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| Abstract             | <p>Cyberinfrastructure (CI) involves networked technologies, organizational practices, and human workers that enable computationally intensive, data-driven, and multidisciplinary collaborations on large-scale scientific problems. CI enables emerging forms of mediated relationships, dispersed groups, virtual organizations, and distributed communities. Researchers of CI often employ a limited set of methodologies such as trace data analysis and ethnography. In response, this chapter proposes a more flexible framework of interviewing members of dispersed groups, virtual organizations, and distributed communities whose work, interaction, and communication are primarily mediated by communication technologies. Telephone interviewing can yield high-quality data under appropriate conditions, making it a productive mode of data collection comparable to a face-to-face mode. The protocol</p> |                         |

described in this chapter for telephone interviews has been refined over three studies (total  $N = 236$ ) and 10 years (2007–2017) of research. The protocol has been shown to be a flexible and effective way to collect qualitative data on practices, networks, projects, and biographical histories in the virtual CI communities under study. These benefits speak to a need in CI research to expand from case studies and sited ethnographies. Telephone interviewing is a valuable addition to the growing literature on CI methodologies. Furthermore, our framework can be used as a pedagogical tool for training students interested in qualitative research.

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Keywords  
(separated by “-”)

Cyberinfrastructure - Technology - Qualitative - Interviews

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# Telephone Interviewing as a Qualitative Methodology for Researching Cyberinfrastructure and Virtual Organizations

Kerk F. Kee and Andrew R. Schrock

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**Abstract**

Cyberinfrastructure (CI) involves networked technologies, organizational practices, and human workers that enable computationally intensive, data-driven, and multidisciplinary collaborations on large-scale scientific problems. CI enables emerging forms of mediated relationships, dispersed groups, virtual organizations, and distributed communities. Researchers of CI often employ a limited set of methodologies such as trace data analysis and ethnography. In response, this chapter proposes a more flexible framework of interviewing members of dispersed groups, virtual organizations, and distributed communities whose work, interaction, and communication are primarily mediated by communication technologies. Telephone interviewing can yield high-quality data under appropriate conditions, making it a productive mode of data collection comparable to a face-to-face mode. The protocol described in this chapter for telephone interviews has been refined over three studies (total  $N = 236$ ) and 10 years (2007–2017) of research. The protocol has been shown to be a flexible and effective way to collect qualitative data on practices, networks, projects, and biographical histories in the virtual CI communities under study. These benefits speak to a need in CI research to expand from case studies and sited ethnographies. Telephone interviewing is a valuable addition to the growing literature on CI methodologies. Furthermore, our framework can be used as a pedagogical tool for training students interested in qualitative research.

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**Keywords**

Cyberinfrastructure · Technology · Qualitative · Interviews

Cyberinfrastructure (CI) is an assemblage that includes a national supercomputing network along with associated computational tools, sensors, datasets, practices, and scientific workers (Atkins et al. 2003; Kee et al. 2011; Ribes and Lee 2010). In other words, CI involves networked technologies, organizational practices, and human workers that enable computationally intensive, data-driven, and multidisciplinary collaborations on large-scale scientific problems. These scientific problems include ambitious discipline-specific projects such as mapping the genetic botanical DNA lineages (iPlant Collaborative) and improving cancer therapies (CyCore). A growing body of research has focused on the human side of CI: the individuals, teams, and organizations that coordinate and collaborate on CI projects (Lee et al. 2006; Ribes and Finholt 2008). The workers and practitioners involved in CI include scientists, technologists, administrators, funders, policy analysts, and industry experts. They collectively develop and implement a networked infrastructure for large-scale and big data science through various forms of mediated relationships, dispersed groups, virtual organizations, and distributed communities. Researchers of CI, although they generally approach it as a socio-technical assemblage, gravitate toward investigating human communication and organizational practices within the context of CI. Capturing this empirical richness is the methodological challenge this chapter takes up by describing and justifying the use of in-depth telephone interviews.

## Cyberinfrastructure Methodologies

Social and organizational research of CI tends to be conducted ethnographically at the project level. However, Ribes and Lee (2010) note a need in CI research to move “beyond the project scale” and toward “treating CI as a holistic phenomenon” (p. 240). Given the large scope of CI, this has occurred most commonly within book length treatments that combine large-scale data analysis and case studies (Meyer and Schroeder 2015; Shrum et al. 2007). Achieving this level of empirical richness remains a challenge for article-length publications that have less room to make a long-form argument.

In addition to the technical infrastructure of CI, there are several motivations to research human infrastructure and move beyond the “project scale,” as Ribes and Lee suggest. CI involves mediated relationships, dispersed groups, virtual organizations, and distributed communities. Additionally, from an organizational perspective, communication processes tend to involve a combination of in-person and computer-mediated episodes (Browning et al. 2011). For example, a group of CI practitioners might meet in-person at a conference, then communicate over email about developing data standards, and meet again at another conference to continue the work. Individuals strategically use sequences of technologies at their disposal to maximize effectiveness of their communication and reduce overload (Stephens 2007a). Therefore, FTF interactions may only be transient and representative of a small part of the totality of communication interactions that constitute organizations.

Social and organizational researchers of CI have recognized there is often no one single geographical site to enter, since events that occur on-site represent only a fraction of all practices and collaborations. This stands as a challenge to ethnographic methods that currently dominate CI research. Although various interpretations of ethnography exist, they all involve a long period of on-site immersion to produce a full picture of the people and social world under investigation. Studying a single medium, event, institution, or interaction is unlikely to capture the full complexity of how CI develops and enables virtual organizing.

This chapter explores an alternative methodology that addresses the challenge of collecting qualitatively rich data in a timely fashion across multiple sites and diverse practitioners: telephone interviewing. More specifically, the purpose of this chapter is to explore strategies qualitative researchers can employ to recruit participants via emails and conduct effective telephone interviews to collect quality data. First, the chapter briefly defines interviewing as a methodology and describes its practical benefits. We rely on Rubin and Rubin’s (1995) definition of qualitative interviewing, which, “is a way of finding out what others feel and think about their worlds. Through qualitative interviews you can understand experiences and reconstruct events in which you did not participate” (p. 1). This can be effectively achieved via the telephone interviewing mode and, for many tasks, even offer advantages to dominant methodologies of researching CI, such as ethnography. Therefore, this chapter poses the research question: *How can members of dispersed groups, virtual organizations, and distributed communities be strategically recruited and effectively interviewed for understanding their work, interaction, and communication mediated*

by *digital networks*? Next, the (virtual) sites and interview sequence are described. Third, emergent advantages and lessons learned that came out of using telephone interviews are considered, before concluding by addressing some implications of this methodology.

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## Telephone Interviewing as a Methodology

Interviewing, as a qualitative methodology, can be traced back to the turn of the nineteenth century, when it was commonly used in anthropology and sociology (Travers 2009). Initial methods of interviewing and observing were developed based on conditions of early cultural communities and sociological phenomena. Communities emerged out of and existed in a single location, and members were collocated. Therefore, the primary mode of access to qualitatively study sociological phenomena was face-to-face (FTF) and extended direct contacts. Given these conditions, the qualitative tradition has tended to hold in higher regard research that involves long period of interaction and immersion to produce quality data and tacit understanding of the people and social world under investigation.

Interviewing became widely recognized in communication, sociology, and organizational science, where it remains a viable option for qualitative data collection (Lindlof 2002). During this time, the use of the telephone for interviewing was adopted in public opinion research and marketing. For example, conducting structured telephone interviews for surveys was popular for both just-in-time political polling and product research. However, the ways in which people communicate, form groups, organize, and develop communities, have evolved beyond the initial conditions. Sturges and Hanrahan (2004b) summarized that “the use of telephone interviews in qualitative research is uncommon” (p. 108). The reluctance of researchers to conduct semi-structured interviews, rather than structured opinion surveys, over the telephone may stem from a perception that the challenges outweigh the benefits and a move toward structured online surveys that can result in a larger overall sampling for lower cost.

## Practical Challenges

Interviews rely on participant recall of perspectives, experiences, and events. Rubin and Rubin (1995) noted the affective and phenomenological dimensions of qualitative interviews, which intersect with traditional concerns of CI researchers. For example, challenges associated with telephone interviews include lack of non-verbal cues to facilitate the interviewing process (Harvey 2011; Holt 2010). Researchers are also concerned that participants are more likely to provide no-opinion and acquiescent responses over the telephone (Holbrook et al. 2003), there is limited contextual and ethnographic information for subsequent data analysis (Holt 2010; Shuy 2002), and respondents are more likely to provide no-opinion responses. However, similar to Sturges and Hanrahan (2004b), there was no

difference in quality between the in-person and telephone interviews collected when using a protocol that employed the steps described in this chapter to encourage faster development of rapport and interviewer-participant trust.

## Practical Benefits

Despite the aforementioned challenges, telephone interviewing can be a cost-effective way to collect qualitative data from members of virtual communities on a variety of topics. These topics include their practices and routine with computer-supported cooperative work arrangements. This section briefly sketches the *practical* benefits of telephone interviews in research: time, flexibility, responsiveness, and data consistency.

*Time* is a critical concern of researchers studying CI. Gaining access and spending sufficient time at a site is arduous for interviewers, particularly when travel is needed (Stephens 2007b). If a qualitative researcher insists on an FTF interview, the result may be much fewer interviews and a lower response rate (Harvey 2011). Time is also a concern of participants. For example, the most common reason participants give for preferring a telephone-based interview over an in-person one is time (Sturges and Hanrahan 2004a). Time is also a theoretical concern of researchers who study CI because CI projects can take years to come to fruition and can have differing temporal dimensions (Karasti et al. 2010) that are a challenge to capture.

Telephone interviews have geographic *flexibility*. That is, because interviews conducted in person and on the telephone result in a similar quality of data (Kee and Browning 2010), they can be used to work around constraints to obtain a more geographically-diverse sampling. For research projects that involve participants at multiple geographical locations, it is often not financially feasible for a researcher to travel extensively for a qualitative study (Gratton and O'Donnell 2011). Telephone interviews also present a practical and cost-effective (Harvey 2011; Holt 2010) option that can be used alongside sited methodologies, much as ethnography often includes on-site interviews and collection of workplace documents.

Telephone interviews are *responsive* to participants' constraints and concerns. Offering the flexibility of selecting a time and place for an interview can increase participants' willingness to be interviewed, increasing response rates (Sturges and Hanrahan 2004a). Holt (2010) points out that when an unexpected interruption occurs during a scheduled interview, it is easier and more flexible to rearrange for another appointment. In a semi-structured format, participants can ask clarifying questions. These responses can then be refined and worked into the interview protocol, keeping with grounded theory's reflexive stance.

Finally, telephone interviews produce *consistent* data. Successive analyses can therefore "stay at the level of the text" (Holt 2010). In other words, the researcher can rely on what the participants share as the context from which to make analytical interpretations. This can still contribute to an appropriate depth of data when researching complex socio-technical phenomenon. These advantages suggest that the quality of interview data collected via the telephone may not be compromised

simply because it is not FTF. Rather, in some situations, it may be superior to FTF interviews. To understand the broader benefits of telephone interviews and our research protocol, we will describe the iterations of our research projects. As noted above (Ribes and Lee 2010), researchers of CI are interested in moving beyond case studies and projects. Accordingly, this study draws on insights from three studies conducted between 2007 and 2017.

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## Research Iterations

Study 1 focused on a distributed community, TeraGrid, a supercomputing consortium funded by the US National Science Foundation (NSF). Studies 2 and 3 investigated XSEDE (Extreme Science and Engineering Discovery Environment), the successor of TeraGrid. Together, TeraGrid and XSEDE represent the largest supercomputing and big data science community in the USA during the first two decades of the twenty-first century, in which many NSF-funded CI projects and cases emerged. Therefore, by studying TeraGrid/XSEDE, the research moved to studying CI as a holistic phenomenon. In all three studies, the researchers conducted in-person ( $N = 87$ ) and telephone ( $N = 149$ ) interviews (Table 1). In-person interviews tended to be shorter; for example, in Study 3, the average length of in-person interviews was 25:08 min, while telephone interviews averaged 45:28 min.

### Study 1: TeraGrid

TeraGrid was the largest CI distributed community during the initial establishment of NSF's Office of Cyberinfrastructure (OCI, which was reinvented as the Division of Advanced Cyberinfrastructure and now the Office of Advanced Cyberinfrastructure). TeraGrid was funded between 2001 and 2011. It involved a range of professionals located at 11 partner sites at universities, supercomputing centers, and national laboratories across the USA. TeraGrid was led by a "Grid Infrastructure Group," which consisted of representatives from all the partner sites, as well as working groups of specialists who collaborated with colleagues from other sites on different key issues related to the TeraGrid.

Members of TeraGrid primarily belonged to different institutions across the USA. They were also funded by the NSF OCI to work collaboratively on overlapping funding allocations. From its inception, TeraGrid existed as a virtual organization and/or distributed community with its members working with each other via a mix of in-person meetings, annual conferences, teleconferences, telephones, and the Internet. Given its inherent distributed nature, it made a suitable vehicle for testing the benefits of semi-structure telephone interviews for researching CI.

Interviews were conducted for TeraGrid over a period of 32 months from November 2007 to June 2010. This period represents the mature stage of TeraGrid. The dataset includes 70 interviews with 66 participants from across 17 US states and 3 other countries. The few non-US interviews were conducted to provide contrasts to

**Table 1** Interview format by origin for recruitment

| Recruitment site        | Telephone interviews | In-person interviews |
|-------------------------|----------------------|----------------------|
| 1. TeraGrid (2007–2010) | 48                   | 18                   |
| 2. XSEDE (2013–2016)    | 38                   | 60                   |
| 3. XSEDE (2016–2017)    | 63                   | 9                    |

frame the US case in the study. The interviews were spread across 4 years with 10 participants in 2007, 42 in 2008, 16 in 2009, and 2 in 2010. The interviews averaged approximately one hour each and were conducted in-person with 19 of the participants and over the telephone with the remaining 51 participants.

**Studies 2 and 3: XSEDE**

XSEDE was the successor to TeraGrid. Since 2011, it has continued as a distributed community that supports CI projects across the USA (Kee 2017). Thus, the general scope of XSEDE resembled that of TeraGrid with additional support. CI practitioners attend and present at a yearly XSEDE conference.

Interviews were conducted for Study 2 on XSEDE and involved 98 participants from 25 different states and 4 countries between November 2013 and July 2016. Interviews for Study 3 started in March 2016, and it is an active project at the time of the writing of this handbook chapter. As of the date of writing this chapter, there have been 70 interviews obtained from participants in 27 different states.

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**Interviewing Protocol**

The interview process involved an intentional sequence that allows for improvisations, beginning with recruitment:

**Recruit in Person or Online**

Researchers of CI select a sampling method that matches with their empirical goals. They may want to seek representative coverage, as in a quantitative social scientific paradigm. Qualitative researchers decide to end data collection when they achieve saturation in responses (Lindlof 2002). However, a sample cannot be biased toward a particular network, unless that is the explicit goal. The 3 studies in Table 1 obtained a saturation of data for our research questions. Recruiting was performed from in-person meetings and online lists of contacts, leading into a snowball sampling (Kerlinger and Lee 1999) with a maximum variation approach (Baxter and Babbie 2003).

Study 1 conducted in-person interviews via convenience sampling as circumstances allowed at one of the main participating sites of TeraGrid. Participants were

then asked to recommend peers that might be interested in an interview (snowball sampling). In order to reduce biases and improve diversity, recommenders were asked to suggest peers who are professionally and demographically different from themselves. Studies 2 and 3 transitioned to random sampling from a list of XSEDE conference attendees, who were also asked to recommend participants. Recruitment was still performed over email, leading into a snowball sample similar to Study 1. Emails described the study and what participation would entail, along with a list of potential times to perform the telephone interview. The following procedure applies only to the telephone interviews.

## **Clarify Initial Uncertainty**

Given that recruitment included a series of emails that explained the purpose prior to the telephone call, there was no additional overview of the study in the interviews provided unless the participant asked. A consent form with additional information was always signed and returned prior to the interviews. By the time the participant and interviewer talked on the telephone, they already were well informed and had a good understanding of the scope of the interview.

The conversation started with giving the participant an opportunity to ask any questions about the interview. Interviewers would usually say, “Before we begin, do you have any questions about the interview today?” If participants wanted an overview to refresh their memory, interviewers would then provide one. If they wanted to know how the interview would be used, interviewers would then address that issue.

Giving participants an opportunity to ask clarifying questions in the beginning gave them a sense of control over the interview and provided an opportunity to build rapport. As Shuy (2002) explained, “When interviewers permit respondents to participate in setting the agenda, to ask questions, and to change the direction of things, they surrender personal power and help to distribute power more equally between the participants” (p. 550). Interviewers regularly fielded questions about how interviews would be used and also about funding for the project.

## **Build Trust**

Groves and Kahn (1980) recommended that “the first few moments of the interaction should be designed to request no information but rather to attempt to develop trust of the interviewer by the respondent” (p. 204). In order to build trust further, the interviewer would say, “Can I have your permission to put you on speakerphone and turn on the audio recorder?” This signaled to the participant that they would be informed of every step to be taken during the interview. This gave them a sense of control, and it also increased trust.

## **Document Consent**

Consent is an important part of adhering to ethical practices and requirements of Institutional Review Boards (IRBs). Therefore, interviewers made sure that verbal consent was documented during the interview in addition to ensuring participants signed the consent form. Once the audio recorder was turned on, they would continue, “[Name of the participant], you are now on speakerphone and the audio recorder is running, can you hear me alright?” Participants’ response indicated that they were aware of being audio recorded and that they were agreeing to it. In addition to verbal consent, the interviewer also retained a copy of all email exchanges as additional evidence of consent to participate.

## **Warm Up with a Biography**

Since this was the first synchronous interaction between two strangers, the warm-up exercise encouraged the participant to provide his/her biography. This activity relaxed the participant and built trust between them and the interviewer. Biographies as a warm-up prompt were effective as a strategy to start the interview, to build trust, and to set the stage for more disclosure. They also provided information for improvisation and customization. Finally, how much participants shared their biographies also gave us a sense of how they would respond to our interview questions with details, preparing us for the need to probe deeper.

## **Customize Prescribed Questions**

Interviewers prescribed interview questions about CI development (i.e., coproduction between scientists as users and technologists as developers), adoption (i.e., reasons and rationales for using the infrastructure), implementation (i.e., distributed collaboration and virtual organization among small groups and interconnected groups of scientists via CI), definition (i.e., explanation, metaphors, and analogies), history, and future visions for CI. However, not every question applied to every participant. With their biographies in mind, interviewers were able to improvise, customize, and personalize the interviews based on their unique backgrounds and experiences.

When time was limited (e.g., a couple of participants had only about 15–20 min each for the interview), interviewers were able to select the questions to prioritize, drop, and pursue. Furthermore, customizing prescribed questions based on biographies allowed us to show our attentiveness to the conversation and to discover what was salient about their identity at work at the moment. If time allowed, interviewers later pursued less pertinent issues. Having heard their biographies also prevented us from asking uninformed questions due to a lack of knowledge of a participant’s background.

## Free-Flow Narrative for Improvisation

An important strength of qualitative interviews is the potential for serendipity. A highly structured interview may be efficient, but it may miss interesting insights. In grounded theory (Glaser and Strauss 1967), an investigation is guided by questions that make room for improvisation and adaptation. Shuy (2002) suggested that, “if the goal is to probe deeply and to elicit thoughtful answers, then interviewers’ letting respondents self-generate whatever is on their minds is superior to having probes controlled by a standardized set of questions” (p. 552).

In order to increase the likelihood of serendipity and elicit thoughtful insights, interviewers built in an opportunity for free-flowing narrative. When interviewers say, “We have covered a lot of issues in this interview. Before we wrap up, were there questions or issues you thought might come up during the interview, that didn’t?” This question usually prompted participants to talk about what they thought might be relevant (if they had given some thought to the interview beforehand) or to answer their own questions about CI. They often offered interesting insights that otherwise would have been left out by a prescribed protocol.

For example, two participants talked about tensions and conflicts between groups of scientists in the process of cyberinfrastructure development only after the interviewer started wrapping up the interviews. However, these tensions and conflicts were strong and powerful in these interviews that they prompted a careful analysis of the entire dataset in Study 1. As a result, a hidden theme in the dataset surfaced after the interviewer had been enlightened by the participants. The result also led to a publication subsequently (see Kee and Browning 2010).

## Give in Return

Before concluding the interviews, the interviewer thanked the participants for their time and insights. Furthermore, the interviewer also offered to share our research findings when the project is complete, giving our anticipated project completion date. Because the interviewer offered to give something back in return, participants often felt appreciated for their efforts. This promise of reciprocation, although a couple of years in the future at the time the interviews were conducted, helped further strengthen the trust that was established beginning with the first email invitation and culminating in the interview.

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## Lessons Learned About Telephone Interviewing

During the 10 years, our research team came to appreciate several benefits of telephone interviewing for studying CI as a socio-technical phenomenon. Recently, Tracy et al. (2014) suggested, “we would like to see all qualitative researchers spend

a bit more space—if only several sentences—sharing ‘backstage’ moments in their publications so this insight need not be relegated to forums or separate confessional tales” (p. 427). In this spirit, this chapter presents strategies proposed in the context of a study, sharing our “backstage” decisions and rationales, including those prompted by participants’ emails. Furthermore, by sharing the organizational context and case in which the proposed framework was developed, this chapter highlights what Brummans (2014) terms the “situatedness” (p. 444) of research and knowledge in organizational communication scholarship. Reflecting on our experiences, the team feels these benefits of telephone interviewing reach beyond the practical benefits described in the introduction and addressed social and organizational researchers of CI’s interest in qualitative depth of response and transcendence of work environments.

## Persuasion to Participate

Recruitment for interviews presents a challenge. Interviewers want to ensure objective responses. However, maximizing the number of positive responses to invitations is in the best interest of a research project. Therefore, the goal of an invitation is for a potential participant to respond, agree, and commit to an interview. In our snowball sampling, interviewers obtained three names, in cases the previous participants provided them, at the end of each interview. Sociology has long held that homophily is a powerful force that cements social relationships (McPherson et al. 2001). Potential participants were more likely to be interviewed if they knew interviewers had an *association* with a colleague. Persuasion by *trust* is the assurance that the interviewer will not misuse information. It can be established by institutional affiliation and offering personal information about the interviewers. Persuasion by *identity* was also important. Interviewers personalized invitations using a Google search on every new contact before sending him/her an email invitation. In the invitation email, addressed appropriately with their titles, interviewers emphasized an aspect of our studies that related the most to them.

Finally, persuasion by sequence refers to strategically sequencing communication to induce a greater likelihood of participation. Using a foot-in-the-door and Cialdini’s (2009) principle of consistency, our team recognized that persuasion is a sequence and not a single act. The first invitation email was to get a new contact to respond and agree to be interviewed. The reminder email prior to the phone call was to persuade a new contact to allow audio recording. Interviewers did not want to request audio recording in the first email because digital documentation may make some new contacts uncomfortable before trust has been established. After several email exchanges, and when interviewers sensed that trust has been established, they extended the audio recording request while making it optional. Among the 70 interviews conducted in Study 1, there was only one instance when an informant requested not to be audio recorded.

## Induced Richness

Nonverbal responses are limited during a telephone interview (Stephens 2007b), and people who live in western cultures are generally uncomfortable with silence (Chen 1997; Hall 1989; Newman 1982). Leveraging this observation, Berry (2002) suggested that the telephone mode can be used to create a productive tension that leads to more detailed answers. Furthermore, Holt (2010) explained that the lack of nonverbal cues makes both the participant and the interviewer tend to perform full articulation, which produces richer text for subsequent analysis. That is, meanings that would be communicated through nonverbal cues in an in-person setting are explicitly included in the interview conversations, leading to richer data for subsequent analysis. In telephone interviews, participants described facets of their biography in greater detail than they might in a naturalistic ethnographic setting where the facets become taken for granted.

## Improved Rapport

Scholars of mediated communication have long noted that a lack of visual cues can lead to more rapid development of trust (Walther 1996). Studies that use the telephone mode can create anonymity and psychological distance that makes the participants feel more comfortable with disclosing sensitive information. That is, they may feel less judged by researcher in their work settings – what Holt (2010) referred to as the “professional gaze” (p. 115). Some participants are more comfortable with the increased sense of anonymity during a telephone interview (Greenfield et al. 2000). As Fenig et al. (1993) argued, “partial anonymity granted by the telephone may increase the validity of responses by reducing the embarrassment involved in responding to emotionally or socially loaded questions in a face-to-face situation” (p. 1). In the context of CI research, this took the form of participants being candid about constraints they faced in current and/or previous workplaces. These were facets of work life that participants were be reluctant to disclose, but are valuable to study.

## Neutralizing Assumed Privilege

Within a social research setting, there are demographic variables such as race, ethnicity, age, socioeconomic class, and different abilities that could induce undesirable power relations between the participant and the interviewer. For example, Sturges and Hanrahan (2004a) reported a study involving family members of jail inmates who came from marginalized segment of society (as compared with the interviewer). In our Studies 2 and 3, young undergraduate research assistants on the team conducted some interviews with senior administrators. In a telephone interview, some of these demographic variables may not be obvious and/or prominent. Having the interviews mediated by the telephone can better neutralize the conversational space for both the participant and the interviewer.

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## Working Outside the Now

The “now” can be a valuable way to retrospectively reflect on meaningful practices and pivotal events that occurred naturally in the workplace. However, many questions about CI are naturally longitudinal (Karasti et al. 2010). Telephone interviews can encourage participants to expand on aspects of CI invisible to episodic ethnography and cross-sectional surveys. Participants told stories about key moments in their personal histories and how these moments built up to impact them in the current day. For example, an African-American woman participant in Study 3 discussed her participation in CI since the early 1970s. Her interview was not just about how she became involved with CI – it was a lens on her subsequent efforts to involve institutions through diversity outreach in subsequent decades. The interviewer was able to recognize her unique contribution to CI and ask follow-up questions to encourage her to elaborate on specific influential events outside the now.

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## Conclusion

This chapter has presented telephone interviewing as a viable alternative to dominant methodologies for researching cyberinfrastructure. Telephone interviews have distinct practical, social, and cultural advantages. They can result in high-quality data on practices and collaborations in socio-technical systems such as CI. That is, when practiced appropriately under the right circumstances, the telephone mode could yield better quality data or data that otherwise cannot be easily obtained. In order to systematically assess if the data collected via the telephone and the research analysis based on telephone interviews are of rigorous standard, Tracy’s (2010) eight “Big-Tent” criteria are helpful to guide qualitative research. She argues that in order to be deemed excellent qualitative research, a study needs to demonstrate: worthy topic, rich rigor, sincerity, credibility, resonance, significant contribution, ethics, and meaningful coherence.

Interview data have been shown to be appropriate for grounded theory analysis and content analysis using coding software such as NVivo, ATLAS.ti, and MAXQDA. Given the steady development of CI in the domain of big data science and the rapid development of information and communication technologies in societies across the world, researchers will continue to witness the emergence of a plethora of mediated relationships, dispersed groups, virtual organizations, and distributed communities for research. Telephone interviewing can also be used as a supplement to more traditional methods of ethnography, surveys, and even trace data analysis. The protocol described in this chapter provides a framework that researchers can adopt and adapt into their methodologies for researching a variety of socio-technical phenomena.

Finally, this framework can be used for pedagogical purposes. In other words, for students learning how to conduct qualitative interviews for the first time, the persuasion principles and telephone interview protocol presented could be used as an initial guide, adapted appropriately to the goals of the qualitative methods

professors of individual classes, especially if the project involves studying distributed communities who are comfortable with using a range of communication technologies. In fact, “there is no common procedure for interview research. Interview research . . . if well carried out, can become an art” (Kvale 1996). This framework is not intended as a strict guide, but a starting point for furthering the art of qualitative interviewing.

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