone's website. I don't want to put myself out there. I work [behind the scenes]. (P50-OP-F-80's)

Fifteen of 63 respondents were categorized as active opinion leaders by virtue of either serving as a neighborhood or community organization officer or as a member of an Atlanta local planning and zoning board. Of these opinion leaders, 5 of 15 did not make their video viewpoints public vis-à-vis the 10 of 46 lay citizens who did not make their videos public. At this sample size, these findings are not statistically significant.

Three of the participants who kept their video viewpoints private were older than 60 years of age; two were socially prominent—one expressed privacy concerns, the other concerns with appearance. These two participants were close to the median age of all

participants. The third was not socially prominent, but she expressed derision for the technology from the beginning. One noteworthy issue is the general challenge of engaging opinion leaders in a low-privacy method. One person held a government job and implied that making one's views public could impact his/her ability to appear neutral in work. Although not stated, persons in public service are, in general, are often constrained from taking public positions on issues, particularly if there is partisan involvement.

As mentioned previously, there was a higher degree of self-monitoring among opinion leaders. Despite the assurances of the consent form, a number acted as though they were "on the record" from the start and would not video anything that they did not want to make public. This behavior was witnessed while leaders formulated responses to the questions about the need for a new stadium in the city and the need to increase hotel/motel taxes to pay for it. After reviewing the first video, one leader (P51-OP-M-60's) said, "I like that, that's nice," but hesitated about the stadium question. He winced and provided a careful answer and he declined to add a video on the follow-up question about hotel/motel taxes. However, during the user survey he stated no concerns about having video taken. Another respondent (P2-OP-M-30's) , when asked about the stadium, firmly said "NO, I don't want to add a video." (Similarly, he did not want to add a video viewpoint to the hotel/motel tax question because he did not want his answer to affect potential future partnerships. When asked about the potential of the survey method, he stated that any concerns he had about having video taken "related to individual questions, but [he had] no overall concerns." This strategy enabled the respondent to say "yes" to making his responses public.)

Neighborhood leaders seemed conflicted about going on the record, as though it should not be of serious concern, but it is actually not a common situation. For example, one respondent (P4-OP-F-40's) agreed to share videos, but noted that she provided videos only for important questions: “I gave permission to add the video if it added to the answer I gave.” This subject later expressed that the ideal method for her was voice or text, but because video was requested in this survey, she would release it.

> If it [the video] exists, it exists forever. Running with – there’s still a video. . . . The ability to add info is huge . . . I’m not into taking videos . . . it’s a generational use. (P60-OP-M-30's)

The fact that video can be *persistent* was a theme among opinion leaders. One person sat and thought before providing a response to the stadium project question, citing the social costs of being personally connected to some of the powerful advocates of the project, and laughingly noting that a response could be a problem, “If I ever run for office.” This person decided to talk about the stadium project off-camera, giving some critical remarks. On other questions, answers were given, but permission to make the overall survey responses public was not.

Less Involvement

Of the 46 persons who we identified as having less or low involvement in the community, 10 did not make their videos public. Of those 10, social consequences influenced the decisions of four respondents. Two women (I emphasize gender here as I believe it is relevant) from among those four respondents experienced some type of crime: One was the victim of cybercrime, the other of crime within her neighborhood. These experiences appeared to be a strong factor in their respective comments initially that neither would

allow video recording. However, both agreed to allow audio only, but did not give permission to make their views public. The cybercrime victim had her computer stolen and hacked; she subsequently disabled all her social media accounts. When asked why she did not want to make her video viewpoints public, she expressed worry about the video's destinations and added that she did not want to appear on the Internet: "I'm trying to lose weight, maybe another day I might let you." The respondent who experienced problems with crime (drug dealing) on her street, and who thought that she was not receiving help from the local authorities, had little trust in the institution that sponsored our survey. The third of those four respondents did allow some video taking but sparingly. She marked crime as her top issue and was mostly non-verbal, rendering her videos useless. The fourth person stated that among members of the black community the social norm was not to criticize each other in public; therefore, he stated his opinions privately, but he would not allow them to be public, especially because he was new to the community. In each case, it was clear that those respondents were concerned with their security, social consequences, and possible retaliation.

Of the remaining six respondents who did not make their videos public, their reasons varied. One person was very interested in the method and wanted to participate, but appeared shy and was concerned with privacy for reasons not stated. Three women were concerned with their appearance, particularly their hair or weight. (Women were twice as likely to mark concerns with their appearance as men were.) One person was just starting a government job. He did not state explicitly that this influenced his decision not to make responses public, but he was new to the area, responded carefully, and declined to comment when he did not feel informed. Another person was in the business of

conducting man-on-the-street interviews and stated up front that he would participate; however, he "knew how these things go" and was not going to make answers public. Lastly, two participants, who were unemployed and were interested in earning money, did not seem particularly invested in the results of the poll from the beginning of their interviews. One said he was curious, but did not enjoy the experience and thought it took too long, because "he's not a talker." He stated that he would *not* take such a survey again.

Privacy Concerns

> I will tell you anything if they can't find me . . . yes, because Fulton County retaliates. (P25-LP-F-30's)

A number of lay public members who lived in neighborhoods with crime and poorly performing schools raised the issue of the perceived social costs of going public with their concerns. For them, the first two questions about the most important issues facing the county were sensitive because they had first-hand experience with serious challenges to their safety and well-being. I asked the respondent who is quoted above if she thought that if she complained that she might actually have more trouble getting the services she needed from local government, and she responded, "Yes, because they label you. . . . Oh, that was the one that was on video . . . yeah, she's a troublemaker" (P25-LP-F-30's). In several cases, although this was not stated, I had the impression that some respondents may have had problems with law enforcement or had been incarcerated; for those reasons, it was best not to go public with opinions. One man elaborated at length about the issue of social costs. He said that he came every day to the library in which we were interviewing people, so he was not going to complain about the "people" [library

employees]. Then, in terms of the elected officials, he said he believed that "professional politicians" often take advantage of their ethnicity to get elected without being responsible to their constituency. He thought that there was a cultural expectation "that I am supposed to vote for you because I am black and you [the professional politician] don't have to pay me back, because if I complain, then I'm a rat." He added that, in his opinion, in the African-American culture, it is inappropriate to complain about other African Americans. He further added that because of this expectation he would not go public because he was nervous, specifically about retaliation. He marked one of his concerns with video taking as "my identity being known" (P13-LP-M-50's).

Social Media Use

The active use of social media was strongly correlated with a willingness to make videos public. Of the 19 people who used social media *more than* three times a week, only 1 declined to make his video viewpoint public. Among those persons who used social media *less than* three times a week (n = 42), 14 declined to go public with their answers.

Table 16

Use of Social Media and Willingness to Make Video Viewpoints Public

Make Public?	**Yes**	**No**	**Total**
Social Media ≥ 3x week	18	1**	19
Social Media < 3x week	28	14	42
TOTAL	**46**	**15**	**61**

***p = .018, Fisher's Exact Test

Interaction of Social Media Use and Privacy Concerns. The respondents who used social media frequently had lower levels of privacy concerns with the data collection than the low social media use group: 21% (4 of 19) versus 31% (13 of 42). However, people with low social media use who did *not* make their videos public (14 of 42) had a much higher level of concern with privacy: 50% had privacy concerns compared to 21% (6 of 22) of

those who made their videos public. Although none of these findings are statistically significant due to lack of power, the qualitative record reveals that the low social media group who did not make their video public had distinct features for declining to go public that may be important considerations for fielding this type of survey in the future.

Social Media ≥ 3 times a week. Because only one person with high social media use did not make their video public, no comparisons can be made regarding the interaction of social media, privacy concerns, and making videos public between the high and low use social media groups. Only four people in this group indicated a concern with privacy. The single subject who did not make his video viewpoints public did not indicate on the survey or in talking with us that privacy was a concern. Rather, he had a strong preference for text only, saying that text was easier for him because he was "not a talker." The subject was very quiet and reserved, often answering questions in nods and single word answers. Curiosity was his main motivation for participating in the survey. He said, "I didn't know what was goin' on, but, I asked and I'm in on it now." (There was another subject at a different venue, who did not use social media at all, but repeated this theme of being curious and was very reserved, although more verbal than the other respondent.) Another factor for this respondent was that he may have been under the influence of substances; he did not understand a few of the questions, was easily distracted by environmental factors, and had a hard time, overall, concentrating on the task at hand. In the end, he stated that he would not do such a survey again; he just wanted to check it out because of the video function and he thought that the survey took too long because of the taking of videos.

Social Media < 3 times a week. Of the low or no social media group who did not make their videos public (13), six people were marked for privacy concerns. Two had been the victims of crime, two were socially prominent, one specifically mentioned that he perceived that he would violate a social norm by speaking out against members of his same race/ethnicity, and one simply did not "like my picture being posted on a public website." Therefore, one might assume that their privacy concerns likely also inhibited their use of social media. These participants also may have perceived the survey as being similar to social media because we stated that the results would be posted on the Internet. Of the remaining seven *who did not mention privacy*, two people said they had concerns about their appearance, and two others, as noted previously, held government positions, although this was not explicitly cited as the reason for not going public. Of the remaining three, one did not like the technology from the start and thought it was shallow (she is discussed in *Dissenting Voices*), another had been in the media business, and one did not make her video viewpoints public for unknown reasons.

Framing of Questions (Use of Video Viewpoints to Challenge)

The second claim embedded in the case study model states that public opinion-gathering surveys that afford respondents the option to challenge questions being asked using video viewpoints will have a greater level of acceptance among people who have (a) high involvement in the issues, (b) low concerns for privacy, and (c) high familiarity with technology. One may state this as a null hypothesis as follows:

> H03: Levels of use of involvement in issues, privacy concerns, and social media use will have no impact on the degree to which people challenge framing or create one's frames using mobile surveys that enable one to add video viewpoints to closed-ended questions.

To test this hypothesis, I built into the set of survey items opportunities for respondents to engage reframing or framing issues. For example, the first two questions of the survey seem innocuous enough, but are forced choice, asking respondents to choose *one item only* from a list as a top public issue, although "other" as a potential response is included.

OpinionSurvey-01 From this list: What do you think is the most important issue in Fulton County today?

- Housing issues
- Health issues
- Population, growth, and development
- Immigration, legal and illegal
- Drugs and drug abuse
- Poverty, homelessness, social welfare
- Other

OpinionSurvey-02 Of this list, what is the most important issue facing Fulton County today?

- Traffic and transportation
- Schools and education
- Crime and gangs
- Environment and pollution
- Jobs and the economy
- Other

The last question on the survey invited participants to contribute questions that they would like the Commissioner to ask on future surveys.

OpinionSurvey-10 If you could add a question to this survey, what you do think would be an important question to ask residents of your community?

- I have a question I'd like asked
- I don't have any questions I'd like asked

An additional question, "Do you have specific community perspectives you would like to offer?" was added for interviews with persons identified as opinion leaders.

OpinionSurvey-11 Do you have specific community perspectives you would like to offer? [FRAMING – Opinion Leaders]

- Yes No Maybe

Finally, the question about how one might identify oneself on the political spectrum, which was included to provoke reactions as a potentially sensitive question, was a question that evoked reframing from a number of people.

OpinionSurvey-13 I would consider myself in politics to be

- Very liberal
- Somewhat liberal
- In the middle
- Somewhat conservative
- Very conservative
- Other

In the qualitative analysis, participants were coded for reframing if they (a) used the video to criticize the construction of the question, (b) picked "other" on the forced-choice items because they disagreed with having to choose one answer, or (c) added a clear question to the survey.

Quantitative Findings

Overall, 22 persons from our 61-person sample, roughly one-third, were involved in reframing actions, shown in Table 17. The ways in which they reframed items or commented on framing will be examined in detail in the qualitative record.

Involvement. For those who engaged in reframing, the percentage of respondents who were highly involved in their communities remained very similar to the percentage found in the overall sample; highly involved persons accounted for 32% (7 of 22) of those engaging in reframing. Level of involvement did not affect participation in reframing activities. However, the 82% who challenged the framing of questions (18 of 22) did add more questions to the survey than those who did not (67%; 26 of 39). One could speculate that these respondents, whatever their level of involvement in the community, *were more involved in the taking of the survey* itself.

Table 17

Characteristics of Respondents Who Engaged in Reframing

	Overall	Reframed Yes (n) %	Reframed No (n) %	%Y - %N diff
All Respondents	(61)100	(22) 36	(39) 64	
Highly Involved (HI)	(19) 31	(7) 32	(12) 31	+1
Had Privacy Concerns (PC)	(17) 28	(11) 50	(6) 15	+22**
Social Media $\geq$ 3 x week	(19) 31	(8) 36	(11) 28	+5
Had a Q to Add	(44) 72	(18) 82	(26) 67	+10
Made Video Public	(15) 25	(15) 68	(32) 82	-9

**p = .0076; Fisher's exact test (two-tailed).

Highly Involved	=	NPU member, neighborhood leader, works in planning or community, attends/involved in formal meetings regularly
Privacy Concerns	=	Indicated on survey or was coded for privacy concerns
SM Use > 3 x week	=	Uses Facebook or Twitter three or more times a week

Privacy. The biggest difference between those who were or were not coded for framing actions is identified between levels of privacy concerns. This difference is significant (p = .007): 50% (11 of 22) of the respondents who reframed survey items mentioned privacy concerns compared to only 15% (6 of 39) of those who did not "push back on the survey." As another indication of a relationship between privacy concerns and active questioning of the survey, people who engaged in reframing activities made their videos public at a lower rate, 68% (15 of 22) than those who did not reframe items, 82% (32 of 39). However, a comparison to the overall rate does not indicate this difference is statistically significant.

Technology Use. Those who commented on or challenged the framing of survey question were likely to be more active in social media channels (36%; 8 of 22) than those who did not (28%; 11 of 39).

Qualitative Findings

> So many times you get asked questions and, in my mind, it's not a yes or no question. I wanna (balls hands into fists), say "uh-uh, that's wrong!" and, "No, you need to say more.". . . . So I like that aspect of it. (P61-LP-F-60's)

That quote was made by a participant when asked why she agreed that the method of adding videos was good. It highlights the problem of fixed framing in closed-ended survey items discussed in the introduction to the problem space that this study seeks to address. Although the concept of *framing* is highly abstract, and is not often explicitly discussed by people outside the communication field, many people are aware that issues are presented on surveys in ways that exclude the expression of certain perspectives. A marked example of this problem is how census and public health data have —for years— required the respondent to choose from a limited set of ethnicities or gender. A number of participants' responses indicated support for the claim that the survey mode enabled people to express views not promoted by the survey item itself.

Adding to "Other"

I'm going to do something creative and say "all of the above" (P32-OP-M-60's). Current survey techniques often couple an open-ended response mechanism solely for enabling respondents to explain why they may have chosen "Other" from a set of responses. The *SayWhyPoll*'s question format was used for this purpose, but also we saw a number of people do more than simply adding choices. For the first forced-choice question, which asked respondents to choose a single issue as the most important one facing Fulton County, 12 persons chose "Other" and made videos to explain their answer. (This was the demonstration of the video function, so a response was prompted.) Six of them added a

choice or choices (selections not on list), but did not complain about the way the question was worded. Their concerns, for the most part, arose from their individual interests or expertise, and their "others" included government efficiency, parenting support, ethics, and flaws with regional planning processes. One person interpreted the question to mean that she should discuss that issue most important to her personally, and she provided a personal story about how the water quality was poor in Atlanta compared to a city in which she had previously lived.

Four persons explicitly challenged the framing of the forced-choice question, expressing either that "everything is interrelated" or that picking one issue over another is a challenge. "I don't necessarily think one is more important than the other, so I will pick 'other'" (P33-OP-M-40's). One person picked "other" because he did not see a choice that he thought was a problem for his area of the county; yet, another used his/her video to correct how the interviewer paraphrased what s/he had said when the interviewer prompted the video viewpoint.

On the second forced-choice question, three respondents picked "other." Interestingly, no respondents who chose "other" on the first question chose "other" on the second. Similarly to the first question, two respondents expressed that they did not want to choose between items: "Those [choices] are very close together—schools and education, (and) crime" (P8-OP-F-70's). The third person, a socially prominent opinion leader who showed confidence in virtually ignoring the two forced-choice questions as written, used the opportunity to present his views on a single issue central to his advocacy, providing a comprehensive response with the thought that the elected official should hear his perspective. He repeated this strategy in response to a question about the

stadium. He offered a thoughtful and, perhaps, previously argued response that included sub-facets of the issue, “Seventy percent of what I have answered is what you didn’t ask me,” he joked (P32-OP-M-60's).

Questioning the Questions”

Another way people used the survey method to express themselves was to disagree or comment on how choices were defined by words in the choices or question. The question requiring people to pick a political stripe garnered strong reactions from a number of participants, three of whom made comments that the choices presented were restrictive. One put it bluntly, “I don’t fit in a box” (P8-OP-F-70's). Another said, “If I am going to label myself, I like to use independent,” and another, humorously stated, “I would say I’m somewhat liberal . . . *not very or somewhat*,” implying that the choices were not sufficiently nuanced (P30-LP-F-50's). On the question that identified *involvement* as participating in “local school decisions, services to the community, zoning and planning decisions, and neighborhood association actions,” one respondent said he did not do any of those things, but he considered himself very involved in his neighborhood: “Just bringing people together” through work in a community garden and “supporting local businesses” were just as important (P3-LP-M-30's). The explanations people gave for their choice on this question were invaluable to understanding that the question as constructed was flawed. Despite having been given specific examples of involvement to guide their answer selection, many ignored the examples and chose “actively involved,” citing other activities, such as being active in parent-teacher meetings.

Involvement in Issues

Although some leaders did condense their positions on issues into a short statement, it was evident that they were concerned that a short statement could be subject to

misinterpretation (reframing). Therefore, although this was not explicitly stated by any respondents, it was clear that the method may have limitations in its use for those who are in the public eye managing the issues presented in the survey. The leaders with whom we spoke who were voting members of organizations affecting land use in their parts of the city, view those issues as complex and associated with a decision-making process laden with trade-offs that require detailed discussions, deliberation, and negotiation. One leader reflected on neighborhood-level zoning discussions:

> These issues are decided more on a conversation basis. It's hard to boil them down to, "Do you agree with the new development going in your neighborhood?" "No!" But, well, it's going to happen anyway, let's talk about what we're getting and how we're getting and how to make it the best project we can make it. . . . A lot of the zoning issues are unique.

And, he added:

> For more broad issues, or to determine what the questions are, I could see it. But, I'm kind of old-fashioned. I kind of think people need to discuss the issue left, right, top to bottom—it can't really be boiled down to a couple dozen, you know, degrees of answers. (P1-OP-M-40's)

This sentiment may be found among community activists who are deeply engaged with issues, as expressed by the community advocate who found the survey "shallow" (P47-LP-F-60's). For activists or leaders seeking to raise issues or their profile, however, the opportunity to record viewpoints may be deemed advantageous, which was indicated by several cases in our study. One retired leader (P36-LP-F-70's), who did not make her views public, gave detailed answers and expressed pleasure at being able to share

perspectives gained from years of work in her area of expertise. As mentioned previously, one leader (P32-OP-M-60's) used the opportunity as a bully pulpit on issues near and dear to his heart.

As they noted concerns with their own participation, active opinion leaders nearly unanimously agreed that the survey method could have value as a device to better understand viewpoints from the lay community. A number of them, however, qualified this endorsement by saying that the method would be of value only with attention to balance and fairness in the survey administration and presentation of results. This reflects the importance of issue framing. One leader stated it in this manner:

> Answers can be skewed based upon how the questions are constructed, how it's asked, the order of the question. [But] I think that the video, which is fairly simple in this process, allows the person that's being interviewed or participating in the survey to give a broader understanding of where their position is, and I think that's better feedback than a simple answer. (P45-OP-M-50's)

As noted previously, people with lower levels of involvement were equally likely to engage in reframing questions as those more involved. Respondents used the video to clarify why they chose items, which in itself is a framing step, and one person used the video to provide insight into her interpretation of the question choices, which she found somewhat ambiguous (P19-LP-F-50's). The conversational style adopted for the interview rather than a more formal, controlled administration of the survey was likely a factor that prompted persons to express freely thoughts that were not necessarily represented by the survey items.

Privacy Concerns

Engaging in framing activities and wanting to preserve one's privacy did not seem to be directly related in the qualitative record, although there is some association in the quantitative analyses. However, in the qualitative record, there appeared to be some connection among engaging in framing, having concerns with privacy, and low use of social media, although this needs more study, a suggestion supported by the following three cases. Of those who commented about item framing and were coded for privacy concerns, three respondents did not make their video viewpoints public. One had been the victim of cybercrime (P10-LP-F-40's), which seemed to be her overarching concern with publicizing her identity; another also forthrightly commented, "I don't like my picture being posted on a public website" (P19-LP-F-50's). Two persons who declined to share their videos were prominent community leaders who were more than 65 years old. Both offered very thoughtful, frank answers that they were unwilling to share to the public. One said that he was not very photogenic right now, but also talked a lot about trust during the interview (P32-OP-M-60's); the other mentioned that control of one's personal image was nonexistent once it was made public (P8-OP-F-70's).

The other seven who expressed privacy concerns did grant permission to post their comments publicly, and there is no discernable thread or theme that ties these respondents together. Two of them were among the few who insisted immediately that the camera be turned away from their faces so that they could not be identified. One respondent was coded for framing because s/he noted that results can be manipulated and that the validity of the method depended upon data analyses. Most of these respondents mentioned privacy concerns in general, which are best characterized by the comment,

“You know, cause these days with technology, who knows where my face may end up” (P29-LP-M-40's).

Of those who challenged framing who did not mention privacy concerns, the observation overall was that most (9 of 11 respondents) exhibited ease with being on camera: They were relaxed while responding to questions and a number of them told stories to illustrate the reasons they chose particular answers. One participant was one of the most expressive subjects we had. She was interviewed in a bar. As the interview progressed, the more animated she became. Our entire interaction was taken in fun, although the concerns she raised were quite focused (issues with garbage collection).

Three did not make their videos public; each was of retirement age. In two of these cases, it was clear that the respondents had confidence that their videos could not be shared without their permission; i.e., they understood their protections under the study and made a forthright decision to not to share their videos, which gave them the latitude to express freely their views.

Social Media Use

All those who used social media more than three times a week and engaged in framing or reframing the issues presented in the survey made their video public (8 of 22). They generally had a low involvement index; only one was a regular attendee to formal neighborhood meetings. Only two of the eight mentioned privacy concerns, which led again to the overall observation that those respondents active with social media were at ease with having their opinions recorded whether or not they were engaged in challenging the questions asked. Those who did not use social media had similar attitudes as those who had privacy concerns. Overlaps between those who did not use social media and those who had privacy concerns were noted.

Framing One's Own Question

As the last aspect of framing, I explored the findings of giving people the explicit opportunity to frame a question for future surveys. Would they be able to shape future surveys or challenge the current survey? For example, "Well, one question I thought you would ask, that I would like to know the answer to, is this." To prompt responses, the following question was included for all participants (lay public and opinion leaders):

> OpinionSurvey-10 If you could add a question to this survey, what you do think would be an important question to ask residents of your community?
>
> - I have a question I'd like asked
> - I don't have any questions I'd like asked

Soap Box

This question did *not* consistently produce the result I anticipated, which was that a respondent would simply say, "Yes, I have a question," and then, adding a video, state a comment such as, "My question is: Are you satisfied with your garbage service?" Not quite in this vein, but congruent with the idea of enabling people to "talk back to the survey" was this response from a community advocate:

> My question that I would ask is, Would the Fulton County and Atlanta Land Trust be willing to utilize some of the vacant lots and abandoned houses to create urban farms to service the health of the community? (P11-OP-M-30's)

The response I expected could be likened to the format of the quiz show *Jeopardy*, in which the answer is viewed by the contestant who must formulate the question that correctly corresponds to it. For example, if presented with the answer, "The body of water between England and France," the correct question response would be, "What is the English Channel?" Instead, many people used the opportunity to comment about

issues that were salient to them. In short, they did not frame their responses as questions; they responded to the question as though it were worded, “Would you like to add any additional comments?” This quote typifies most of the responses:

> How come more parents of the Fulton County Cobb County, in other words, the urban county, why aren't they ever out there advocating for their children? As much as Jonesboro, Marietta, and other towns such as that, I mean, our kids don't need an education? And if I ask you to come and join me, I understand you have work, I understand you have responsibilities, but your main responsibility is as a parent. Because we are trying to prevent the next generation of droids and drones. (P46-LP-F-40's)

Another participant humorously stated that he had a question that he wanted to ask but was unsure of its suitability: “Yeah, but it’s probably not appropriate. . . . Why are you such a jackass, (that) you didn’t support T-Stop/Mass Transit?” then followed with “I realize that’s not a simple question you can ask” (P45-OP-M-50's).

Thinking Through

However, among several subjects it was evident that the commentary was the method by which they formulated what mattered to them. The burden of translating their ideas into a question to be answered by others was, in effect, a second step of the process, which required facilitation from the interviewer. Here is a response that followed this pattern:

> The question is basically one of city services versus county services . . . it always strikes me that there is a duplication of some services of what the county provides by its charter and what the city provides by its charter, and what it should provide by its charter. And I'm sure over history it was a function of, well, the city doesn't think the county is doing it so the city is going to take it upon itself to get it done or vice versa or the county doesn't think the city is doing it, although I don't really think that's the way it ended up going down. So it's more of going back and coordinating county and city services to avoid that duplication to make sure all those services that are needed are provided but that's a better economy of scale than to have multiple agencies working on it. [Interviewer: Is there a question?] Yeah, I guess: Is there a set of services that the county currently provides that the city should instead or is there stuff that the city provides that the county should instead? (P60-OP-M-30's)

The previous quote illustrates another pattern that emerged from presenting the question to respondents of adding an issues question; i.e., the action of *questioning the questioner* by using the survey to pose questions to the official sponsoring the survey. Some questions were laden with values. For example,

> How can there be more help in school for people who have disabilities like special finances, more tutors, and you know, people who help, instead of people judging people, taking time out to help people? (P27-LP-F-20's)

Additional Themes and Observations

In addition to findings related to the key research questions and variables of interest in our case study model, participants also provided their thoughts on the advantages and disadvantages of the survey mode in general, its potential for remote delivery, and suggestions for improvement.

Feeling and Thought

A number of respondents commented on the interplay of their feelings and thoughts as they considered the questions and the survey method. We first heard the following in an initial pilot study from a freshman at Georgia Tech, who reflected on being presented with a question, making a choice, and then having to explain his choice:

> It gave me, made me think more about what it [the survey question] was asking and why I decided to choose the way I answered. [Interviewer: So after you realized you could say something about why you chose an answer, when you went to the next question you're saying, you kind of thought a little more about …?] While I was asked why, uh, "you want to make a video"? Then you think more about what your answer was and why you chose it, go deeper into why you chose it. Instead of saying, oh I can agree with that, you stop and really think about the process why of you chose it. (Pilot: LP-M-<20's)

This respondent, when probed, elaborated that he answered the question first and then thought about why he chose his answer by creating a video. In short, he gave a response based on feeling and then vocalized his thoughts about those feelings. An older respondent, who was fairly dispassionate in her responses, commented simply that she "was interested in how the questions made her think" (P8-OP-F-70's). One respondent commented on the benefits of eliciting "off-the-cuff" feelings from people:

> I think most of the time when you're trying to gain insight from somebody—as much as you want them to take it in, reflect, meditate, come back on it, be deep in thought—you really want somebody's initial gut reaction, when you are talking about schools, when you're talking about zoning issues, when you're talking about repaving half of Auburn Edgewood and businesses having to close, you want to know how someone really feels when they think about it. (P57-LP-F-20's)

This idea of being able to "see" how people feel echoes a response quoted earlier:

> Because people can really feel, you can really feel, if it's going to be on video, they can really see and feel the passion, how the person really feels, more so than just writing on the paper. (P23-LP-F-50's)

Yet we observed that the freedom to express one's feelings varied greatly from lay public members to opinion leaders. The opinion leaders tended to mask their emotions or, having thought more about the trade-offs regarding the current issues, had worked through their emotions. One opinion leader, who did not give permission to share videos, said, "I like typing something out . . . the filter between my mind and mouth is not all that thick with me." (P60-OP-M-30's)

Accessibility

> You need a lot of people's opinions to get to know what is going on in the area and some us appreciate you all taking the time out to come out here and help us to get our opinions because it does not happen. I think it is really important because

> we do not get the opportunity to speak out like that when we need to. Like the lower class neighborhoods they don't come to us, they don't care about us. They don't fix streets. They don't empty the trash. They don't do anything except come and arrest you. (P5-LP-F-30's)

The notion of enabling access through mobility was investigated by fielding our survey in economically depressed areas of the city whose inhabitants commented that they had limited financial means and/or limited transportation options for attending public meetings. When asked if surveys could be delivered remotely, respondents called attention to the expense of owning a smartphone as a drawback. Overwhelmingly, they thought it was a good face-to-face tool. People believed that the spoken (mobile) survey mode would help with the gathering of opinions from people who had lower educational levels. They also believed that the mobile survey mode provided opportunities for people who did not have the resources to attend meetings. One person commented that it would be good to field surveys in advance of public meetings. One person noted:

> Everyone is not going to city council, town halls, and sometimes it takes great people like you all to come out and ask the real questions and not skirt the issues. This is a great thing to show people they care and show our community that there is hope for the future. (P6-LP-M-30's)

Speed of delivery was cited also as a plus in receiving feedback from people on the street to decision makers.

We interviewed many adults who required reading glasses and two adults who had limited vision. We observed that reading glasses could be a challenge in terms of both seeing the screen and in presenting oneself on camera. Two respondents were putting on glasses to look at the survey, but taking them off to record a video. One participant finally gave up on reading and managing his performance altogether, sitting

back to have the questions read to him and not worrying about being presentable on camera (P32-OP-M-60's). Our two low-vision respondents expressed satisfaction with the face-to-face mode of delivery, citing the reading of questions and recording as enabling them to provide detailed responses without the challenges of reading and writing. Although they both said they could not take the survey by themselves, one noted that the application would benefit people with certain disabilities if implemented on a device with a screen reader.

> So, you know, when you talk about high-tech, I think that you also have to consider high-touch, and help the human element, or the human interaction piece of it. (P33-OP-M-40's)

Respondents predominately thought face-to-face administration would be more successful in their communities than remote delivery, due to disparities in smartphone ownership, a bias against technology in older adults, potential usability challenges, and time constraints. Many of our respondents did not own a smartphone, and they voiced concern that the results could be biased toward higher-income earners if delivered by phone only. Regarding age-related biases, a respondent in her seventies, who enjoyed our conversation but had trouble with the touch screen, said, “With you asking the questions and punching what it needs to be, it’s fine, but if I had to do it, it would never get done” (P8-OP-F-70's). Yet, some younger respondents were not keen on remote administration either. One person in his thirties, who is highly active in his community, asked,

> Is that going to be the most used app that we’re going to use, especially with political decisions, um, basically being on the table every single day? Are you going to take the time out every single day to state your opinions on an issue?

> Probably not. Are you gonna always know what issues are coming up? Um, probably not. (P11-OP-M-30's)

Both lay and leader respondents thought the method was useful; however, a number noted the best option might be face-to-face and remote options for taking the survey, with the survey as one of several methods for input. One person said,

> So if you had someone who didn't have a phone or what they do for the public library for people who don't have computer access, that you can come to the library and get internet access. . . . I suggest you put out some method for people who want to do this can use a mobile device can, but also have something people can take away or just call in or have a live person there. (P25-LP-F-30's)

A number of people, however, commented on the expense of face-to-face methods and challenges with getting a representative sample.

Usability, User Experience, and Feasibility

In addition to studying what participants felt and thought about the new survey mode, the research team took notes on the interactions between the interviewer and interviewees with attention to usability, user experience, and feasibility of the method in the field. By presenting the survey on the phone, we wanted to determine if (a) the respondent expected to hold the phone, (b) the phone would be passed between the interviewer and the respondent, or (c) the interviewer was expected to hold the phone. Many respondents were tentative about taking the phone completely in hand, although it appeared that persons who owned smartphones had a higher degree of comfort doing so. For example, even after the interviewer demonstrated how to provide responses, one respondent (P32-OP-M-60's) did not touch the phone, and waited for a video to be taken before

elaborating on why he chose an answer. For the majority of the interviews, we passed the phone back and forth or selected the answers for the respondent while he or she watched; i.e., we shared the screen.

When taking videos, as noted earlier, respondents preferred that we held the phone away from us as though we were taking a shot of ourselves and the interviewee, rather than pointing it at the interviewee, which put them on the spot. However, a drawback to the method of holding the camera at arm's length became obvious: If the interviewer did not effectively divide attention between the interview subject and the recording task, both the recording state and framing suffered. It was tiring for the interviewer, especially when the response was long. Because of time constraints, we did not check recordings in real time; in hindsight, audio, framings, and recordings should be spot checked daily throughout the interviewing process as a quality control measure.

Most of the respondents who did take the phone in hand did not have the same model of phone we used. We observed that this likely contributed to errors when respondents selected answers using touch interaction. Both vision and dexterity issues were present, more so among older respondents than younger ones, as would be expected. Respondents made the highest number of errors on the fixed-interval Likert-scale slider bar and the least number of errors on the radio button choices. We received numerous comments about the slider used on the Likert-type items:

> Just, where to push the buttons, how to get to the next screen, how does the little slide button work, back and forth—I mean, once you explained it, it worked, but if you had not been here and just handed that to me, I might not have been able to figure out exactly what that meant. You're always used to seeing these things with

> little dots—agree, disagree—with little dots instead of the slide that would make more sense. Yeah, it's not hard, but it's just not something that I expected when I saw it the first time. (P1-OP-M-40's)

One woman (P47-LP-F-60's), who obviously was not familiar with smartphones, asked, "Can I touch it with my finger?" She read to herself while tilting her head and pushing hard on the touchscreen to make a selection. Eventually she became frustrated. In summary, we had a full range of expectations with regard to the device; some people were eager to have the phone in hand and others waited for the survey to be read to them.

Field Conditions

It was expected that the greatest barrier to implementing the survey in the field was the immediate environment. The most common issues interviewees mentioned/specified about the interaction with the device were background noise and screen glare and size. Locations on busy streets are good for intercepting people; however, recording clean video and clear audio are challenging because of traffic noise, environmental sounds, and passersby. We discovered that inside locations, which seemed ideal acoustically, produced videos with poor audio recordings. We also had trouble with soft-spoken respondents against background noise, particularly wind.

Suggestions

The team coded for direct suggestions from participants for improving the application. Their suggestions are noted here with ideas for improvement arising from other findings presented in the discussion. One opinion leader suggested that some sort of notification system be incorporated with the feature that enables a respondent to select issues of interest or key words about which s/he could be alerted, such as the number of a bill

pending legislation. The leader emphasized that an alert regarding pending legislation and any associated survey item should be delivered well ahead of time so that an elected official can receive constituents' opinions and feedback prior to decision making.

Another feature suggested by one participant, which is supported in the literature about interviewing elites, is respondent/participant previewing of all questions prior to the administration of the survey. This could be handled in sections, a recommendation that corresponds nicely to one participant's suggestion of partitioning the survey in that manner. She explained that she might not be able to complete the survey in one session, and, if interrupted, then it would be good to be able to save results midstream. Lastly, our limited-vision participants suggested implementing the method on devices with screen readers.

5.1.4 Discussion

Individual Level Findings of Video Use in a Mobile Survey

The first embedded case study explores the feasibility and acceptability of enhancing public opinion datasets with rich media, specifically video recordings, dubbed video viewpoints. One proposition of the mobile survey case study was that enabling a respondent to elaborate on his or her answers to closed-ended questions by adding a video would enhance his or her opinion-sharing experience because it would allow greater latitude for expression. Overall, survey participants responded favorably to this option: 88% (n = 54) agreed with the statement, "This would be a good method to gather people's opinions," and 75% (n = 46) shared videos. However, this finding was generated from relatively non-controversial questions. The qualitative findings indicated that the more sensitive the questions, the less willing the respondents were to add and share video

viewpoints, particularly those respondents who were well-known and/or in public service. This latter observation confirms the need for general guidance when selecting research methods that advise researchers to avoid low-privacy methods, such as face-to-face focus groups, when conducting research on sensitive topics (Krueger & Casey, 2014; Tourangeau & Yan, 2007).

The hypotheses regarding privacy and familiarity with technology were supported, but results were mixed for levels of involvement. Persons with high involvement in local issues were equally as enthusiastic about the method as those with lower involvement, and they shared their videos publicly at similar rates as persons who were less involved in local issues, but they were more cautious in their selection of questions and how they answered them. Opinion leaders thought it would be a better way to gather others' opinions than their own opinions, with more than one opinion leader noting that he or she had many opportunities to exercise opinions through decision-making power in formal settings. As predicted, people with *low* privacy concerns scored the video option higher on *acceptability* than did those with privacy concerns. In addition, people with *high* privacy concerns were less likely to make their videos public and wanted options other than making a video to explain their survey choices. Finally, regarding familiarity with technology (operationalized as social media use), people who used social media more than 3 times a week had a level of acceptance that was similar to those who did not use social media. More importantly, social media users were *significantly* more likely to make their videos public ($V = .302$, $p = .018$), further indicating a greater level of acceptance than those who did not use social media.

It was anticipated and expected that the qualitative aspect of study—the option to record a video—would reveal expressions of emotion and personal stories. Our anticipation was met, but to a lesser degree than expected. Although a number of respondents recorded answers with notable emotional overtones and told personal stories, there was an overall lack of personal stories in the dataset. More often, respondents presented arguments or reasons why they picked specific answers. This may have been a result of how the "Why" question was presented: It was asked in a neutral, open-ended fashion, "Would you like to add a video to explain why you chose your answer?" without prompting individuals to discuss how he or she felt or without asking, "Do you have a *story* to tell about that?"

The addition of a video became an opportunity for a short interview in the style of qualitative interviewing; we did not strictly adhere to a set of limited follow-up probes. Although many respondents gave a structured answer to the "*Why*" question, others' thoughts appeared to be more in formation and some persons were less verbal. Adopting a *conversational* approach was helpful for building rapport, communicating acceptance, and helping people clarify their positions. During conversations, participants appeared to relax as the process progressed; for example, several persons "corrected" paraphrasing by the interviewer. The value of a cooperative exchange highlights the need for a skilled interviewer and demonstrates the added value of the face-to-face mode. In a remote delivery mode, assistance and encouragement for the faltering or reticent speaker would not be present (Van der Zouwen, 2006).

There are several implications of the use of mobile media if the practice of coupling a survey with an interview, which has its roots in the early days of the social

survey and in field methods prior to the late 1940s, is to be revived. First, greater attention to follow-up question wording and interviewer training will need to be revisited since both can easily influence results due to potential instability of opinions (Lewis, 1999; Zaller & Feldman, 1992). For example, achieving sound answers to open-ended questions hinges upon the interviewer's skills in adapting the conversation to draw out the respondent's specific circumstances related to answer choices chosen (Lazarsfeld, 1935). Choosing this method (the survey coupled with an interview) also requires noting the details of wording and interview technique in writing the results to assure confidence in the data (Sandelowski & Barroso, 2002).

Further, to assure that the *"Why"* question produces incisive data, it may be important to combine qualitative interviewing practices with a structured approach to that question. Converse (1987) noted that asking a simple open-ended "*Why?"* can produce "a vaguely defined frame of reference, which would practically insure a clutter of miscellaneous answers that would be difficult to classify" (p. 100). However, in the early stages of investigating differences in responses among groups, an open-ended approach may be preferred (Weiss, 1995). Protocols that formalize the line of inquiry may include follow-up questions that focus respondents' answers on specific *aspects* of opinions. For example, in marketing research, respondents could be probed about the determinants of their product purchases and preferences based on a taxonomy of influences (Lazarsfeld, 1935; Zetterberg, 2012). Other researchers advocated expanding the "Why?" to the "Wherefore?" to add depth to the data by asking *how* a respondent is affected (Fontana, 2002).

Interaction of Individual and System Levels: Feedback Loops

The multi-level model case study featured a feedback loop between individual and system levels to enhance the data collection by enabling respondents to challenge the framing of questions using the video function or to challenge/contest/dispute the survey framing by adding a question that the survey did not present. We measured results by counting how often respondents *reframed questions* when they added a video viewpoint or if they added a question to the survey. (Both actions could alter the orientation of future surveys if the survey sponsor used such feedback.) However, only one-third of the respondents engaged in successful reframing actions, so the findings overall did not support the assertion that this enhancement would be feasible, although there were notable cases of disagreement with question wording. Perhaps lack of support for this claim lies in the manner in which I defined reframing actions as successful in the codebook. *Success* was either (a) using the video to criticize the construction of the question, (b) picking "Other" on the forced-choice items AND disagreeing with having to choose one answer, or (c) adding a *coherent* question to the survey.

There was an interaction between reframing behaviors and privacy concerns. Respondents with higher involvement in issues did not differ significantly in reframing from those with less involvement in issues. However, persons who engaged in reframing had a higher level of privacy concerns. Overall, only 28% of the sample had privacy concerns; yet, 50% of those who engaged in reframing had privacy concerns but only 15% of those who did *not* reframe, a difference that is statistically significant ($p = .0076$). It could be argued that those who challenged the survey questions took more risks than those who did not and, therefore, they might be more concerned about consequences;

however, this argument requires additional study. Lastly, those who used social media more than 3 times a week engaged in reframing behavior at a higher rate than those who did not.

The survey question that provoked the most comments challenging the wording of a question was the item defining level of *neighborhood involvement* as participating in formal activities, such as attending a local meeting. People did not like being categorized as *less involved* by this definition. (This also helped us realize that the construction of this item was flawed.) Even though a number of respondents (9 of 61) actively resisted the two questions that forced them to choose only one *most important issue* facing the county—by arguing that they saw issues as interrelated—they were in the minority. Instead, many individuals used the opportunity to record video in conventional ways in which people use open-ended questions such as adding detail to their responses other than the item's wording or specifying a single "Other" choice.

The higher-level feedback loop—enabling citizens to *add a question* to the survey or future surveys—failed to work as anticipated. Although nearly all opinion leaders understood the proposition; few lay respondents were able to formulate a question for others (i.e., to translate their issue or concerns into a question.) Perhaps I failed to construct the item correctly, especially since it was the last question on the survey. Most survey responders are accustomed to a final question worded as "Would you like to add anything else?" to which they climb on the soapbox of their respective choice and advocate for it. When asked about adding *a question* most responders simply defaulted to a similar response: picking a topic and voicing their support of it. The conversational approach I took of recording videos may have compounded this problem, which is best

illustrated by the following: “Have you ever noticed this: That people never answer what you say? They answer what you mean, or what they think you mean (Chesterton, cited in Lazarsfeld, 1935, p. 35). Refining the methods and means by which mobile media’s affordances for participant feedback can invite and empower participants needs more study. This direction is supported by scholars who advocate *bi-directionality* between the interviewer and interviewee (Livingstone, 2010) with the attendant concerns of interviewer effects (e.g., bias) (Van der Zouwen, Smit, & Draisma, 2006).

Themes

Privacy, Control, and Permanence

Respondents voiced a number of concerns about the control of the data. When we probed individuals about the likelihood that they would respond to a similarly constructed survey in the future, they attributed the possibility to their understanding of the intentions of the person/organization asking for their participation and of the use of their responses. Prior to agreeing to record videos, they would want to know, *Why are you asking? For what reason? For whom? How will my answer be used? Where will it be seen?* Responses across a number of participants indicated that concerns about control of the data were heightened by the fact that today an individual’s digital traces are potentially permanent if put online. That action makes a voiced opinion no longer ephemeral, but lasting. Concern about online information that an individual no longer controls was voiced by respondents from every socioeconomic stratum and was linked to privacy concerns in comments.

For some respondents, the presence of a camera evoked the notion of participating in a documentary rather than responding to an opinion poll, the former most likely

perceived as a more permanent media form than the latter. One leader, who noted that he would prefer to read all the questions in advance, mentioned the filmmaker Michael Moore's signature technique in which he asks seemingly innocent inquiries that lead to a pointed and, often, devastating question. His implicit concern was that Moore's technique reaps answers that are used strategically to frame previously acceptable responses as disingenuous. The respondent suggested that everyone should be able to read the questions in advance, so that they could "know where things were going" (P60-OP-M-30's). Laypersons also voiced these concerns. One woman stated that she was uneasy at first: "Um, because I didn't know what the questions were. Now that it's really just a general 'what's your opinion,' you give your opinion . . . what's my opinion? . . . I am okay" (P44-LP-F-40's).

These concerns emphasize that although the polling technique lends a casual air by supporting conversations, interviewers should follow best practices in data collection; specifically, (a) to divulge the sponsoring organization and its aims, (b) to express how respondents will be protected, and (c) to disclose who (individual or organization) will control the data. These best practices will encourage respondents to provide truthful and rich responses. The stipulations of the data collection should be provided to respondents in an enduring form such as paper. A design recommendation to address permanence, control, and privacy concerns, in general, is to offer respondents the choice to forego making their answers public *by each question.* Although this might result in fewer videos shared publicly, this option could increase the video answer completion rate for questions that participants perceive as sensitive. Offering respondents the choice to record a video, record an audio, and/or provide text for each question would further insure confidentiality

of responses (if desired) for the open-ended portion of each coupled closed- and open-ended question.

Trust and Legitimacy of Effort

> In any realistic sense, public opinion consists of the pattern of the diverse views and positions on the issue that come to the individuals who have to act in response to the public opinion. Public opinion which was a mere display, or which was terminal in its very expression, or which never came to the attention of those who have to act on public opinion would be impotent and meaningless as far as affecting the action or operation of society is concerned. (Blumer, 1948, p. 545)

Blumer's statement gives voice to an enduring complaint about public opinion surveys: That is, officials field surveys to promote the impression that people's concerns are being listened to, but, in fact, they are not by those who can act on the findings. This concern for the legitimacy of the survey effort by the sponsoring organization emerged as an important theme among our respondents' attitudes toward participating in this and future surveys. Interestingly, respondents also raised concerns with the sincerity of answers. The first concern regarding legitimacy is beyond the parameters of our inquiry; many adults regard public opinion gathering as pro forma and have experienced the feeling of not being heard by officials whom they support.

Blumer (1948) coined the term *effective public opinion*, which was defined by Salmon and Christensen (2003) as "that expression of sentiment that actually reaches the systematic agenda of political decision-makers" and they add, "the goal [of facilitating the expression of public will] must be to ensure that an organization's efforts to define a social problem and its solution reach the ears and eyes of those with power to allocate resources and choose policy alternatives" (p. 7). Although most respondents assumed by our presence in their community that our sponsor, Commissioner Joan Garner, would see their videos, opinion leaders, in particular, did not make that assumption. When asked if

she wanted to make any additional comments, one leader said, “I think it’s a great idea!” and then added wistfully, “I hope Commissioner Garner will really look at it.” She reiterated her statement on video, looking directly into the camera as if speaking specifically to Commissioner Garner (P9-OP-F-60's). Another leader said wryly and with some affection, “I just hope Commissioner Garner, whom I respect (smiles, puts hands to her heart), really does look at these videos and get back to us” (P4-OP-F-40's). Several laypersons noted that although conducting such a survey seemed to be a good idea, the value of the effort on the part of the respondent was in having the opinion heard directly by the elected official. As one person put it, “When we give our opinion to the survey, if it actually changes some of the things that are going on in Fulton County, then I want to know, because it means that the individuals in Fulton County are actually making a difference, their voices are being heard, and the people who are in government are actually listening to the people that they govern.” (P34-LP-F-30's)

As mentioned previously, respondents involved in neighborhood-level issues stated that the survey should not function as a proxy/substitute for an elected official’s visit to the community for face-to-face meetings with residents. One older respondent, whose political heyday preceded the era of social media, was particularly vocal about this issue: “If the Commissioner wants in depth [answers], she needs to come out and find out” (P47-LP-F-60's).

Several persons who were likely to be homeless, based on their comments in the field notes, voiced a sentiment similar to this one: “Some people are just going to do this for the money” and “may not even have opinions” (P39-LP-M-40's). That respondent informed us that he responded to the survey solely for money. Yet, he had well-

formulated positions on the surveyed issues that revealed detailed concerns about local social services.

During the field study, a question arose that remained unresolved: Should the interviewer invite respondents to rehearse their answers before recording a video? Although this step could assist them with the formulation of succinct answers, in general, this step is discouraged in reality-based news and documentary production. At their worst, rehearsals can foster the creation of fiction; at their best, they can spoil the freshness and emotion of responses. Certainly, it can be said that opinion leaders have rehearsed answers to many questions, because they know they will be asked to speak about current issues. However, members of the lay public, even when they have definite opinions, are typically less prepared and, therefore, would be potentially less effective in voicing their opinion using this method if a rehearsal was not offered. Further study is needed to determine the effects of offering a rehearsal to participants.

Accessibility and Reach: Benefits and Barriers

Ensuring accessibility for vulnerable populations and individuals is an important aspect of public engagement mechanisms. Since the mobile phone survey study was fielded—for the most part—in economically depressed areas of the city, we were able to receive perspectives from residents for whom lack of transportation limited or prohibited attendance at public meetings. Many people we met had limited means or transportation options and/or they lived in areas with poor walkability and/or elevated crime rates, which posed barriers to being outside their homes at night. We heard repeatedly expressions of gratitude for "coming out" to the neighborhood and statements about the difficulties of attending county government meetings. Many of the same people endorsed

the opinion-gathering survey as an important face-to-face tool for including the neighborhoods. However, when asked if the use of mobile phones would be an effective method of delivering surveys remotely, respondents noted disparities of smartphone ownership as a negative.

The potential benefits of the survey format for increasing participants' access to officials extended beyond reaching participants where they live. Our sample included two adults who had limited vision. Both of them expressed satisfaction with the face-to-face mode of delivery, citing the interviewer reading questions aloud and recording answers on video as positive aspects of the process. They noted that the method enabled them to provide detailed responses without the challenges of reading and writing. Although they both stated they could not attempt the survey by themselves, one remarked that the application would be of benefit to persons with limited sight if it were implemented on a device with a screen reader.

There are barriers to achieving a fully representative sample with this method, and therefore, the method should be used to supplement traditional surveys providing full anonymity, not to replace them. A predictable but troubling reality to achieving fully representative results using the survey method is the reluctance we observed among some respondents to provide video viewpoints. Barriers to recording video included being (a) socially prominent and concerned about offending others, (b) homeless and dependent on services under comment, (c) employed by a governmental institution and therefore potentially constrained from voicing one's political views, and (d) concerned with potential harm as a resident of a high-crime area or having been a victim of cybercrime

and thus reticent. Providing options to safeguard one's identity (e.g., audio or text-only options) should be included to enable individuals who are too vulnerable to participate.

Limitations

One limitation on the study is that the effects of the use of social and other digital media are evolving as are policy directions regarding the level of privacy afforded to citizens. The study was completed just before the announcement in July 2013 that the U.S. government had conducted extensive surveillance of citizens in this country and abroad of both public figures and private citizens (Greenwald & Ackerman, 2013). The findings fall within the historical window prior to widespread debate, and a follow-on study clearly revealed some behavioral changes in the American public pertaining to issues of government surveillance (Hampton et al., 2014). Further, there has been increased scrutiny of the corporate use of private data following news of Facebook Corporation conducting experiments on its users, such as manipulating what appears on users' feeds, without informed consent (Kramer, Guillory, & Hancock, 2014).

Summary

> Absolutely wonderful tool. I feel like there could be so many ways to integrate this. Fulton County, City of Atlanta, Statewide Georgia Offices, DMV for immediate feedback as I'm going through, love to see it at polls during elections, probably departments of health. (P57-LP-F-20's)

Overall, one could argue that the mode was well accepted. People engaged with the video and provided videos in most cases. A number of people began the process thinking that they were not going to make their videos public, but did so in the end. However, with people who hold public positions, are in the public eye, or are shy, the presence of a recording device could result in the opposite of the intended effect, that of *inhibiting*

expression. That is a well-known phenomenon that serves to temper overgeneralizing these results (Donsbach, Salmon, & Tsfati, 2013).

CHAPTER VI

TANGIBLE ANCHORING

The second embedded case study in the overall case study design evaluated the feasibility and acceptability of *Tangible Anchoring*, a studio/tabletop data presentation platform. To summarize, this system is designed to enable on-air performers (e.g., anchors and moderators) of news and public issues programs to present a media-rich dataset, such as the one produced by the *SayWhyPoll* and other datasets combining closed-ended or "numbered" items with video, audio, pictures, or text. The system fulfills the proposed strategy for improving the (re)presentation of opinion by using the computational affordances of digital media to create new types of interactive visualizations to support new types of analysis and data storytelling. The scenario of use selected for testing assumes a broadcast studio setting, multiple discussants, and a screen system on which videos may be displayed.

The overall objective of the tabletop case study, presented in this chapter, is to generate findings to answer, in part, the third specific research question of my overall study:

> RQ3. In the production of public opinion, can we enhance the representation of public viewpoints using digital media by coupling quantitative survey data with video viewpoints by means of data visualization and tabletop computing?

The case study model presents this claim or prediction regarding this research question:

> Media professionals will find **feasible** the scenario of presenting public opinion data containing tightly coupled close-ended and open-ended public opinion by means of information visualizations on tabletop computing equipment designed for broadcast.

Aspects for evaluation were (a) a proposed production model, (b) the technologies (mobile app and studio desk system), and (c) scenarios-of-use in broadcast programming. Such concepts and technologies were novel at the time of the evaluation, *so the intention of the research was exploratory*. As a result, the claim I tested is modest in scope and the results qualitative; this work sets the stage for follow-up design work and additional studies. In the next sections, I present the methods and results of the case study. These findings were published previously in papers for which I was the lead author and wrote the results sections (Robinson et al., 2010, 2014)

6.1 Formative Research

As discussed in the design chapter, from 2010-2012, television professionals visited our laboratory studio during open houses, including one open house specifically reserved for CNN/Turner Broadcasting professionals and two other open houses for the local chapter of a national organization for women working in cable television. We presented the design scenario, demonstrated the system functionality, and fielded questions and comments. Broadcast professionals working in the area of audience experience across convergent media provided positive feedback on the selection of the anchor desk form factor combined with the displays. We received positive feedback on the use of screens to provide spatial cues in presenting differing viewpoints. The set-up of camera angles, featuring establishing wide shots, medium and close-up shots of discussants, and over-the-shoulder views of action on the table were validated both by program producers and studio operations professionals. Figure 39 provides grabs from the video demonstrating the program flow, which the professionals could view on a separate monitor when visiting the laboratory. In general, these working professionals indicated that the initial

system prototype was well-conceived for television studio environments and potential public affairs programming.

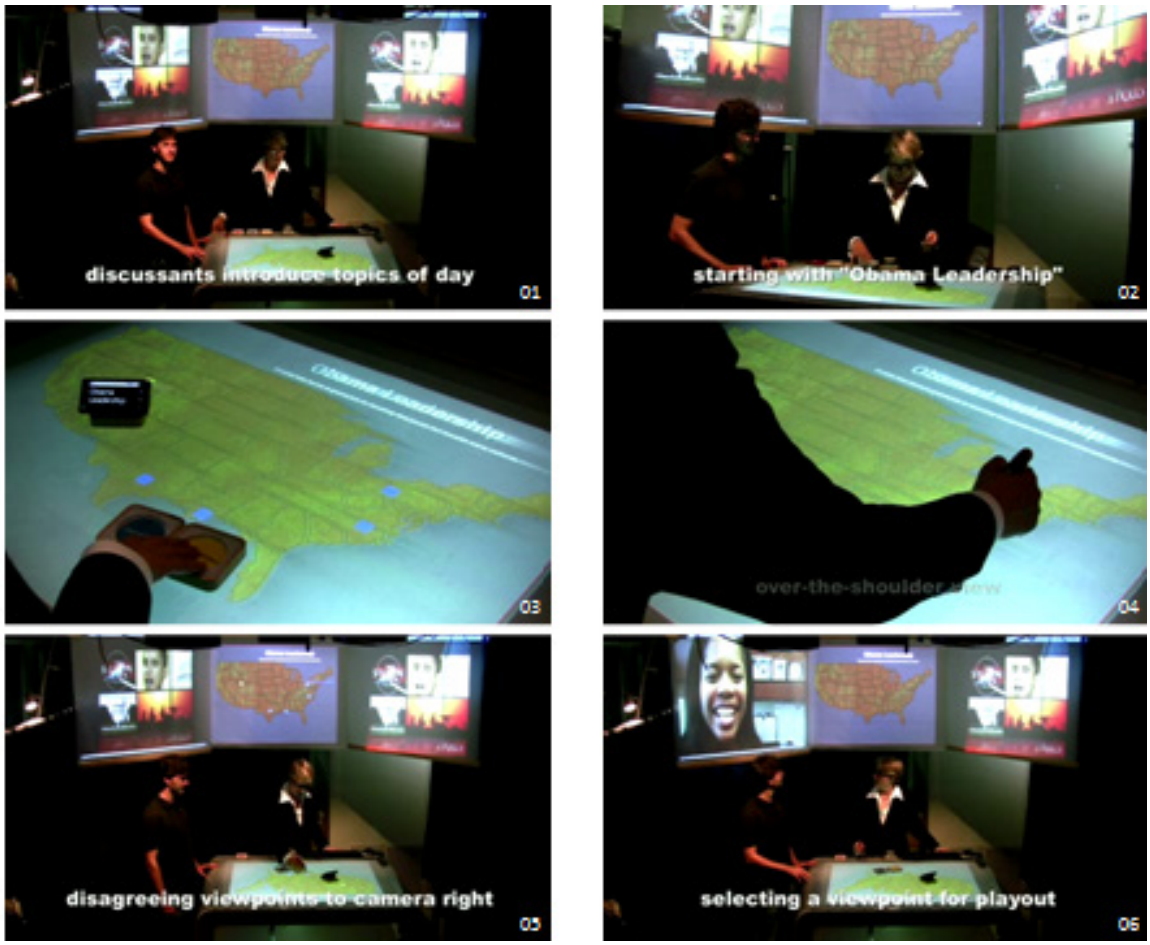


Figure 39. Proposed program flow showing high and over-the-shoulder camera angles.

We asked visitors to comment on our proposal to use the system to support a discussion program format, specifically featuring an anchor-host and guests debating opinion data comprising a combination of quantitative data points, visualized on a tabletop display, coupled with user-generated video viewpoints. One valuable suggestion was to focus the design goal of the tabletop interaction to support data storytelling versus simply reporting numbers. Aspects of data storytelling in their view included "the relationships between

opinions," the need to "identify the most interesting thing [about the data]," and finally, the "user-generated content must be good television."

Our production scenario, in which on-air talent would be supported by associate producers in the television studio and would not require the tangible anchoring desk to be used as a "stand-alone" system for analysis and presentation, was compatible with our visiting television professionals' view of how the technology would be used by staff in their environment. CNN producers familiar with on-air data visualization techniques used in the 2008 elections opined that not all on-air talent can operate technology while reporting. In their collective opinion, John King "does an amazing job with maps; he really understands [the data] at the county level."

During that time, handheld touch-sensitive tablets were not as pervasive as they are in 2015. Still, we probed about the value of adding tangibles to the multi-touch surface. They liked the idea of a hands-on, fully controllable, low-effort interface for news anchors and saw the tangibles as easier to manipulate than multi-touch alone, as mentioned in the design chapter. They were intrigued by our design motivation of using tangibles as filters to present a range of polling data and viewpoints versus limited yes or no, up or down ranges of opinion. One executive who was responsible for innovation in technology remarked that there could be value alone in unconventional representations of data as novel presentation forms are potentially appealing to viewers.

Figure 40. Tabletop system demonstration and feedback, April 2010.

Human-computer interaction (HCI) experts in specialty areas of information visualization and tangible computing also attended demonstrations and gave us feedback. An expert in information visualization commented on the need to expand the limited meta-data preview displayed when initially touching the submissions; this included suggestions to use icons versus text (e.g., state outline, thumbs up graphics). Providing a better facility for preview would enable the discussant to better preview the video viewpoint in advance of playing it. We also received feedback that the graphic submission markers could be improved, perhaps using expressive icons. Other suggestions included clarifying the meaning of submission marker movements by showing scales on the graphic background. Several experts noted that we should ensure that the tangibles did not only serve as filters, but added functional value when they were moved.

The Production Model

Based on input during formative evaluation, for evaluating the feasibility of the system overall, I created a model detailing how the television production process would be

changed across the stages of production to achieve the proposed program scenario. The model called for changes during content generation (typically known as *production*), content curation/presentation (*editorial*), and at the performance stage (*program*). The telling of stories is not reserved solely for the performance stage; it is encapsulated at each turn as seen in Figure 41. Potential roles for each of the actors in each stage is further detailed in Figure 42.

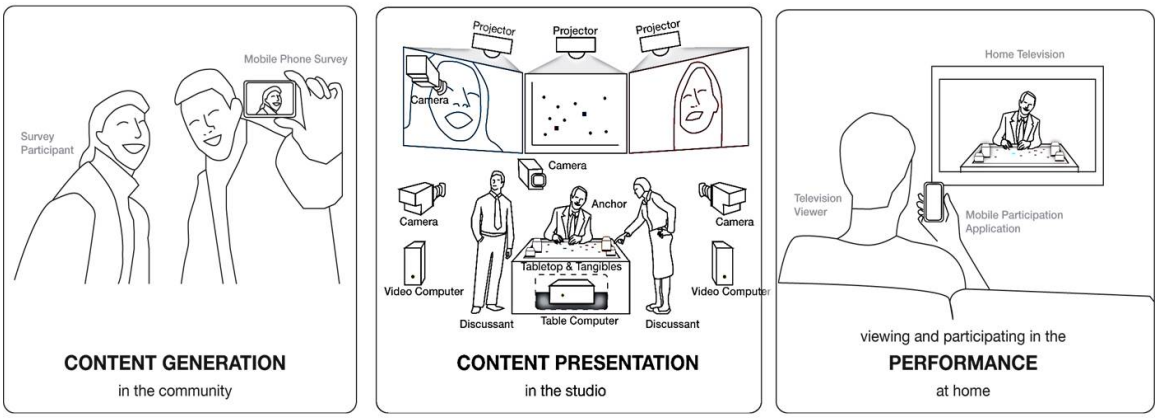


Figure 41. Television production process model. Adapted from "Storied Numbers: Supporting Media-rich Data Storytelling for Television" by S. Robinson, G.Williams, A. Parnami, J. Kim, E. McGregor, D. Chandler, and A. Mazalek, 2014, *Proceedings of 2014 International Conference on Interactive Experiences for TV and Online Video* (p. 124). New York: ACM Digital Library. (Drawing credit: Graceline R. Williams, 2014.)

In the content generation (*production*) stage, producers shape the initial surveys circulated to viewers. However, viewers might also play a role: The initial survey could even ask them what questions *should* be asked about the issues at hand. Further, in creating surveys, producers may choose between two modes for its release: the man-on-the-street or remote mode. The man-on-the-street (face-to-face) mode allows the survey to be administered face-to-face by someone (e.g. a journalist) multiple times. The remote mode sends the survey directly to registered viewers, who may respond to the survey only once on their respective mobile device. In the model, survey data and geographic

coordinates are sent immediately to the server with video sent similarly or data is uploaded later when a high-speed connection is available.

For the content curation/presentation (*editorial*) stage, an associate or producer selects content from the survey submissions to create a compelling story. Deciding what type of information visualization to use is part of the editorial processes in the model because it shapes the story that can be told. The visualization one might choose depends, in part, on the characteristics of the data. For example, one might visualize geographically relevant data such as national election results on a map whereas health trends might be visualized using a scatterplot.

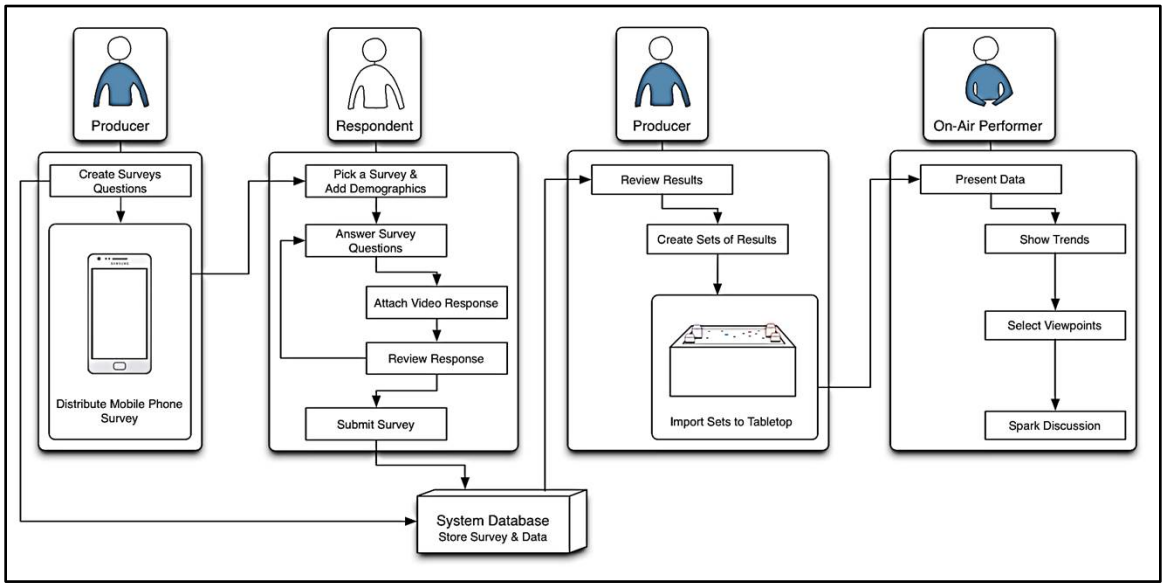


Figure 42. Proposed roles in the production process. Adapted from "Storied Numbers: Supporting Media-rich Data Storytelling for Television" by S. Robinson, G.Williams, A. Parnami, J. Kim, E. McGregor, D. Chandler, and A. Mazalek, 2014, *Proceedings of 2014 International Conference on Interactive Experiences for TV and Online Video* (p. 124). New York: ACM Digital Library. (Drawing credit: Graceline R. Williams, 2014.)

For the content presentation stage, an associate or producer curates the content from the survey submissions, creating a set of results that can tell a compelling story. Deciding what type of information visualization to use is part of the editorial process in

the model because it shapes the story that can be told. The visualization one can choose depends, in part, on the characteristics of the data. For example, one might visualize geographically relevant data such as national election results on a map whereas health trends might be visualized using a scatterplot.

Although some parts of the editorial process can be automated using meta-data from the submission (e.g., answer values), in the production model, the producer is the ultimate *decider* of the story to be told. To assist the producer in thinking through the story, the model calls for the producer to use the same information visualization application on the interactive table to discover interesting content that is used for on-air presentation. One issue is that there may be far more data than is humanly possible to review. If there are more video responses to an item than the producer has time to preview, then the model requires the application to randomize the responses so that each contributor has an equal chance to be reviewed for selection. During the selection process, the producer flags the best video viewpoints for on-air presentation with visual markers and, if desired, notes the most compelling points to be presented in the rundown, cues, and scripts.

In the performance stage of the model, producers brief on-air talent about the content highlights and the overall resulting narrative. The program format would determine the level of improvisation. For example, a short segment in a structured news show would have the talent using the visualization primarily as a device that plays the videos; but an hour-long public issues program could have the talent using viewpoints of persons from different life situations to add contextual depth to a policy debate.

6.2 Laboratory Study

6.2.1 Method

Based on feedback during formative evaluation and my study of tasks associated with analyzing and presenting public opinion data, I selected a scatterplot representation as the primary type of visualization to use in the evaluation of the tabletop system as it provided the highest level of support for analyzing multivariate public opinion data and data analysis tasks. To test the feasibility of the tabletop presentation system, the actual data from the *SayWhyPoll* field study, a combined quantitative/qualitative dataset, was loaded into the *Tangible Anchoring* scatterplot visualization. This was achieved by translating the data into an XML format from the PHP-based database used during the fielding of the survey. The use of the actual field data, which included videos, gave the lab study a degree of naturalism that fabricated data could not provide. This enabled the study team to receive feedback on real results in terms of the results' suitability for use in the media.

The protocol was designed as a cooperative think-aloud combined with an in-depth interview, followed by a user experience survey, to be administered by a investigator who was an expert in television studio production, so that the professionals would not have to explain television program mechanics to the researchers. I served as the investigator, because my years of experience in broadcast and live television enabled me to probe our respondents about technical aspects of producing programs.

The interview guide was structured and sequenced to (a) elicit feedback on the overall model of gathering rich-media survey data via mobile phones and presenting this data using a tabletop information visualization; second, (b) to prompt responses during and after the cooperative think-aloud on specific details of the study participants'

experience of using the system; and last, (c) provide reactions to a scenario-of-use in a public opinion discussion show. The scenario-of-use presented a talk show format with an anchor and two discussants reviewing responses from the public opinion poll and debating the issues.

Due to the presence of international, regional, and local television operations in Atlanta, Georgia, we were able to reach successfully experienced television professionals using a snowball sampling technique. Fourteen (14) participants were classified into three categories of experts: (a) television professionals working or who had worked in television operations, production, or as on-air talent; (b) producers of digital media content associated with news (social and on-line media); and (c) entertainment industry experts. The time required to complete the study was two hours. It was recorded from three camera angles to capture user behaviors and discussion.

Following the laboratory study, the video recording was analyzed for user interaction patterns. The sessions were transcribed and analyzed for themes by five members of the research team using a common code book. All coded transcripts were reviewed by the lead researcher and the findings were discussed among the research team for concurrence. The findings reported here are themes found across at least three respondents, with the responder number indicated by P1-14; the quotes from participants illustrate these themes.

6.2.2 Results

The in-depth interviews and surveys indicated that the expert study participants, who work across a range of environments and roles, found the overall production model to be feasible. They expressed that the concept of coupling survey questions with video was

worth pursuing. They most often framed the approach as a way to engage audiences in the same vein as man-on-the-street interviews and user-generated content give viewers the opportunity to be seen and heard. All participants, except one, indicated that such an application could be used on-air in today's environment and would be helpful when working with user-generated survey content. The interviews also yielded specific insights into the ways by which the production model and system features could be refined during the content gathering, content presentation (editorial), and performance stages to support data storytelling in the context of studio broadcast production. In the next sections, I present the results according to the production model and the technologies and techniques evaluated.

Content

"If It's Good Tape, It's Good Tape"

In general, reactions to the mobile application itself were positive, with respondents perceiving it as a way to reach people in their viewing area when the cost of maintaining reporters in the field across distances is prohibitive. While interacting with the tabletop, participants played video clips from a pilot *SayWhyPoll* survey. Unfortunately, the audio of some of the recordings was poor. This prompted them to comment that the most important factor in content for television is the quality of the clips, which they defined as more than good. As one expert put it, "If it's good tape, it's good tape" (P13). The consensus was that "good tape" interviews present energetic persons making concise points that are entertaining or incisive. One news expert stated that in the U.S. the average sound bite for news programs is 9 seconds; another remarked that sound bites for

discussion shows do not exceed 20 seconds. These estimates were reiterated by other professionals.

Respondents could envision content gathering on a topic coming from multiple sources, rather than solely gathered remotely or through a man-on-the-street intercept. One professional believed that additional content, including packages from professionals and paid respondents, might be in a content set containing a set of survey responses gathered and a story on the issue. Participants representing news operations believed that some level of training is essential if the man-on-the-street interviews are to be useful. For example, "There is a format . . . you want the person to repeat the question and the answer . . . whereas other people . . . it's not a succinct answer" (P13). For people who might receive surveys remotely, ease-of-use and limiting the recording to short bites are critical. One participant noted that content gathering can be successful overall, if the questions presented are of interest to viewers: "I think the question is going to have to be really compelling . . . if it is a question I really don't care about . . . no amount of technology can get me to watch this" (P13).

Editorial

"Finding the Gems"

> That sifter, that curator, seems to me as just as important as the person who is doing this, who is performing the data. (P07)

If good answers start with good questions, then identifying the best viewpoints and representing them in exciting ways is dependent on the human operator in the production model. The participants confirmed the importance of this stage and role and said that the

person overseeing it makes or breaks the show. They identified two main functions at this stage for program producers: (a) to select the best visualization for the content under discussion; and (b) to screen, identify, and select the top sound bites and media to be featured during the program.

Although current on-air programs often feature maps on large displays, the visualization for this study, a scatterplot, controlled by touch and tangibles, was completely novel to all the participants. This new interaction and visualization provoked lively discussion about what types of visualizations would work on television and how complex or simple they should be in terms of the number of data points, graphics, and text, and of potential viewer reactions. Most of the professionals emphasized that any visualization should be comprehensible at a glance and not overwhelm the viewer. They liked the idea of using a scatterplot, but often the conversation turned to more traditional images. One participant said, “Maybe you have a graph on one story, and a map on another story,” and regarding the scatterplot, "I think it works for me—when it’s a big dataset and you are trying to minimize it—but what if you are trying to do this with geography . . . [such as] all casualties in Iraq . . . this might be difficult to control . . . so you get to a level of sophistication [in the commentary] with it” (P14).

For the second editorial function, identifying the best content to show, experts were in agreement that the *act of discovery* was a function of this stage of production, not to be conducted during performance. The feeling was epitomized by one working anchor who said, “[Presenters] don’t want to stumble around, on the show, looking for video” (P02). And, another humorously remarked, “So let’s say that you’re not so skilled at the board . . . you’re coming off a little more miniscule than you are pro” (P01).

As with any temporal medium, experts emphasized that the selection of particular content pieces depends not only on individual merits of each video or image, but the expertise of how the data "dots" will create a dialogue in the flow of the program. Suggestions for adding interest included juxtaposing different types of people (e.g., men versus women), extreme views on either side that could lead to more moderate positions, and opposing political stances. Content that provokes emotion is important in making the data come alive: "That's what makes data interesting . . . the arguments and the human element to it," said one working professional (P14).

Performance

Show Time

Given the participants' high level of expertise, it perhaps is not surprising that the key finding of the study can be summed up as "It depends." Although there were concrete suggestions for improving the scatterplot visualization to support performance, there was less agreement on generalizing how data storytelling might evolve in terms of potential program flow, how much storytelling action occurred either behind the scenes or in front of the camera, and the optimal balance of interaction between touch or tangible controls. These decisions, the professionals told us, depend on the type of show being produced and the strengths and preferences of individual performers.

Learning Curve

All participants noted that there would be a learning curve for using the interactive table when first using the equipment and before each show, whether there was to be a short segment as a sidebar or if the program featured the table. One participant encapsulated this observation by saying, "It's a trained motor skill" (P12). On-air talent thought that

there would always be a short rehearsal prior to any show: “It’s like a symphony, or some kind of choreographed [dance]. You are going to have to do this beforehand to figure out which hand is going to do it. Once you’ve figured out what [the] routine is going to be, I don’t think it’s really a big deal” (P06).

Scripted versus Improvised

> Talent is funny. Some of them are total control freaks, and they want to do everything themselves, and others are like, “All I want to do is sit up here and read . . . don’t tell me I have to do something.” (P08)

Many participants agreed that prior to the program the producer should—at a minimum—provide a rundown of the data and media identified through the editorial process that are going on air, with sequences described and notes on content selected for the on-air performer. From there, the level of scripting could be completely planned, such as a news read in which a few 9-second bites only are featured to an improvised live, hour-long talk show in which talent could select content based on the flow of the conversation.

Several participants remarked that a talent’s knowledge of the domain from which the data are generated would have a great effect on how much support the talent might desire for data storytelling. The political analyst John King of CNN, who pioneered the use of touch surfaces on U.S. television, was cited as an example of someone who “You really think you can go to for real information” (P14) due to his relative ease with using touch surface technology and his command of relevant facts without scripting.

Typically, some improvising in television performance is desired because it increases the liveliness of the program. The dynamic nature of the data visualization was considered a plus in this regard. It was considered visually appealing and enabled the

viewer to understand how on-camera performers arrived at trends and particular viewpoints. However, many participants believed strongly that it was important to know the story in advance so that talent could provide his or her own embellishments without being responsible for determining/developing the next data "plot point". One person observed, "The anchor putting their (*sic*) own perspective on the story would come in is when they look at the material [in advance] and they find something interesting . . . they find one of those questions and they want to pose it to someone who comes in" (P06).

However, the format of the show will change the equation regarding the level of script support. The ability to improvise could be helpful in some formats, such as a morning talk show, during which there are several people on camera at any one time who need something of shared interest: the table could fill that function. One participant noted, "One of the hardest things is about interactivity on set. How do you get all of those people on set at the same time doing something together . . . something they can all look at and talk about?" (P06). But in a show featuring a single personality, using the table for focus could reduce establishing a connection with viewers. As an experienced anchor put it, "How much is the anchor going to be looking down . . . and disconnected? . . . One of the things you would have to work on is making sure that [the talent] is not looking away too much" (P10).

Hidden versus Visible Actions

> I think if someone is going to use this technology in their broadcast they are going to show they are controlling it . . . the charm of this device is seeing how you are taking control of it. (P11)

Another theme that emerged in the interviews was the degree to which "getting to the point" was on display in the actions of the performer. One serious challenge to using this technology on air is simply the expectation, by many audiences, of receiving information quickly. This has implications for the amount of functionality for direct manipulation featured on the interface. One performer advocated for a simpler design and less flexibility on the interface to support fast-paced performance. A producer echoed this sentiment, suggesting the addition of a "mini-screen" with pre-set views of the data that the performer could switch to with a simple touch.

There were a range of opinions about how much behind-the-scenes human and on-the-screen technical support should be provided to the performer, but most believed strongly that the answer was *a lot*. The extreme end of this view was one operations person who suggested the tangibles be controlled on the tabletop through remote means. On the other end, a number of people thought that having the talent perform actions was important, "because the person wants to show the interactivity" (P07). However, the way live television programs are directed identifies the challenge of transferring "where the action is" to the on-air performer.

> So many of the decisions are coming from the control room . . . the anchors are just following what they say do . . . the EP [executive producer] is saying take the full screen . . . cut the tape . . . go back to set . . . we're now talking about baseball . . . let's go the baseball question. (P13)

One of the key takeaways from the evaluation, in terms of supporting action on-air, was the need to improve the meta-data preview of the rich-media content provided when the data points are brushed over using finger touches. Many participants thought key

information displayed would include name, age, location, runtime of clip, and a succinct five-word summary of the point being made, which enables accurate verbal segues by the talent to the material. For example, *"*And now we have Marcie from Michigan who is 47 and she disagrees with our last gentleman."

Tangible versus Touch Interaction

> My first inclination is to touch. That is part of being part of the smartphone culture. "AND"[The tangibles] make it look like a cool, new technology to me - as opposed to this is just a big iPhone. (P06)

As that quote suggests, the use of touch surfaces has greatly evolved, and this study strongly indicates that touch conventions have changed people's interest in and acceptance of tangible controls. Many of the participants could envision replacing the x- and y-axis tangibles with pinch, pull, or swiping motions. They were less resolved regarding the Question and Answer tangibles. The Tagger Tangible, offering a specific function, received little comment. Touch was seen as more "intuitive," and one person said the tangibles seemed "more gimmicky than anything." With an emphasis on touch come other possibilities; for example, "The new media [types] would say, how can we draw circles?" (P14).

The second quote represents the predominant counterpoint even the pro-touch participants voiced: The tangibles provide visual interest and set the technology apart from everyday devices, but their use was more in line with show business. One newsperson stated, "If I could put this on set and look at it through a camera I would probably have a very different perspective on just the aesthetics of all this" (P13). Once

again, the overall results suggest that the choice of interface is less about usability than the preferences of the performer and desired production values.

Information Visualization

The use of a novel information visualization in the study was helpful for revealing what the experts thought was missing or what they would immediately think of creating in terms of graphics on air. It also prompted them to suggest a number of topical areas of television programming to which the practices could be applied. These areas included elections "to be able to gather questions from the community and pose them to the candidates" (P06); sports broadcasting for its wealth of statistics; or special news features; e.g., "Send the [survey] to the Red Cross . . . in refugee camps and ask them to capture what people are thinking" (P14) to supplement current events and, certainly, in the generation of new types of public opinion data-gathering and presentation.

Technical Directions

With regard to technical directions, the participants gave us a number of specific suggestions for each phase in the model of production. For example, we hesitated to limit the length of recorded sound bites during content creation generation, but it is important for saving time in the editorial process. We also plan to develop additional utilities for the content visualization and editorial stage, including a way to input a quick summary of the content's main points, whether it is a sound bite or an image with critical information. Performance refinements may include options on the interactive tabletop for using tangible or touch controls on the current visualization and enriching the graphics according to suggestions.

Fine Points

The participants offered many suggestions for refining the prototype. Art direction was a topic on which participants' views diverged greatly. Some participants argued for more intense graphics; others believed that a sparse look would help convey patterns and not overwhelm the viewer. The latter point is directly related to the complexity of a scatterplot graph. Although offering great flexibility in information visualization operations, the format received mixed responses due to complexity. As one person put it, "Maybe there are too many elements to play with–but I think it makes for good TV" (P04).

Participants thought that the staging, i.e., the simulated studio set up in the laboratory with displays and typical studio camera angles, was well done. They counseled against having guest discussants perform any functions on the table such as manipulating a tangible to filter. Finally, there is a need to consider the height of performers in sizing both the table as well as tangibles because on-air talent could have difficulty reaching all parts of the table, which was experienced by one of the participants.

6.2.3 Discussion

System Level: Mass Media/Institutional Processes

The first embedded case study examined the use of the mobile phone survey to gather data with possibilities for enhancing data presentation in mass media. The second embedded case study featured a system for translating the enriched data set survey into data visualizations for data storytelling in television programs. This system featured the use of tangible interaction on an interactive tabletop to present data and to present video

viewpoints. Our model use case described the manner in which data storytelling could be facilitated at all stages of production: content generation (the mobile phone survey), content visualization/editorial, and performance. The evaluation with television professionals validated our production model, but raised important issues about the variability of production environments and on-air talent preferences for program control, visibility of action, and the use of our interactive tabletop.

The television and news professionals who were shown the *SayWhyPoll* and *Tangible Anchoring* technologies and scenarios-of-use responded favorably overall. News and broadcast professionals perceived value in the enhanced dataset; they noted that the addition of human interest stories, particularly when delivered by lively characters, was valuable as entertainment possibilities. They indicated that the concept was valuable and potentially feasible, although more questions were raised than answered regarding how the system proposed could be practically executed. The production model overall was validated in terms of what would be assigned in the model to humans and what might be assigned or supported through computation. Participants, however, confirmed that the model was highly dependent upon human actors: everyone noted that (a) the editorial function of selecting and sequencing content required an experienced media producer, and (b) the on-air performance would demand a high-functioning personality who could improvise.

The data visualization created by the team to test our propositions generated mixed results for the feasibility variable. The scatterplot was a novel broadcast visualization vis-à-vis the commonly used map-based information visualizations of election result coverage or typical interactive graphs. The scatterplot also was rendered

with few graphical embellishments; when participants saw storyboards, which featured more graphic detail such as thumbnail faces for respondents, many of them said, “Oh, I get it. I see how this might work,” indicating that the lower graphical quality of the prototype might have been confusing. Yet, overall, the sense from our participants was that the scatterplot was too complicated for on-air use. Further development and analysis of this interface for use on air is suggested to better support the performance of data storytelling. It may be that the novelty of the tangible user interface combined with a novel type of information visualization simply was too much for participants to absorb.

Reactions to the scenarios-of-use and participants’ interaction with the technology highlighted the variability in news production environments, which would make scaling the technology challenging. Although no one participant explicitly stated that, the adoption and installation of this invention would likely be the exception, perhaps, of well-funded outlets, rather than the norm. Therefore, it is likely that the model proposed for data storytelling on television is not currently practical in typical local markets, but only feasible for major national network or cable outlets or for special circumstances such as national election coverage. However, given that the costs of our equipment, which is suitable for non-broadcast environments, was minimal (less than $15,000), the system has potential for use in public meetings that may be televised by local cable.

Addressing the Diversity of Performances

The system has two main components: a mobile application and an interactive tabletop presentation system, which supports three stages in the model of data storytelling. Those stages are content gathering, content presentation, and performance. The first two stages are processes that already occur in television production to which we proposed the

addition of networked technologies and computational techniques made possible by the affordances of digital media. However, the third stage invites using a new type of content—media-rich data—to tell new types of stories on air using innovative technologies. It is the shaping of potential practices in the third stage, performance, that the findings may best inform decisions as how to best support storytelling with this new type of dataset.

During the study, we were struck by the diversity of operational environments, program formats, branding, budgets, personalities, and preferences we encountered, even in the partial sample of television professionals. These diverse aspects form the context from which designers and engineers construct specific problem spaces as they seek to create effective technologies to support data storytelling for television. The findings suggest the need for attention to tailoring solutions when designing for broadcast production environments and for the systems of people and technologies found in those environments.

As noted in the findings, we found in the study a set of three primary tensions in the problem space of designing interaction on tabletops for the performance of media-rich data storytelling. The first is a tension between using the system to support improvising on the part of performers, due to one's ability to interact with the information visualization using the table or using the system as a prop to support scripted information flows. This tension is found in all live television programs, especially those involving ad hoc discussion. Some performers are adept at handling the unexpected and are more expert in the subject at hand, while others are better at taking direction, with the program flow determined by producers. The second tension is between making the interactions

with the data visible through direct manipulation on the part of talent; for example, having the talent scroll through answer choices to show patterns in the data and discussing the data, versus having "pre-set" views on the data that the talent simply loaded quickly to present quick contrasts of opposing viewpoints. The third tension is related to the degree to which the talent performs direct manipulation on the data. It is the tension between having a greater degree of tangible controls or more touch interaction. Tangible interaction by nature is more visible than touch interaction, especially in our scenario featuring a horizontal surface to be used on television.

The required *pacing* or flow of the program being supported by the technology is paramount to tailoring it to specific environments featuring differing levels of support for on-air talent and the preferences of talent. For example, during elections, national television news services often will broadcast programs that remain on air as election results are tabulated and conveyed to the networks. Election programs run for hours and there is a wealth of data to discuss, potentially visualize, and supplement with human interest stories. Budgets for these productions are high, extra personnel are present, and top political analysts provide commentary. This is easily a context in which the program producers might decide that a high degree of visible *thought work, s*uch as discussion or analyses, would be desirable because viewers are hungry for reflection. Due to the emerging situation, inefficiencies in improvisation would be tolerable; in fact, there may be time to fill. The addition of tangible interaction as a special visual touch or to enable increased manipulation of large data sets is more likely to be desired for these longer live programs than for short programs.

In contrast, daily prime time local news programs are highly structured and feature rapidly-paced short segments. These programs are typically produced with less resources than special events programming. In this situation, however, the tabletop could be used throughout a period of evenings to examine reactions to an event—such as a toxic spill—across a range of affected citizens relative to the geographic area affected. In this context, a reporter may want to use a map visualization to highlight data about the spill and to access quickly geo-located human interest stories during a period of several days. This usage scenario would lead one to design with dimensions of hidden action, highly scripted content, and touch interaction only.

Limitations

Although participants thought that the production model was feasible and that the overall concept holds promise, there are limitations to the findings. We were able to approximate a television studio only in the laboratory and to speculate how audiences might receive these programs. More study is needed in real production environments to determine if the technologies proposed are truly feasible. Next steps would be to produce pilot programs with data sets and test them with potential audiences to refine program scenarios. In addition, the tailoring of the data storytelling technologies for performers and their environments needs further study.

Summary

Digital media affordances introduce new opportunities to enrich datasets with media and offer new ways to engage audiences in public issues through data storytelling. There are advantages to inviting viewer participation to create content: It potentially raises interest

in the programming offered much like the traditional man-on-the-street interviews. We proposed that coupling mobile content collection, specifically the use of surveys that combine close-ended questions with video, with data presentation in the television studio using an interactive tabletop, is a possible path to seizing these opportunities. The primary challenge to this vision is that the use of interactive tabletops could slow the pace of programs in a competitive environment that demands a high turnover of topics. The study revealed tension among performers arising from less scripted performances; many performers expressed a concern that having more flexibility during their performances could result in errors.

CHAPTER VII

DISCUSSION

Overall, participants in both case studies endorsed overall the technologies and the processes proposed. The results support continued work toward the practical implementation of such a system for enhancing public opinion gathering and presentation, but the findings suggest specific issues that must be addressed if the model is to be implemented. In this chapter, I reflect on the benefits of the interactions made possible by the technologies and model, discuss barriers to adoption suggested by the findings, note potential limitations of the studies that call for future studies, and comment on the technological and cultural context in which the findings should be situated.

7.1 Why? As a Catalyst for Public Engagement

> There are many publics and issues. The public is not given once and for all; it is constructed in interaction and awareness of its participants (Mayer, 2008b, p. 10).

The public opinion survey is more than a measurement device. It is an imperfect mechanism for capturing many aspects of opinion and its very use alters its results by constraining the expressive form of what it measures. Many have proposed its use as a tool or platform for multiple purposes. For example, pollsters and academics have regarded surveys as a mechanism to stimulate political thought and activity among the lay public and as a means to reinvigorate the expression of the public will (Converse, 1987; Fishkin & Luskin, 2005).

The French political scientist Mathieu Brugidou (2006, 2008) argued that the public opinion survey should be regarded as a tool for capturing the *public dynamics* that are raised by controversies, rather than as an instrument for measuring *the public* envisioned as monolithic entity. Brugidou further asserted that the opinion poll is a means by which individuals, who converge to form *publics* raised by an issue, adjust their opinions. He argued that *the survey*, insofar as it brings together opinions, is a platform for the debate of issues. It is a way for individuals to speak *in public*. Brugidou (2009) highlighted the function of the opinion poll as a device to investigate and surface the "'discursive systems" or "grammars" activated in various situations [that] are also value systems" (2009, p. 42). He noted that *opinion* is in the culture of social sphere rather than in the individual mind: "Opinions, when they exist, are in fact always contextualized and public speaking is their only mode of existence" (2008, p. 15).

Following Brugidou's reasoning, I think the most promising aspect of our prototyped system is its potential to provide *visible* stages from which individuals can speak publicly and interact with others about issues. Not only could this enrich the understanding of views, but it could encourage citizens to declare their views, stimulate information seeking, and, possibly, increase tolerance of different views. In one sense, the system provides an asynchronous platform for deliberation that could complement more formal, real-time engagements; such engagements have been shown to create stimulating effects (Guttman, 2010).

In the use of the prototyped technologies and model, it was my experience in fielding the mobile survey that the first visible stage was created between the interviewer and interviewee. The coupling of survey questions with video viewpoints captured by

conversational interaction enabled individuals to make visible their thoughts and feelings about issues. A second stage was created when their video viewpoints were joined with others' videos in the larger arena of a shared media space as part of the interactive data visualization on tabletop; this system provided observable negotiation of meaning as statements were juxtaposed, presented, and, in the future, perhaps debated by experts.

Further, the use of the tabletop visualization for television enables a richer form of shared cognition than a sequence of man-on-the-street clips; with visualization, issues can be viewed from different perspectives, and "pictures" of the data can produce patterns of responses that would not be seen otherwise. These techniques have the potential to transfer the traditional survey—a one-way response-only channel—into an instrument for dialogue; i.e., a bi-directional conduit if data collections occur over time or in real-time and if the survey's construction is responsive to input from participants.

Using these techniques to transform the survey into a stage for debate returns the method to its roots in the American social survey movement, wherein "changing the community's consciousness was indeed the ultimate aim" (Converse, 1987, p. 25). As a naturalistic means of voicing ideas and new ways of making ideas visible, the techniques piloted in this study could be used for public engagement by the mass media; for example, real-time input during public debates or events. Applications beyond mass media include using the system to (a) facilitate debates during deliberative democracy exercises; (b) explore research into the framing, motivations, and values of publics engaged in a controversy; and (c) support citizen surveys with data collection and on-line curation.

7.2 Ready for "Prime Time"?

The vision of using the system to open discursive spaces around public issues, however, must be tempered by closer examination of the *SayWhyPoll* user feedback survey results and the concerns people voiced in both studies. On the feedback survey, although 88% of the respondents agreed that the survey type was an acceptable method for gathering public opinion and 75% of the respondents made their videos public, fewer persons selected video as an option they preferred (57%) on a post-survey user experience item. A smaller percentage (24%) indicated that they would rather use only voice or text options. It is likely that the rate of refusal to record videos or make videos public would increase if the questions were of a sensitive nature such as race relations or reproductive issues. Differing cultural values across regions and countries and within cities could influence participation and results.

If gathering opinions *to be made public* is a goal, then one path forward is to use this method for exploring topics that are not socially sensitive or highly charged with conflict; for example, one television producer suggested that an immediate on-air content use for this type of survey could feature people's opinions on lifestyle topics such as parenting strategies or fashion trends. However, not all serious topics need to be precluded. Many of the tabletop study participants mentioned election coverage as an ideal topic for the survey mode. Another person suggested the mobile survey was an unequivocal method for gathering salient details related to news stories outside United States; for example, stories from people in situations of famine, refugee status, or other crises for which there is a need to galvanize international action.

Constraints on feasibility documented by the tabletop study were the questions media professionals raised about implementing the system with regard to the human resources required to support performers. Most all the respondents also noted that full interaction with the data (versus completely scripted), i.e. dialogic transactions, would require the performer to be highly adept with both the topics under discussion and the technology. These observations suggest that the technologies, while promising, are not quite ready for prime time–television.

Given these considerations, an obvious path forward would be to use the system in opinion gathering (or other survey research efforts) when a deeper dive into people's reasoning is desired, but the sharing of results publicly is not required. Outside the media arena, research efforts across many domains could make use of these prototypical technologies and methods. The methods hold particular promise for mixed-methods research as the coupling of in-depth qualitative responses to closed-ended survey items and the interaction techniques designed to access rapidly this data through visualizations on interactive surfaces could be a powerful technique. The possibilities deserve additional study, including piloting protocols and techniques. The possibilities for the survey mode beyond public opinion gathering are discussed further in detailing future work.

7.3 Low Privacy Methods in a "No Privacy" Era

A limitation of the study was the period in which I conducted the study: March to July 2013. The field data collection was concluded immediately prior to the news announcements that a U.S. intelligence analyst, Edward Snowden, had proof that the U.S. National Security Agency (NSA) had been engaged in widespread surveillance of electronic communications (email and phone) involving both members of the domestic

public and international government officials (Greenwald & Ackerman, 2013). This led to widespread and open discussion of the lack of privacy in today's digital communication environment with one study (Hampton, Rainie, Weixu, Dwyer, Shin, & Purcell, 2014) concluding that a "spiral of silence" had been generated around the Snowden-NSA story. The Pew study revealed that Americans were far less willing to discuss the Snowden story on Facebook and Twitter (42%) than were willing to talk about it face-to-face (86%). The debate about the secret life of government surveillance is a significant historical development with regard to the method tested in this study and, perhaps, research methods with citizens in general. The revelations have sensitized many to the perils of on-line life and increased concerns about the use of one's on-line data.

However, I would argue that increased concerns about personal on-line data potentially make face-to-face methods *more valuable* to people because in an era of *no-privacy* it has become more important than ever *to know who is collecting data* and *how the data will be controlled*. The data on *response intention* from the *SayWhyPoll* field study supports this argument. As noted previously, respondents emphasized the importance of control of the data collected, more in relation to a general feeling of lacking it (control) in today's digital environment than concerns with our specific study. Although it is clear that the method will not scale as well as on-line surveys because it is labor intensive, in an era in which people do not trust that they will have anonymity, having face-to-face, real contact with survey sponsors may be a prerequisite to getting *any* answers. This would particularly apply to individuals who have low trust in institutions.

The survey method tested is a low-privacy method; therefore, guidelines must be developed for its appropriate uses with attention to ethical issues, especially with vulnerable populations, before its wider implementation. There are practical issues raised by the method; for example, respondents' surroundings and situations (i.e., environment and circumstances) and the risks associated with both when questioned to capture information. These factors must be considered by those conducting interviews. We administered the study in economically depressed locales and in areas with a high prevalence of homelessness and potential drug use, including one venue adjacent to a juvenile court. During our interviews, we encountered individuals who agreed or asked to participate in the survey who, we realized during our encounters with them, might have been under the influence of substances, thereby incriminating themselves by recording videos. Although some of these individuals signed the video release form, we excluded their videos from the public dataset because of our concerns that their appearance could have put them at risk for harassment or arrest. In addition, in one interview, we observed a detail on the video that could have put our respondent at risk: keys were hanging within reach at the entry door to the respondent's home. Both of these examples demonstrate the importance of a thorough training of interviewers, appropriate oversight of public disclosure of the data, and awareness of ethical and safety concerns.

7.4 The Closed-Ended and Open-Ended Debate

In the 1940s, the debate about closed- and open-ended survey methods in the United States was strongly tied to the technologies for survey research that researchers had available at that time. This turn of fate reflected twentieth century American values: desires for speed, convenience, cost-effectiveness, and the rational (Igo, 2009). Early in

the debate regarding "the divide," Lazarsfeld (1944) offered a "negotiation," proposing a compromise solution using of a set of question types (such as checklists) to form an interlocking system of poll questions. However, there has been a dearth of scientific research on either his proposal or the debate through the early 1980s (Converse, 1984). As a result, the quantitative survey method in the U.S. has been privileged; many would argue, unfairly so (Asher, 2007; Herbst, 1993).

Since the 1980s, work to resolve this debate has resumed. Some highlights include investigations of what is truly measured by open-ended questions—superficial or salient concerns (Geer, 1991) and what approaches/methods should be used to interpret responses. The latter question has seen contributions from the fields of psychology, sociology, and anthropology, examining not only how the mind of an individual responding to the open-ended item's wording may affect results (cognitive approach), but also aspects of the interaction between the interviewer and the individual (social interaction) (Schwarz & Sudman, 1995; Suchman & Jordan, 1990; Van der Zouwen, 2006). Another vein of research involves assessing the rhetorical competencies of individuals and groups to answer survey questions (Berinsky, 2006; Brugidou & Escoffier, 2005).

These developments in the social sciences have been accompanied by rapidly evolving technologies that have changed the mechanisms and meaning of participation in public issues, not only in real space, but cyberspace. The proliferation of two-way and networked, multi-directional communication channels and devices, particularly social media, mobile media, and interactive publishing platforms have provoked debates regarding privacy in the face of surveillance of these channels by institutions—for profit

and in the name of national defense. Social, cultural, and legal norms guiding the interaction of individuals, groups, and governmental and corporate entities in this evolving media ecology are in rapid flux, with generational differences clearly seen (Nam, 2010; Pfeil, Arjan, & Zaphiris, 2009).

While clearly, traditional surveys have advantages and are here to stay, the findings from this study support redressing some of their limitations —in gathering and presenting data—by supplementing these methods using the affordances of mobile media and tangible computing. The field study clearly demonstrated that mobile media surveys featuring mixed-methods questions could be used as a tool to spark and capture conversations in real contexts where people work, live, and play. For younger people, the mobile phone often was seen as an informal tool for facilitating the exchange of ideas, but for other respondents, particularly those of the *Silent Generation*, it was treated as an object of curiosity and, even, disdain. However, we found little or no association between age and education and acceptance of the method; rather, a strong correlation between social media use and acceptance. Using a mobile phone enabled us to establish rapport and quickly supplement the closed-ended item on our survey with comments from nearly all participants across age groups. Our second case study demonstrated the viability of using the dataset from the mobile phone, rich in qualitative data although indexed with numbers, to produce data visualizations for data storytelling with television audiences using new types of presentation technologies.

Beyond the applications tested in this study, interest in datasets combining closed-ended and open-ended data should only increase as computational technologies overall are making the process of analyzing those datasets that contain a mix of numbers and

words easier, if not more affordable. For example, powerful applications for analyzing large bodies of text are gaining use in the social sciences, which allow linguistic analyses correlated with variables based on sociodemographic or other data (Schonhardt-Bailey, 2013). These technologies represent results in multidimensional formats that enable the representation of opinions to exceed bar charts and graphics, enabling experts and non-experts alike to explore such data in novel ways that add depth to insights.

From a historical perspective then, one may frame the closed- and open-ended question debate of the 1940s in the U.S. and the ascendency of quantitative methods as strongly tied to the technologies of the survey method available to researchers at that time. The divide between quantitative and qualitative methods has been characterized in terms of cultural norms (Mahoney & Goertz, 2006). Yet, in other countries, qualitative methods prevailed (Mayer, 2008b). It will be helpful to acknowledge these traditions when considering solutions for better engaging various public(s) on issues of concern. As the field advances, it will be important to bring political and social scientists across cultural contexts into the conversation with technologists to assist with closing the *quanti-quali* divide in methodologies for measuring, analyzing, and presenting public opinion data.

CHAPTER VIII

CONCLUSION AND FUTURE WORK

8.1 Summary of Contributions and Conclusions

Given that surveys are a fact of political life, one has the choice of disparaging the form or working to make it better, one researcher noted (Mayer, 2008a). In my work, I chose the latter posture and proposed a strategy of exploiting the *communicative affordances* of convergent digital media, specifically mobile media and tangible tabletop computing technologies, to create media-rich datasets with the end goal of to better expressing the nuanced views of different publics (Brugidou & Escoffier, 2013; Dewey, 1954; Stoneman et al., 2013). My overarching research question was:

> *How can we enhance the expression and representation of public viewpoints using the affordances of convergent digital media technologies in the production of public opinion?*

Building on a literature review of relevant theory and research in public opinion, I explored this question through mixed-methods research. I used the literature review to identify variables of interest, which I integrated into the design and evaluation of my proposed technological interventions; (a) a novel mobile survey mode to tightly coupling closed- and open-ended opinion data and (b) a tabletop system featuring interactive data visualizations for presenting this enriched data. I used a descriptive case study design to investigate how individuals and institutions might receive these technologies in the gathering and presenting of public opinion. The case study featured a model of public opinion production that was tested by the study of two embedded cases at two different

units of analysis—the individual and the institutional. Individuals who participated in our evaluation included (a) members of the public and opinion leaders with whom we fielded the experimental mobile survey and (b) potential users of the tabletop system—television professionals who would be involved in presenting the media-rich dataset produced by the mobile survey.

The findings supported the claims of the multi-level case study model, which (a) for the mobile survey study, predicted higher acceptance of the mode among those who were highly involved, had low concerns for privacy, and a familiarity with technology; and (b) for the tabletop study, predicted professionals would, in general, find the technologies and usage scenarios feasible. Some exceptions to this overall picture prevailed, however. In the mobile survey case, respondents with higher levels of involvement perceived the survey technology of higher value when used with persons other than themselves and lay respondents did not readily grasp the survey feedback mechanisms. Familiarity with technology was operationalized as social media use, and there was a significant correlation between those who used social media more than three times a week and the highest measure of acceptance of the survey mode—the act of making one's video viewpoints public. In the tabletop system case, I did not test claims as this was an exploratory study. All but one of the participants endorsed the system concept and indicated that the production model was feasible. However, all participants found the scatterplot visualization complex and indicated that work should be done to create a more practical system for the television environment.

Beyond the specific findings of my investigation, the approach I took to answer my research questions provides an example for conducting interdisciplinary work when

undertaking problem spaces at the intersection of humanities, social sciences, and human-computer interaction (HCI). First, in choosing a problem space in a domain with an established theory base and methods of investigation, public opinion (measurement and communication), I framed my investigation using theory and methods from the domain to increase the defensibility of my research with domain experts as opposed to using frames from within my home disciplinary domains (humanities, human-computer interaction.) Second, in conceptualizing the problem space as spanning multiple levels (units of analysis), I confronted the need to create an organizing framework for my research both in theorizing the problem space and its critical dimensions and addressed this need by selecting an appropriate multi-level model also from within the problem domain. I will reflect on my approach to the research and its broader implications before concluding with ideas for future research to extend the findings of my studies.

8.1.1 Approach: Using Models and Theory in Interdisciplinary Research

> Third-paradigm approaches tend to focus on theory more as heuristics to be drawn on, with full understanding emerging from the combination of theoretical lenses and what happens practically at the scene of action. (Harrison, Sengers, & Tatar, 2011, p. 389)

In this dissertation, the technologies prototyped and evaluated are, in essence, *strategies* for improving public opinion *practices,* based upon historical and current criticisms of these practices and new opportunities made possible by technological advances. The practices in which I intervened operate across multiple levels in a system comprising individuals, groups (government and business elites), processes (social, organizational,

and institutional), and technologies (networked mass media). In working on multiple levels, I used theoretical constructs from relevant disciplines to inform the (a) design of new technologies, (b) evaluation plan, and (c) analysis and interpretation of the data gathered. Relevant disciplines included behavioral, social and political sciences, mass communication, computer science, and human-computer interaction (HCI).

In the HCI field, researchers have increasingly emphasized the important role that theory from both sciences and humanities can have in a range of research for different problem spaces (Bardzell, Bardzell, DiSalvo, Gaver, & Sengers, 2012; Hekler, Klasnja, Froehlich, & Buman, 2013). One factor in this development has been a shift in focus in HCI from contexts in which computer use dominates the scenario (work, desktop, etc.) to ubiquitous computing (everyday, mobile, play) in which human dimensions writ large such as values, ethics, and politics in design arise. While translating theory into practice is not novel in fields other than HCI, especially applied fields such public health and other highly politicized arenas, citations referencing theory increased notably in HCI between 2003 and 2013 inclusive as the field began to focus on health and behavior, sustainability and activism, and cultural dimensions of human existence (Harrison et al., 2011). Notable work includes the use of existing behavioral theories in technologies for health behavior change (Grimes & Grinter, 2007), theory from sociology and communication for community technologies (Erete, 2013), feminist theory in technologies to support activism (Dimond, Fiesler, & Bruckman, 2011), critical theory in game design (Harrell, 2009), and theory and its relationship to design (LeDantec & DiSalvo, 2013; Sengers, 2006).

Although the end goal of many investigations involving computational artifacts is to *translate findings* (about human interaction with technology) *into design recommendations,* the starting point for my work was different. Instead, I used theory (and related evidence) to *inform* predictions regarding the reception of the technological strategies proposed. I took this path because these strategies ran counter to norms of *proper* practices in the field I was investigating, the production of public opinion data. After using theory to *inform* (rather than drive) the focus of my research, I included in the evaluation design steps to capture data related to the theoretical constructs I used to shape the intervention strategies.

There were a number of steps in my approach. First, I acknowledged that the problem I was tackling (lack of nuanced articulation in public opinion data) involved interventions at more than one level (unit of analysis) and involved a domain that had its own knowledge base, comprised of theory and evidence. This prompted me to search for a suitable multi-level model of the problem space from scholars in the public opinion field to organize my investigation. The McLeod & Pan (1995) multi-level model of relationships best fit the units (levels) of analysis at which I wished to intervene—the individual and the institutional.

Next, I proposed two technological interventions at two levels of the multi-level model of the problem space: a mobile polling application featuring an experimental survey and tangible tabletop form factors for analyzing and presenting the data. Due to the scope of the investigation and limited resources, I placed more emphasis on generating evidence on one intervention, the mobile survey, than on the other, the tabletop presentation system, while also conducting some exploratory work on the latter

intervention. Each intervention was evaluated in its own embedded case study to be combined at the end in discussing how well the set of interventions worked to address the problem space.

For purposes of illustrating the principles of my approach, I will outline additional steps taken using only the more detailed evaluation plan of the mobile survey. In this investigation, I used relevant theory to formulate *claims* that included not only predicted outcomes for the intervention related to acceptability and feasibility of the technology, but I specified domain-specific theorized *determinants of acceptability* at the individual level: involvement, privacy, and familiarity. Next, I transposed these claims into explicit hypotheses for testing in a mixed-methods case study investigation.

In testing these hypotheses, I also factored in theoretical constructs as I shaped the context of the evaluation activities to minimize potential confounds. For example, one determinant of response rates, according to literature in the public opinion field, is *perceived legitimacy* of the survey effort. To eliminate this factor as a confound to results, I teamed with a legitimate institution to gather data that officials could use to understand constituents' perspectives. Thus, theory was used to conceptualize the research context beyond social and physical spaces, common in HCI investigations (workplaces, schools, homeless shelters, etc.) to the social and psychological space of politics, which involves dimensions of power and, likewise, powerlessness and vulnerability.

Finally, I embedded measures of hypothesized determinants and other factors (operationalizing variables such involvement) in the survey instruments used for data collection and in the first iteration coding manual for the qualitative analysis. To ensure

that I did not constrain the investigation by an overly emphasizing known variables, I included qualitative interviewing and open coding of interview data and field notes in the protocol. These latter activities resulted in a number of thematic discoveries. My final step was to combine data generated through qualitative analysis with the statistical analyses to understand how study participants received the mobile survey.

In summary, one contribution of this dissertation is a demonstration of how models and theories may be combined to inform the design and evaluation of technological interventions for problem spaces crossing disciplinary domains and for instances in which the technologies proposed as interventions may challenge norms.

8.2 Future Work

The work in this dissertation is the first to investigate (a) using digital media affordances to couple systematically closed-ended survey questions with the option to record rich-media for expressing opinions in data gathering, and (b) using the resulting/consequent dataset in the analyses and presentation of opinions with interactive visualizations designed for mass media channels. My goal was to explore ways to use digital media affordances to enhance the expressive and representational qualities of the opinion data produced across phases in the process. I characterized these phases as *gathering*, the cycle of the formation of opinions by individuals and the expression of opinions, i.e., when these are "voiced"; and *presentation,* the analysis and interpretation of opinion data, i.e., the *representation* of "publics" that may form in response to public issues. Future work falls under these two phases and in their combination.

8.2.1 Giving Voices to Choices: Forming and Expressing Opinion

Coupling a survey item with an open-ended question in a face-to-face mode constitutes a new type of mixed-method survey mode. While the findings of the field study provide general support for the proposed experimental format of coupling closed-ended questions with video recording and other open-ended response formats, such as audio or text, this new survey mode demands much more study to refine approaches for its use in various contexts with sample sizes offering greater power. It should also be piloted in combination with sample surveys for mixed-mode data collection, which would give not only breadth, but depth to the findings.

Possibilities for applying and studying this mobile survey mode are many. I preface this discussion by noting that all studies of survey methods must necessarily be bound to the culture in which they are studied. Norms regarding survey taking vary radically among cultures; for example, survey-taking is an everyday occurrence in the United States, while in West Africa, being asked for one's opinion in rural areas may be extraordinary and considered intrusive, or engender mistrust, or conversely, considered an honor or privilege.

The most obvious path for a new study in the United States and similar environments would be to deploy the survey method remotely in single-user mode, in which the recipient takes a survey once, and in reporter-mode, in which the recipient can conduct multiple surveys and study differences in response rates and quality of the responses; i.e. to conduct a multi-modal investigation. Contexts could include use by citizen journalists or pollsters for citizen surveys. Exploring this path alone is an entire vein of research. In addition, future work should include (a) studies with larger and more

varied respondent samples and content analysis of responses correlated with respondent characteristics; (b) the exploration of methodology vis-à-vis public issues with differing levels of sensitivity; and (c) additional investigations of privacy concerns.

Research regarding potential practical applications beyond the public opinion domain of the mobile survey mode should be continued. There are a number of potential uses for a survey that tightly couples numbered data with spoken or visual data. Uses would depend upon the values, goals, and aims of those asking questions and those answering them. In studies of human behavior and social phenomenon, this new type of survey holds substantial promise for increasing the fidelity of data under a mixed-methods research framework. For example, investigators in the areas of industrial and environmental safety, public health, and health communication have expressed interest in this research. In my work I have seen opportunities for its adoption. For example, during the 2014-2015 Ebola outbreak , in the country of Guinea, response leaders at the national level were in great need of surveys that combined (a) closed-ended measures of knowledge, attitudes, and practices, such as categories of reasons for not adopting protective behaviors with (b) qualitative data to provide deeper insight; for example, asking people why they were resistant to changing their behaviors. In the business and government sectors, data generated by the survey method could provide finely grained details about how people perceive a product, service, policy, or issue.

The specification of standards for data collection and for insuring the quality of the data is another area ripe for future work. Depending on how the results are presented, using data from the survey method for public issue debate via television broadcast calls for the same type of guidelines one sees today in the presentation of polls. For example, it

will be important in using this tool to clearly characterize efforts as either a representative sample that is generalizable or a straw poll. Outside the media arena, if social scientists or media investigators employ the method in studies for which generalizability is the goal, refined protocols, especially ethical safeguards, need to be developed.

As mentioned previously, the study supported the role of the interviewer as critical to the quality of data gathered, however, procedures for clarifying answers during the open-ended queries should be revisited in light of longstanding debates. Some experts argue for strict standardization of procedure to minimize bias and to produce comparable answers among respondents (Van Der Zouwen, 2006); other experts advocate flexible interviewing techniques to encourage elaboration by participants (Schober & Bloom, 2004). The survey method could support a range of emergent practices, including critical ethnography and scholar-activist strategies (Bailey, 2008). Future work should include larger scale studies of the survey method to compare results from different interviewing methods and to determine those contexts in which the different methods may be appropriate.

Finally, there are a number of practical observations, recommendations, and open questions from the study to pursue through future research. First, although many participants enjoyed recording videos, others needed options to safeguard their privacy: therefore, it is important to provide audio- or text-only options to potential respondents and to test how and when these options are used. Also, enabling individuals to preview survey questions is another refinement that is supported in the literature of interviewing elites (Rubin & Rubin, 2012). The limited-vision participants suggested another area of research, which is to implement the method on devices with screen readers.

More study is needed if the vision that drove this initial inquiry is to be realized: to make survey respondents feel less like being railroaded than like being able to lay the rails of investigation. For example, unanswered questions of the study include (a) whether asking explicitly for a personal story or structuring questions to elicit stories will provoke the telling of more stories or more arguments, and (b) how best to present individuals with opportunities to create new survey questions.

8.2.2 Storied Data: Interpreting and Representing Opinions

I have coined a term for the resulting dataset, the *artefact*, produced from the experimental mobile survey: *storied numbers* (Robinson et al., 2014). Storied numbers or storied data, are a set of records containing tightly coupled numbered and narrative information that lends itself easily to data visualization techniques. Although my work focused on featuring storied data in broadcast media programs, the system for representing enriched datasets using tangible and touch computing has potential for any type of activity in which people desire to supplement closed-ended survey questions with rich media, make it visible to others, and facilitate discussion. Potential contexts of use include participatory media events during which one gathers individual viewpoints in advance or in real time, and for display and exploration. Application domains range from face-to-face meetings (e.g., deliberative democracy exercises or an election debate, art happenings, community planning exercises, public issue debates, conflict resolution, or corporate events such as stockholder meetings) to the asynchronous curating of public comment with regard to policy decisions and group documentary work (Robinson et al., 2010).

In the broadcast arena, more studies are needed to examine how television viewers and other media audiences receive programs that feature discussants exploring data featuring numbers and stories through our limited laboratory study raised many questions. Areas for exploration include:

1. technology refinement: refining the technologies for and mechanics of interacting with data visualizations as a performer in settings with cameras transmitting the interaction;
2. performer support: what support is needed for tangible and touch interaction, scripted to improvised performances, and the visibility of actions within different contexts of performance;
3. visualizations: the types and mechanics of visualizations, their performance using the tabletop, with interaction techniques, and whether they facilitate shared cognition among television performers and audiences; and
4. system applications: how it can be applied with specific topics other than public opinion such as election coverage, sports, news, and entertainment programming.

8.3 Concluding Remarks

This study investigated how mobile media affordances and tabletop computing may be used to enhance public opinion practices by coupling closed-ended questions with rich media during data gathering and using tangible tabletop computing to present this media-rich dataset to better express diverse viewpoints among publics. Our findings confirm long standing guidance for the careful use of low-privacy methods when research is conducted on sensitive topics, but add to emerging evidence that social media use is connected to increased political expression (Gil de Zúñiga et al., 2014). Tangible tabletop

computing affordances introduce new opportunities to present media-rich datasets and offer new ways to engage audiences in public issues through data storytelling. Beyond public opinion, the methods prototyped and studied have relevance in any field of inquiry in which it is important to understand not only what people think and feel, but why, and how people may benefit from "speaking their minds," and coming together to discuss public issues.

APPENDIX A

STUDY DOCUMENTS:

SAYWHYPOLL

Project Title: SayWhyPoll Study
Investigators: Dr. Ali Mazalek, Susan Robinson
Field Study Guide, November 2012

Recruitment & Consent Form

Hello,

We are with Georgia Tech is currently researching ways to improve how public opinion polls are conducted. We have developed a new mobile polling application for which we would like to get your feedback. We are also working with Fulton County Commissioner Joan Garner and her staff to use the technology to better understand issues in Fulton County District 6.

If you would like to participate in our study, it will take no more than ten minutes. At the end, you will receive $3.

Would you like to participate?

> If, no: thank you.
>
> If yes:
> Then I will just need you to read the following information, or I will read it to you, so you will be fully informed of our work and your rights.

[Hand consent letter to participant]
After participant has read the consent letter, or you have read it to them.

Finally, if you take part in our survey, it means that you have read (or have had read to you) the information contained in this letter, and would like to be a volunteer in this research study.

Opening comments (2 mins)

First, thanks for agreeing to participate in this study. To remind you, the purpose of this study is to test the strengths and weaknesses of a mobile phone application for gathering public opinion. It was created at Georgia Tech. Because you work, play, or reside in District 6 of Fulton County, County Commissioner Joan Garner and her staff, who serve this area, haves worked with us to put together the opinion survey used in the study.

The application is currently running on an Android phone. But it could easily run on another Smartphone, such as an iPhone.

Let's get started.

Survey (7 mins)

Okay – if you would please, let's take some basic information.
[Go through first screens]

Let's get started.

[Read question] [Get answer]

Now on this survey you can not only say WHAT you think, by answering questions, but you can also say WHY you think that by attaching a video or audio. So let's give it a try.

[Demonstrate video recording]: "To ask you why, we select video, [position phone, start recording] [Be sure to include yourself in the shot, or try to.] So, you said [give answer]. May I ask why?] [Finish video recording.] [Demonstrate video play back.] [Demonstrate delete video.]

All right, is it pretty clear how it works? [If not, repeat with the first question.]

[Read next question] [Get answer] [Ask if they would like to record a video to explain why]

> To video recording, if yes:
> Okay, so let me ask why? [Position phone, include yourself in the shot] So, you said [give answer]. May I ask why? [Play back video if requested] [Delete video if requested]
>
> If no:
> Okay, let's go to the next question.

Continue through all opinion survey questions.

By Phone – All Questions Are Coupled with a "Why" Video Question

OpinionSurvey-01 From this list: what do you think is the most important issue in Fulton County today?

- Housing issues
- Health issues
- Population, growth, and development
- Immigration, legal and illegal
- Drugs and drug abuse
- Poverty, homelessness, social welfare
- Other

OpinionSurvey-02 Of this list, what is the most important issue facing Fulton County today?

- Traffic and transportation
- Schools and education
- Crime and gangs
- Environment and pollution
- Jobs and the economy
- Other

OpinionSurvey-03 Disagree or agree?: I have a good understanding of the services that Fulton County government offers versus the City of Atlanta.

Strongly disagree Disagree Neutral Agree Strongly agree

OpinionSurvey-04 Check all the local government services you think are provided by Fulton County versus the City of Atlanta.

- Health clinics and services
- Providing economic and financial assistance to eligible residents
- Operating area transit, such as buses, light rail, and the airport
- Repairing streets
- Library Services
- Operating detention facilities
- Homeless shelters

OpinionSurvey-05 Have you visited a Fulton County Library in the past 12 months?

- Yes
- No

OpinionSurvey-06 Think about the library you visit most often. Check the things that met your expectations:

- Staff was helpful to your problem/concern
- The library hours of service were good for me
- The computers for public use were available
- The books and other resources I needed were available
- The library's buildings and grounds were good
- Other

OpinionSurvey-07 How would you rate accessibility to programs for senior citizens in your area of the County?

- Poor
- Fair
- Good
- Excellent
- Is it not applicable to you

- DK/REF

OpinionSurvey-08 Does Atlanta need a new stadium for the Falcons?
- Yes
- No
- Maybe

OpinionSurvey-09 Oppose or Support? Using hotel/motel taxes in Atlanta & Fulton Co to help finance a new stadium?
Strongly Oppose Oppose Neutral Support Strongly Support

OpinionSurvey-10 If you could add a question to this survey, what you do think would be an important question to ask residents of your community?
- I have a question I'd like asked
- I don't have any questions I'd like asked

OpinionSurvey-11 Do you have specific community perspectives you would like to offer?
- Yes
- No
- Maybe

OpinionSurvey-12 Neighborhood issues include local school decisions, services to the community, zoning and planning decisions, and neighborhood association actions. Would you say that you are:
- Not very much involved
- Somewhat involved
- Actively involved
- Leading action

OpinionSurvey-13
- I would consider myself in politics to be...
- Very liberal
- Somewhat liberal
- In the middle
- Somewhat conservative
- Very conservative
- Other

[End of opinion survey.]

Second survey:

The answers to the following questions will be reported in a way that these answers cannot be linked to your previous answers.

Demographics Questions By Phone

Demographics-01 Including yourself, how many adults age 18 or older live in your household?
1 2 3 4 or more

Demographics-02 How many children under the age of 18 live in your household?
0 1 2 3 4 or more

Demographics-03 What is your current work status?

- Full-time employed
- Part-time employed
- Not employed
- Retired
- Student

Demographics-04 What was the last grade of school you completed?

- Less than high school/8th grade or less
- High school diploma or equivalent
- Special/technical training (not college)
- Some college (not grad from 4-year college)
- College graduate (from 4-year college)
- Post graduate advanced degree (Masters, MBA, PHD)
- DK/REF

Demographics-05 What is the approximate total income in your household?

- Less than $15,0000
- $15,000 to less than $25,000
- $25,000 to less than $35,000
- $35,000 to less than $50,000
- $50,000 to less than $75,000
- $75,000 to less than $100,000
- $100,000 to less than $150,000

Debrief (5 minutes)

Okay, thank you very much. Now that we've used the mobile application, we would like to hear your thoughts about it. I will now go to a second survey on the phone, which is

separate from your opinion survey. The answers to this survey will remain confidential and not be shared in any way.

By Phone – All Questions Are Coupled with a "Why" Video Question

UserEx-01 The mobile application seemed easy-to-understand and use.
Strongly disagree Disagree Neutral Agree Strongly agree

UserEx-02 This would be a good way to gather people's opinions on local issues.
Strongly disagree Disagree Neutral Agree Strongly agree

UserEx-03 I had some concerns regarding having my video taken.
Strongly disagree Disagree Neutral Agree Strongly agree

UserEx-04 I had the following concerns regarding having my video taken (mark all)

- No concerns
- My appearance
- My identity being known
- Other
- Not sure

UserEx-05 I think I could easily use the video attachment feature.
Strongly disagree Disagree Neutral Agree Strongly agree

UserEx-06 To explain why I chose answers to the questions in the survey, I would be comfortable with the following (check all):

- My video
- My voice
- Text
- My voice only
- Text only

UserEx-07 I was interested in answering the questions presented.

- Yes
- No
- Maybe

UserEx-08 I thought the number of questions being asked was ...

- Not enough
- Just right
- Too much

UserEx-09 I would be interested in seeing the results of the poll.

Strongly Disagree Disagree Neutral Agree Strongly Agree

UserEx-10 Would you like to use this app again?

- Yes
- No
- Maybe

UserEx-11 Do you have any additional comments on the mobile application?

- Yes
- No

UserEx-12 Neighborhood issues include local school decisions, community services, and planning choices, and neighborhood associations matters. Would you say you are:

- Not very much involved in neighborhood issues
- Somewhat involved
- Actively involved
- Lead action

UserEx-13 Please check all that apply:

- I post on Facebook less than once a week
- I post on Facebook several times a week
- I have a Twitter acct I tweet on less than once a week
- I have a Twitter acct I tweet on several times a week
- I watch news or public opinion shows less than once a week
- I watch news or public opinion shows several times a week

UserEx-14 What is your education level?

- Grade school
- High school
- Some college or training
- Vocational training/2 year degree
- 4-year college/bachelor's degree
- Post graduate study
- Post graduate degree

Opinion Survey Release Form

Our final step is to ask you if you would like to share your video responses with others on a public Web site. This will help your neighborhood leaders better understand the needs of the community and views of people within the community. You will also be able to see your responses on this Web site and be able to compare your responses with those of others.

However, people may be able to identify you if you agree to share your video responses. Your participation in sharing video responses is completely up to you. Would you like to share your responses?

> If yes:
> Okay, here is the release form we need to share your video responses. [Have them read and sign.] This is your participant number that you can enter on the Web site to compare your responses to others.
> If no:
> Okay, no problem. Thank you again for taking part in our study. Thank you very much for taking time to participate in this survey.

Thank you again for taking part in our study. Thank you very much for taking time to participate in this survey. Results will be available by (date) at the following public Web site (Web site address TDB.)

Project Title: SayWhyPoll Study
Investigators: Dr. Ali Mazalek, Susan Robinson
Adult Consent Form

You are being asked to be a volunteer in a research study.

Purpose

The purpose of this study is to better understand how public opinion processes can be improved using mobile technology and mobile video. Fulton County Commissioner Joan Garner has agreed to work with us during this study to see how this technology may improve communication between elected officials and the public. We expect to enroll 90 people in this study.

Procedures

If you decide to be in this study…

- You consent to **take an opinion survey on a mobile phone.** The survey consists of questions and you have the option to attach videos to explain your responses to the questions.
- **You consent to taking a second survey to tell us what you think about the experience.** The survey also consists of questions with the option to attach videos to explain your responses.
- This will take about ten minutes. You may stop the study at any time.
- You consent to **having the responses to the questions asked on the surveys logged and analyzed**.
- After the study is over, you **will have the option to share your answers to the opinion survey** on a public Web site, by written permission only. This will require a separate form.

Risks/Discomforts

The following risks/discomforts may occur as a result of your participation in this study:

There are no foreseeable risks or discomforts in this study. The risks involved are no greater than those involved in daily activities such as speaking on the telephone or using e-mail.

Benefits to you

The following benefits to you are possible as a result of being in this study:

You are not likely to benefit in any way from joining this study. We will provide the information in summary form only to Commissioner Garner and her staff and this may help them in betting understanding the needs of your community.

Compensation to you

For participating in our study, you will receive your choice of a $3 Amazon gift certificate or $3.

Confidentiality

The following procedures will be followed to keep your personal information confidential in this study:

In our publications, we may wish to refer to your survey responses or quotes, and we will report summarized responses to Commission Garner. To protect your confidentiality, we substitute a fake name for your real name.

During the opinion survey you will be able select answers to questions. You will have the option to record a video to explain why you answered the way you did.

After you have finished the study, you can choose to share your responses to the opinion survey on a public Web site. For us to share your answers on this Web site, you must give us written permission on a form we have.

Whether you choose to share your answers is completely up to you, but it has important implications for your confidentiality. If you give us permission to share your video responses on the Web site, people may be able to identify you. They would then know what you personally think about the needs of the community and your views on issues.

> If you chose not to give us written permission to share your answers to the opinion survey on the public Web site, you will remain completely anonymous.

The data that is collected about you will be kept private to the extent allowed by law. To make sure that this research is being carried out in the proper way, the Georgia Institute of Technology IRB will review study records. The Office of Human Research Protections may also look at study records.

Costs to you

There are no costs to you, except for your time.

In case of injury/harm

If you are injured as a result of being in this study, please contact Dr. Ali Mazalek at telephone (404) 385-2527. Neither the Principal Investigator nor Georgia Institute of Technology has made provision for payment of costs associated with any injury resulting form participation in this study.

Subject rights

- Your participation in this study is voluntary. You do not have to be in this study if you don't want to be.
- You have the right to change your mind and leave the study at any time without giving any reason, and without penalty.
- Any new information that may make you change your mind about being in this study will be given to you.
- You will be given a copy of this consent form to keep.
- You do not waive any of your legal rights by signing this consent form.

Questions about the study or your rights as a research subject

- If you have any questions about the study, you may contact Dr. Ali Mazalek, at telephone (404) 385-2527.
- If you have any questions about your rights as a research subject, you may contact Ms. Melanie Clark, Georgia Institute of Technology at (404) 894-6942.

If you sign below, it means that you have read (or have had read to you) the information given in this consent form, and you would like to be a volunteer in this study.

_____
Participant Name (printed)

_____ _____
Participant Signature Date

_____ _____
Signature of Person Obtaining Consent Date

School of Literature, Media, and Communication
Graduate Program in Digital Media

Project Title: WhyPoll Study
Investigators: Dr. Ali Mazalek, Susan Robinson
Protocol and Consent Title: ***Protocol H12151, WhyPoll Study***

District 6 Citizen Opinion Survey Release Form
November 2012

If you want to share your opinions on the public Web site, please read and sign the release form below (two copies.) **Sharing your responses to the opinion survey with others is strictly voluntary.**

Release

I do hereby authorize Georgia Tech, assignees, successors, and those acting pursuant to its authority to:

(1) Record my participation and appearance in the District 6 Citizen Opinion Survey.
(2) Use my likeness and voice in the sharing the results of the District 6 Citizen Opinion Survey on a public Web site, on which people can see my responses and the responses of others.
(3) Exhibit, store and forward, copy, edit, and/or distribute my responses in whole or in part without restriction or limitation for any educational or promotional purpose which Georgia Tech, its assignees, successors, and those acting pursuant to its authority, deem appropriate.
(4) No royalties, compensation, or residuals will be paid.
(5)

_____
PRINTED NAME

_____
SIGNATURE

_____
PARTICIPANT REFERENCE NUMBER - LOGIN NUMBER TO SEE YOUR RESPONSES

URL (will be active later) http://synlab.gatech.edu/whypoll

Atlanta, Georgia 30332-0165 U.S.A. Phone 404-894-2730

Introduction email from Georgia Tech WhyPoll Team to Neighborhood Opinion Leaders & Elected/ Government Officials

SUBJECT: Georgia Tech/Fulton County District 6 Public Opinion Survey and Study

Dear <Salutation> <First Name> <Last Name>,

Fulton County Commissioner Joan Garner and staff and a research team from Georgia Tech are working together to study new ways of getting citizen input for public policies and issues using mobile surveys in District 6. The study consists of students walking District 6 neighborhoods to meet folks where they work, live, and play. They will use mobile phones to ask questions and record video viewpoints regarding Fulton County's services, communication, and other issues. They will also ask people what they think of the experience of taking a mobile survey. Participation will be strictly voluntary. The results of the neighborhood surveys will be available from a link off of Commissioner Garner's Web site.

Through your participation in community activities [Because of your role in local government affairs], you have been identified as a potential stakeholder in your neighborhood's [Atlanta] public issues. Therefore, we wanted to let you know of this activity in your neighborhood [district] so that you would be informed.
Secondly, the Georgia Tech team would like to have your views included in the survey results. If you would like to participate, please reply to this email with the best email and phone number they may reach you at to schedule a 15 minute appointment for you to take the mobile survey. Below also is a contact name for the Georgia Tech team who can answer any additional questions you may have.

We thank you again for your service to the community.

Georgia Tech Mobile Polling Project
Project Lead: Susan J. Robinson, PhD Student, srobinson@gatech.edu

APPENDIX B

STUDY DOCUMENTS:

TANGIBLE ANCHORING

TANGIBLE TABLETOP DATA VISUALIZATION – STUDY PROTOCOL

Lab Set-Up

The sessions will be recorded using two cameras, 1) a wide-shot showing investigator and subjects, capturing facial expressions, and 2) an overhead shot of the table to capture hand gestures. The activity on the tabletop will also be recorded using Camtasia software and software event logging.

Procedure

Total Time	Section Time & Actions	Section/Script
	00:10	Consent Form/Introductions
		CONSENT FORM Introduce subject(s) to each other and assistants.
00:10	00:10	System Overview
		INVESTIGATOR: [EXPLAIN THE SET UP.] SCRIPT TO BE PARAPHRASED: In this session, you will use the tangible tabletop data visualization system to explore data from a recent public opinion survey. A key feature of this system is that it plays out a new kind of survey that combines a close-ended item, such as a multiple choice question, with an open-ended item, which in this case is video. What you see on the table is always displayed in the middle screen. The videos play out on the left and right screens, depending on the value of the answer. For example, a “Yes” may play out on the left screen, while a “No” plays out on the right screen. On the table, the system shows all the data points on a scatterplot. Data points that have a video are represented by a square. Data points that do not have an associated video remain round. You use a combination of finger touch and the tangible controls to get different views of the data and to explore the data points. You use touch to access the data points. Holding your finger over the data point shows the values of that answer. If you quickly tap a data point that has a video, it will play the video out on the screens. You use the tangible controls to: -Filter the data according to viewpoints[demonstrate]

Total Time	Section Time & Actions	Section/Script
		-Change what is displayed on each axis, which can be characteristics of survey respondents – or answers to questions. -And you can zoom in and out of the data [demonstrate] Two other tangibles are use to: -Change the questions displayed, and -Once you have selected a question, change the answer displayed. Last, we have a tangible, called the Tagger, which puts the table in tagging mode. This enables you to pre-select data points you want to revisit later. When you place it on the table, you have tagging activated. Once you tag a data point, it will have a white outline. You can take the Tagger off the table and the tags on the points disappear. If you put the Tagger back on the table, the tags appear. If you turn the Tagger to the right, you will see only the points you have tagged displayed. Turn it back and you will see all the points and tags. To erase the tagged data points, you turn it over. *Any questions?* [ANSWER QUESTIONS.] PROBES • What is your initial reaction to this technology? • What do you think about putting the data points with the video?
00:20	00:15	Session 1: Open-Ended Exploration of Application
	Reset table. Start video recording and observation notes.	Let's play with the table a little. First, how do you think you use the tangibles to look at the data and discuss it [ATL ADD: if all three of you were around the table]? [OPEN-ENDED EXPLORATION FOR AT LEAST FIVE MINUTES.] *Ask subject(s) to say what they are thinking as they play with the application, but do not press if they don't verbalize easily.* PROBES (counter-balance these between groups)

Total Time	Section Time & Actions	Section/Script
		• What do you find easy about this? • What do you find hard or confusing? • What are you enjoying? • What are you not enjoying? • *Follow-up probes as needed to clarify.* Great. Please take a break, while I set up the next part of our session.
00:35	00:30	Session 2: Data Visualization – Exploration Scenario Evaluation
00:10 00:20		Next we are going to try doing some specific tasks with the table. <u>MINI-TRAINING SESSION</u> *INVESTIGATOR conducts a mini-training session, repeating the instructions from the previous overview of the table technology, but this time asks each subject (one or more) to work hands-on with the table to perform the operations in a stepwise (systematic) fashion.* <u>TASK PERFORMANCE</u> 1. Getting an Overview of the Data First, let's look at some patterns in the data. Here is a summary of the overall results in a traditional format. [Hand subjects a print-out showing traditional bar graphs.] You will see if you can use the scatterplot to examine this data in closer detail. **Filtering; Finding Clusters, Arrangements, Gaps** a) (Cluster) Let's see if you can find an example of something you would expect. For example, you can see that [Question X, Answer Y] is correlated with the Strong Republicans. Let's see if you can get to that result on the tabletop. b) (Gap) Let's explore other results of that question to see if there are any combinations of respondents and answers that indicate that certain types of people did NOT pick a particular answer.

Total Time	Section Time & Actions	Section/Script
		2. Drilling Into Details Okay, let me reset the table. ***Finding Isolated points, Outliers*** c) Next, let's see if you can find interesting results in the data by viewpoint. Something you might not expect. Specifically, let's see if you can find where a Strong Democrat or Democrats and a Strong Republican or Republicans agree on the following [Question], and have a video attached. ***Playout*** d) Let's play those out. ***Tagging*** e) Let's tag those two videos so you can remember them for later. ***Zooming and Panning*** f) Let's stay with this question and try to find some video viewpoints from people over sixty who make more than $75,000 a year. ***Details on Demand*** g) Let's change the value of the x-axis to look at respondents by type of occupation. Let's see if you can find a female student who is an independent. ***Tagging*** h) Let's tag all the viewpoints in this view that have a video. ***Reset table to beginning*** i) Okay, let's return the table to its original view to get ready for our next session.

Total Time	Section Time & Actions	Section/Script
		DEBRIEF • What did you think of how things went, using the table? • What do you find easy about this? • What do you find hard or confusing? • What are you enjoying? • What are you not enjoying?
01:05	00:30	Session 3: Data Visualization – Broadcast Data Storytelling Scenario
		Investigator explains scenario using storyboards. One proposed scenario-of-use for this is that the table could be used in a broadcast studio. Prior to going on air, associate producer types would do all the tagging in advance and prepare a script so that the on-air talent could use the table to go to the different videos for play-out in a program focused on public opinion. The television studio or a presentation environment would have the screen output being a part of a set. All screens and audio are fed to the control room, along with the multiple studio cameras. You can switch any feed to the broadcast output at any time. Assuming that an AP and producer/writer have prepared the data and videos in advance for the talent, let's play act out the scenario. In our scenario, [one of] you will be the anchor, and I will play the role of a pundit [ADD ALT: another a liberal/democrat party leaning pundit, and the other a conservative/republican leaning pundit. What position would you like to take?] *[Use if needed] We can assign control of the tangibles as follows:* • *Anchor: x axis tangibles; independent viewpoint* • *Conservative: y axis tangibles, republican viewpoint* • *Liberal: Q&A tangibles, democrat viewpoint* Okay, here is a script showing the flow of the show (script will be based on data available; will be a familiar TV program script.) Let's take a moment to review. Let's see how it goes.

Total Time	Section Time & Actions	Section/Script
		[PLAY ACTING – FREE FORM] DEBRIEF • What did you think of how things went, using the table? • What do you find easy about this? • What do you find hard or confusing? • What are you enjoying? • What are you not enjoying? • What do you think about this scenario-of-use? • Assuming the data could be easily ported to the system and the videos trimmed in advance, what would be the operational barriers to implementing this type of system?

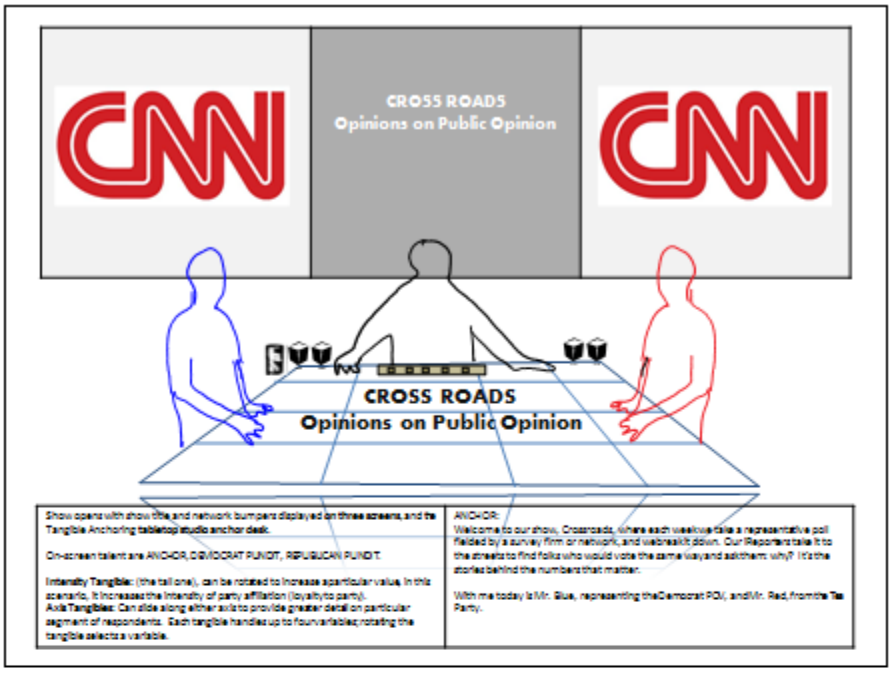
Tangible Anchoring: Post-test Survey

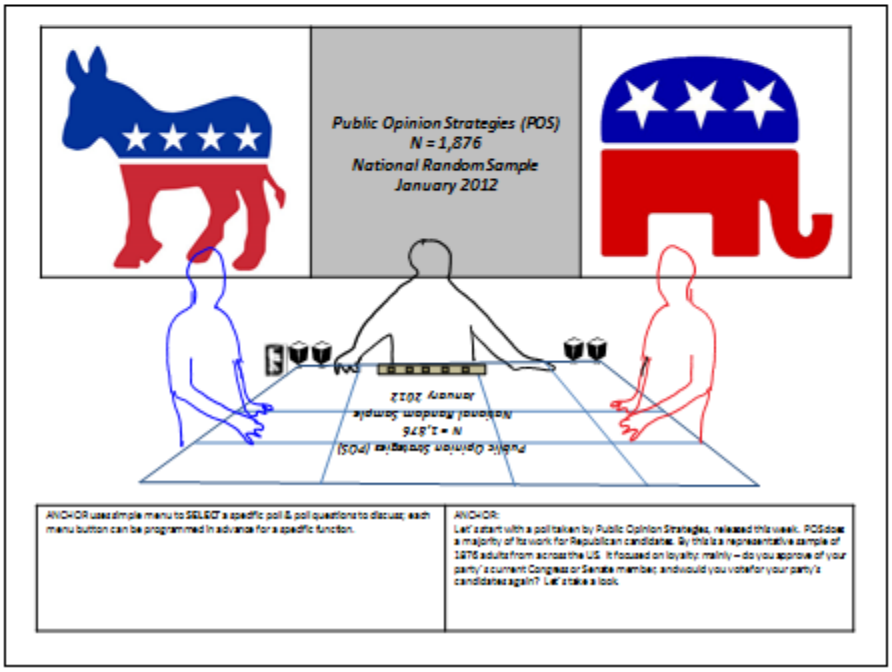
Post-test survey	# Date
Please indicate on the following scale your level of agreement with the following statements.	
It was immediately clear to me how to use the system.	Strongly Agree Agree Neutral Disagree Strongly Disagree -----|----------|----------|----------|----------|-------
I always knew how to perform a desired action.	Strongly Agree Agree Neutral Disagree Strongly Disagree -----|----------|----------|----------|----------|-------
It was easy to go between touching the screen and the tangible controls.	Strongly Agree Agree Neutral Disagree Strongly Disagree -----|----------|----------|----------|----------|-------
It was easy to rotate the tangibles to select viewpoints.	Strongly Agree Agree Neutral Disagree Strongly Disagree -----|----------|----------|----------|----------|-------
It was easy to use the x- and y- axis controls to zoom into the data.	Strongly Agree Agree Neutral Disagree Strongly Disagree -----|----------|----------|----------|----------|-------
It was easy to tag or untag videos for playout.	Strongly Agree Agree Neutral Disagree Strongly Disagree -----|----------|----------|----------|----------|-------
It was easy to play videos out on the screens.	Strongly Agree Agree Neutral Disagree Strongly Disagree -----|----------|----------|----------|----------|-------
Generally, I could work in a natural way using the tangibles.	Strongly Agree Agree Neutral Disagree Strongly Disagree -----|----------|----------|----------|----------|-------
The number of tangibles was:	[too much] [just right] [not enough]
It was easy to work with the others at the table to look at the data.	Strongly Agree Agree Neutral Disagree Strongly Disagree -----|----------|----------|----------|----------|-------

I felt like the discussion with others regarding the data flowed.	Strongly Agree Agree Neutral Disagree Strongly Disagree -----|----------|----------|----------|----------|-------
I found the tabletop application enjoyable.	Strongly Agree Agree Neutral Disagree Strongly Disagree -----|----------|----------|----------|----------|-------
The system's response time was good.	Strongly Agree Agree Neutral Disagree Strongly Disagree -----|----------|----------|----------|----------|-------
The tabletop would be helpful in working with user-generated content for surveys.	Strongly Agree Agree Neutral Disagree Strongly Disagree -----|----------|----------|----------|----------|-------
This application could be used for on-air programming in today's environment.	Strongly Agree Agree Neutral Disagree Strongly Disagree -----|----------|----------|----------|----------|-------
The first scenario on exploring data is feasible in today's television environment.	Strongly Agree Agree Neutral Disagree Strongly Disagree -----|----------|----------|----------|----------|-------
The second scenario on presenting data on-air is feasible in today's television environment.	Strongly Agree Agree Neutral Disagree Strongly Disagree -----|----------|----------|----------|----------|-------
Please rank the importance of the features of the technology in your opinion, from 1-4, 1 being most important:	[ ] Compare answers to more than one question at a time [ ] Compare answers to one question against types of respondents [ ] Tag specific answers for video play-out [ ] Combine survey questions with video
User Information	
1. Gender	(A) Male (B) Female
2. Age	(A) Under 18 (B) 18-30 (C) 31-50

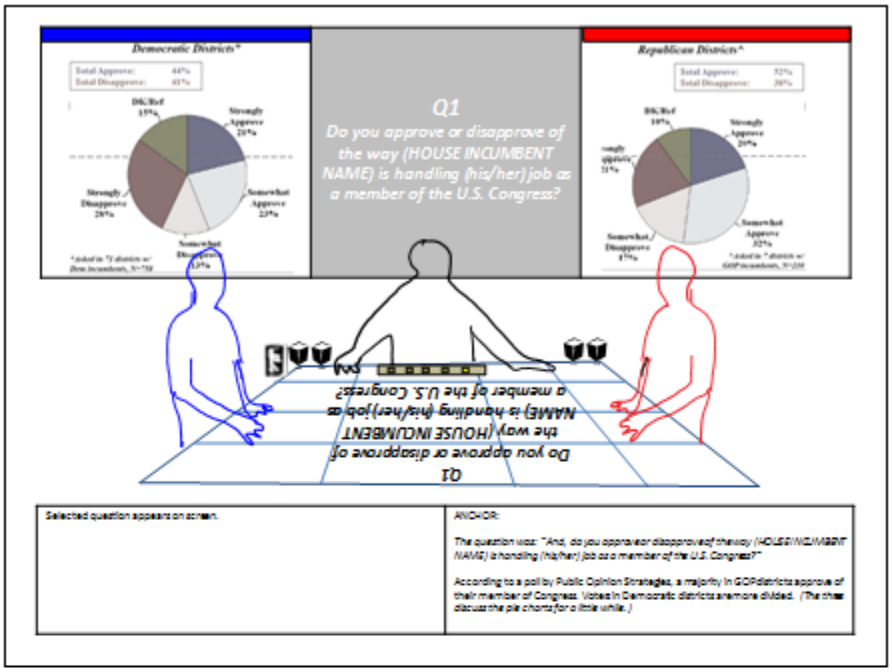
	D) 50 or above
3. Are you left-handed or right-handed?	(A) Left-handed (B) Right-handed (C) Ambidextrous
4. How would you rate your expertise with data analysis and visualization?	(Expert) 7 6 5 4 3 2 1 (Novice)
5. How would you rate your experience with touch screen devices?	(Expert) 7 6 5 4 3 2 1 (Novice)
6. How would you rate your experience with determining content/scripting of on-air portions of television programs?	(Expert) 7 6 5 4 3 2 1 (Novice)
7. How would you rate your experience with working on the behind-the-scenes operational aspects of television programs?	(Expert) 7 6 5 4 3 2 1 (Novice)

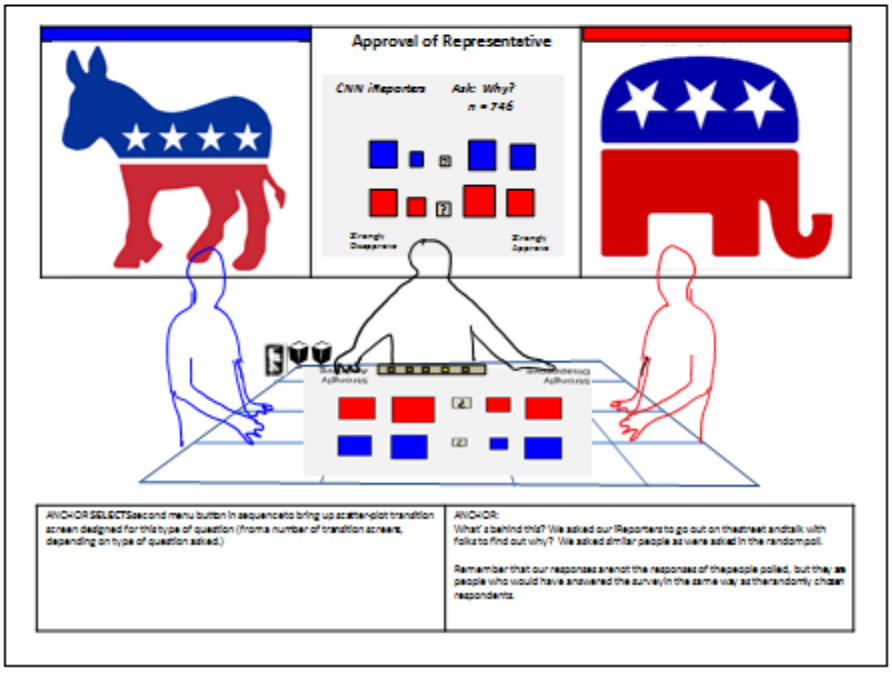
Tangible Anchoring: Storyboards - Page 1



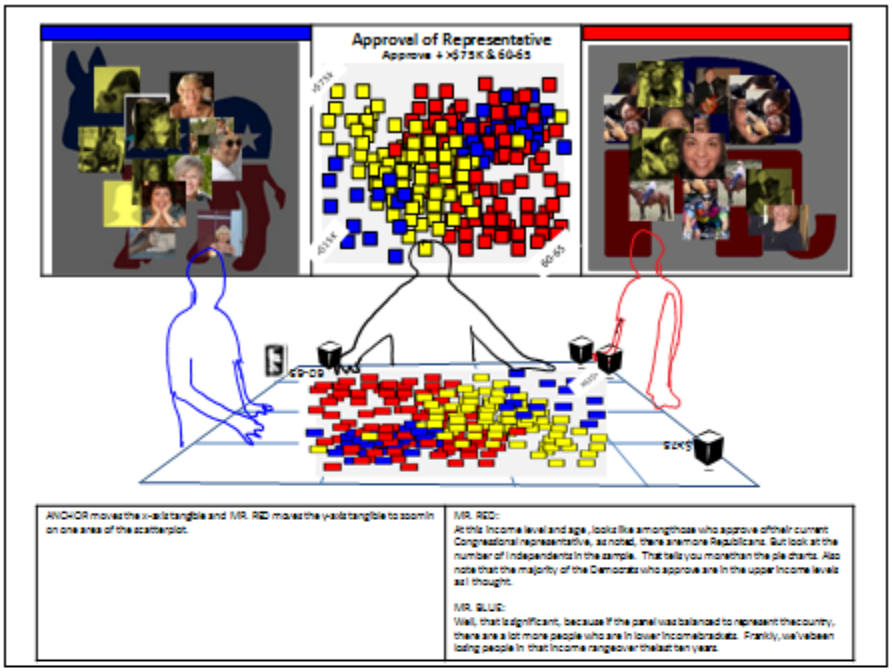


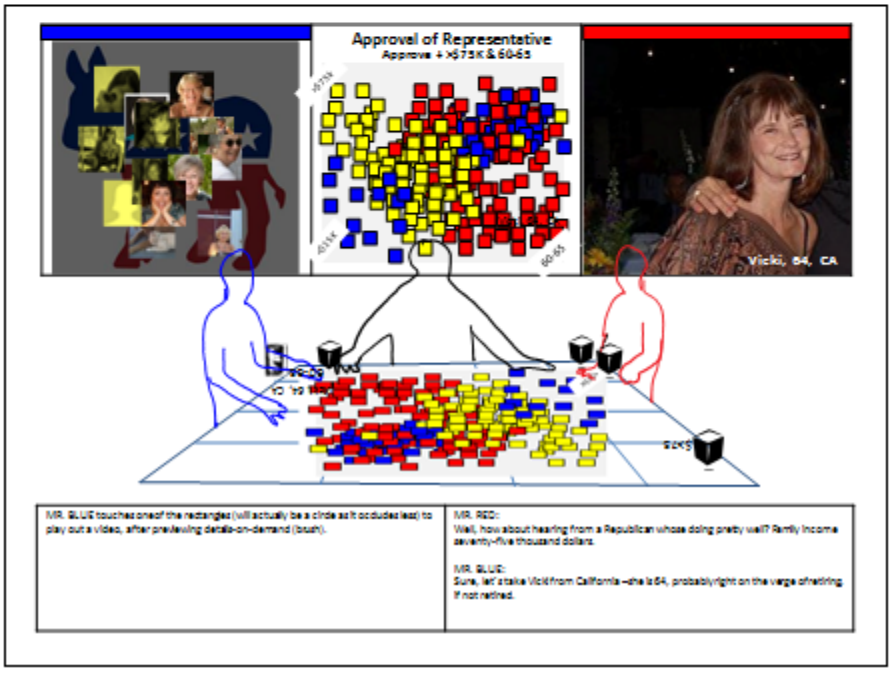
Tangible Anchoring: Storyboards - Page 2



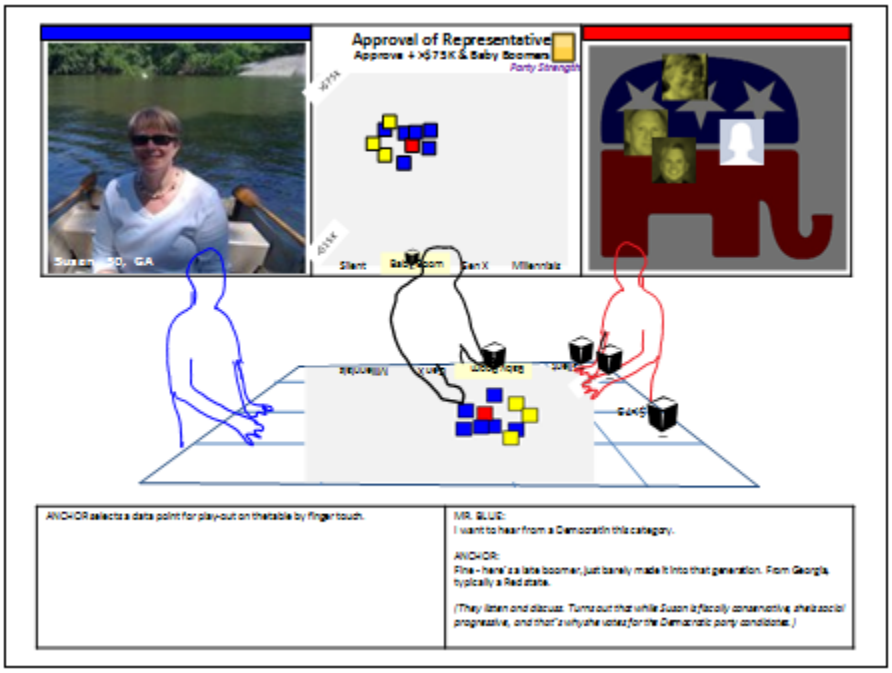


Tangible Anchoring: Storyboards - Page 3





Tangible Anchoring: Storyboards - Page 4



Project Title: Tangible Anchoring
Investigators: Dr. Ali Mazalek, Susan Robinson
Protocol and Consent Title: *Protocol H13257, Tangible Anchoring*

Adult Consent Form

You are being asked to be a volunteer in a research study.

Purpose

The purpose of this study is to better understand how tabletop computing technologies may be used for presenting data and information in new ways, with a focus on context of broadcast and cable television production. Applications range from presenting public opinion data to sports analysis. We expect to enroll up to 30 people in this study.

Procedures

If you decide to be in this study…

- You consent to **working singly or with others on a tabletop computer to explore and discuss data.** The process involves learning about the technology, doing some tasks, and role-playing. The sessions will be videotaped for purposes of analysis only.
- You consent to **participating in discussions and taking a survey to tell us what you think about the experience.**
- This will take about two hours, with a short break. You may stop the study at any time.

Risks/Discomforts

The following risks/discomforts may occur as a result of your participation in this study:
There are no foreseeable risks or discomforts in this study. The risks involved are no greater than those involved in daily activities such as speaking on the telephone or using e-mail.

Benefits to you

The following benefits to you are possible as a result of being in this study:
You are not likely to benefit in any way from joining this study.

The following benefits are possible in general as a result of this study:

Methods of gathering and presenting survey date, such as public opinion polls, may be enhanced and officials using survey data to make decisions may be better informed.

Compensation to you

For participating in our study, you will receive $20.00 and parking fees for parking in the Centergy deck or the open lot beside it on Spring Street will be reimbursed. If you choose to leave the study early, you will receive $10.00 and parking reimbursement.

NOTE: U.S. Tax Law requires a mandatory withholding of 30% for nonresident alien payments of any type. Your address and citizenship/visa status may be collected for compensation purposes only. This information will be shared only with the Georgia Tech department that issues compensation, if any, for your participation.

Confidentiality

The following procedures will be followed to keep your personal information confidential in this study:

1. In our publications, we may wish to refer to your study responses or quotes. To protect your confidentiality, we substitute a fake name for your real name in our publications.

2. The data that is collected about you will be kept private to the extent allowed by law. To make sure that this research is being carried out in the proper way, the Georgia Institute of Technology IRB will review study records. The Office of Human Research Protections may also look at study records.

Costs to you

There are no costs to you, except for your time.

In case of injury/harm

If you are injured as a result of being in this study, please contact Dr. Ali Mazalek at telephone (404) 385-2527. Neither the Principal Investigator nor Georgia Institute of Technology has made provision for payment of costs associated with any injury resulting from participation in this study.

Subject rights

- Your participation in this study is voluntary. You do not have to be in this study if you don't want to be.

- You have the right to change your mind and leave the study at any time without giving any reason, and without penalty.
- Any new information that may make you change your mind about being in this study will be given to you.
- You will be given a copy of this consent form to keep.
- You do not waive any of your legal rights by signing this consent form.

Questions about the study or your rights as a research subject

- If you have any questions about the study, you may contact Dr. Ali Mazalek, at telephone (404) 385-2527.
- If you have any questions about your rights as a research subject, you may contact Ms. Melanie Clark, Georgia Institute of Technology at (404) 894-6942.

If you sign below, it means that you have read (or have had read to you) the information given in this consent form, and you would like to be a volunteer in this study.

_____
Participant Name (printed)

_____ _____
Participant Signature Date

_____ _____
Signature of Person Obtaining Consent Date

Project Title: Tangible Anchoring
Investigators: Dr. Ali Mazalek, Susan Robinson
Protocol and Consent Title: Protocol xxxxx, Tangible Anchoring Study

Introduction email from Georgia Tech Tangible Anchoring Team to Film/Television Professionals

SUBJECT: Georgia Tech: Broadcasting & Cable Television Studio – Tabletop Data Visualization Study

Dear <Salutation> <First Name> <Last Name>,
The Synaesthetic Media Lab (Synlab) team is evaluating tabletop computing technologies for presenting data and information in new ways this <date period>. We have developed a new type of studio desk using multi-touch and tangible controls. We would like to invite you to participate in assessing how it might work in the production of television and cable programming, and other contexts. Possibilities for its use range from presenting public opinion data to supporting sports analysis.

You are receiving this email because we've met you during visits to our lab, other discussions, perhaps a recommendation from someone else, and your expertise. We are interested in views from all aspects of production: from technical, behind-the-scenes know-how to live on-air experiences by talent and viewers.

We would greatly value your feedback on our system as it is now implemented, http://synlab.gatech.edu/projects/tangibleanchoring/ . (If you have visited before, this is an enhanced prototype.) This would take a couple of hours of your time, at your convenience. You would try out the technology either in a small group or singly, give feedback, and complete a short survey. You will receive $20 and parking reimbursement. Participation is strictly voluntary.

We would like to follow-up and schedule a time with you for a visit to our lab at the Technology Square Research Building. We would greatly appreciate if you could:

- Reply to this email: let us know how to contact you best to see if we could work out a convenient time (we've found follow-up by phone/text is good for coordinating calendars).

Thank you for your time and consideration!

Sincerely,
Susan J. Robinson, MS
Study Manager, PhD Candidate
Georgia Institute of Technology

Ali Mazalek, PhD
Director, Graduate Program in Digital Media
Director, Synaesthetic Media Lab
Georgia Institute of Technology

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