Designing Digital Qualitative Research Workflows:

Enabling Stakeholder Participation Across All Research Stages

Jay Albert William Rainey

Supervisors: Dr. Kyle Montague
Prof. Roger Burrows

Advisors: Prof. Pamela Briggs
Dr. Jan Smeddinck

School of Computing
Newcastle University

This thesis is submitted for the degree of
Doctor of Philosophy

February 2021

Abstract

Participatory research approaches are increasingly being used by practitioners – *academics, civil society organisations, and citizens* – to inform decision-making processes where participants contribute to idea generation and data capture, but less often to data analysis and dissemination. This can leave participants feeling ineffectual and unrepresented in the research output as analytical decisions made on their contributions are opaque. Digital tools offer opportunities to enhance qualitative practices but are often designed for academics and primarily for data analysis, which can limit participation and adoption by other practitioners.

In response, this thesis explores the design of digital tools to structure inclusive participation across all stages of qualitative research. Through synthesizing literature on the qualitative practices of practitioners, a cross-cutting *qualitative workflow* is defined that introduces design considerations to overcome existing barriers to participation. An action research approach was taken across three case studies that iteratively designed digital prototypes to explore how technology can augment this workflow. Design insights from this informed the development of **Gabber**, a digital platform that encompasses the end-to-end qualitative workflow that prioritises interactions with audio media to lower existing barriers of participation in each workflow stage. Following this, two distinct case studies configured and used Gabber across the workflow where observations of platform use, and semi-structured interviews surfaced opportunities and challenges around transparency of participation and stakeholder engagement across the workflow.

This thesis' primary contributions are a conceptualisation and real-world empirical exploration of a digital qualitative workflow across five case studies that augment and examine the qualitative practices of practitioners. Across this research, practitioners wanted to understand who and how their contributions were engaged with. This informed the secondary contribution, design implications for digital tools to leverage paradata to improve process transparency and demystify decision-making processes for stakeholders involved.

Prior Publications

Research presented in chapter 4 and chapter 6 are published in peer-reviewed conferences:

1. **Jay Rainey**, Kyle Montague, Pamela Briggs, Robert Anderson, Thomas Nappey, and Patrick Olivier. 2019. Gabber: Supporting Voice in Participatory Qualitative Practices. *In Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems (CHI '19)*. Association for Computing Machinery, New York, NY, USA, Paper 377, 1–12. DOI:https://doi.org/10.1145/3290605.3300607

2. **Jay Rainey**, Carlos Alvarez, Dan Richardson, Dan Lambton-Howard, Sara Armouch, Tom Bartindale, Shaun Hazeldine, Pamela Briggs, Patrick Olivier, and Kyle Montague. 2020. TalkFutures: Supporting Qualitative Practices in Distributed Community Engagements. *In Proceedings of the 2020 Conference on Designing Interactive Systems (DIS '20)*. Association for Computing Machinery, New York, NY, USA, 771–784. DOI:https://doi.org/10.1145/3357236.3395531

Research derived from chapter 7 is currently under review in a conference submission:

1. **Jay Rainey**, Siobhan Macfarlane, Aare Puussaar, Vasilis Vlachokyriakos, Jan Smeddinck, Pamela Briggs, Roger Burrows, Kyle Montague. 2021. Exploring the Role of Paradata in Digitally Enhanced Qualitative Co-Research. *In Submission*

The digital platform developed in this thesis, **Gabber**, has informed other academic research resulting in two additional peer-reviewed publications:

1. Delvin Varghese, **Jay Rainey**, Tom Bartindale, Kyle Montague, Patrick Olivier, and Matt Baillie Smith. 2020. Utilizing Participant Voice in Volunteer Training. *In Proceedings of the 2020 CHI conference on Human Factors in Computing Systems (CHI '20)*. Association for Computing Machinery, New York, NY, USA, 1–14. DOI:https://doi.org/10.1145/3313831.3376208

2. Rosanna Bellini, **Jay Rainey**, Andrew Garbett, and Pamela Briggs. 2019. Vocalising Violence: Using Violent Mens' Voices for Service Delivery and Feedback. *In Proceedings of the 9th International Conference on Communities & Technologies - Transforming Communities (C&T '19)*. Association for Computing Machinery, New York, NY, USA, 210–217. DOI:https://doi.org/10.1145/3328320.3328405

Acknowledgements

The research presented in this thesis would not have been possible or as enjoyable without the continued mentorship, collaboration, and support from many throughout this journey.

Thanks to my supervisors *Dr. Kyle Montague* and *Prof. Roger Burrows* who have provided continued guidance and advice throughout the PhD. I also had the pleasure of being supervised by several others for which I am grateful: to *Prof. Patrick Olivier* for your constant enthusiasm and ideas, and *Dr. Jan Smeddinck* for shepherding me through the write-up year. I am deeply grateful for the support of *Prof. Pamela Briggs* who has been instrumental in refining how the resulting research publications were framed and written, which helped refine this thesis.

Thanks to all my Open Lab colleagues who have been a source of inspiration and collaborations over the years. In particular, *Dr. Rosanna Bellini*, *Dr. Delvin Varghese* and *Kieran Cutting* for pioneering the use of Gabber within your own research. Thanks to *Tom Nappey* and *Rob Anderson* for contributing your design and technical expertise to help refine the Gabber website. A special thanks to my CDT and PhD colleagues who have taken this journey alongside me.

This research would not have been possible without the kindness, time, and enthusiasm offered by individuals and organisations who participated. To all those who participated, I am eternally grateful for your effort and cannot express in writing what I learned through our collaborations. In particular, to *Dr. Ray Middleton* for your invaluable role in eagerly trialling early Gabber prototypes, and *Siobhan Macfarlane* for facilitating a collaboration that underpinned the final case study presented in this thesis.

Thanks go to *Shaun Hazeldine* for the opportunity to lead a case study with the IFRC's innovation team that forms a chapter of this thesis. Thanks *Dr. Dan Richardson* for contributing to the development of the TalkFutures mobile application, *Sara Armouch* for your language expertise, and *Juan Carlos Alvarez de la Vega* for conducting interviews and contributing to data analysis.

Thanks to my family for your support and curiosity about what this PhD entails, and to my Italian family for your kindness, company, and adventures by the sea and in the mountains.

Lastly, thanks to my partner *Elena* for your constant encouragement throughout this journey.

For my #1

Declaration

I hereby declare that except where specific reference is made to the work of others, the contents of this thesis are original and have not been submitted in whole or in part for consideration for any other degree or qualification in this, or any other university. This thesis is my own work and contains nothing which is the outcome of work done in collaboration with others, except as specified in the text and Acknowledgements. This thesis contains fewer than 80,000 words excluding appendices, bibliography, footnotes, references, and tables.

Jay Albert William Rainey
February 2021

Table of Contents

List of Figures

List of Tables

Nomenclature

Acronyms / Abbreviations

API Advanced Programming Interface

AR Action Research

CCPA California Consumer Privacy Act

CCS Community Citizen Science

CSS Citizen Social Science

CS Citizen Science

DC Digital Civics

DG Design Goal

GDPR General Data Protection Regulation

HCD Human-Centered Design

HCI Human-Computer Interaction

IFRC International Federation of Red Cross and Red Crescent Societies

NGO Non-Governmental Organization

NLP Natural Language Processing

PADRE Participatory Action Design Research

QDAS Qualitative Data Analysis Software

QFT Question Formulation Technique

RO Research Objective

TA Thematic Analysis

VCS Virtual Citizen Science

WoZ Wizard of Oz

Chapter 1. Introduction

1.1. Overview

Human-Computer Interaction (HCI) research has a rich history of exploring new ways to support public consultations, such as local government consulting its citizens [52, 162, 171] or civil society organisations engaging its members [21, 78, 84, 265]. Traditionally, these consultations were designed to capture public opinion in an advisory capacity with limited involvement of participants beyond the data capture procedure [95]. Social movements and non-governmental Agencies (NGOs) have pioneered the use of participatory action research approaches that include stakeholders in all aspects of consultations: from determining what problem to explore, to capturing community insights, to disseminating the captured data [93, 100, 265]. Building on the intersection of this work is the emerging *digital civics* (DC) research initiative that aims to support citizens becoming more actively involved in the design of public services through the co-production of digital technologies, resources, and knowledge in partnership with the decision-makers that can enact change [201, 270]. Examples of DC projects include collaborations with regional transport authorities and citizens that informed the redesign of light rail carriages [31], partnerships between community groups and local planning authorities to inform public policy [145, 174, 277], and local charities and its members with the aim of refining service delivery to better suit the needs and aims of service-users [25, 79, 268]. Key to these partnerships is the role participants take in capturing, documenting, and sharing their lived experiences, where media is often central due to its inclusive format [21]. This form of participation is in contrast to the typically one-off events of public consultations, which have more recently been supplanted by *community engagements* that aim to democratise participation across the engagement [54].

The participatory and collaborative processes underpinning DC research and the aim of involving stakeholders throughout the research process resonates with broader qualitative research activities: from *capturing* lived experiences, contributing to *data analysis* through workshops, to *disseminating* community insights. As such, the stakeholder groups involved in DC research – e.g., *academics, civil society organisations, and citizens* – are referred to throughout this thesis as *qualitative practitioners* to indicate their active participation in *qualitative practices* but who may not be necessarily trained in or explicit in defining these as qualitative activities. This thesis argues that designing within the intersection of these distinct yet overlapping stakeholder groups provides opportunity to design digital tools that can create inclusive spaces to more actively involve these stakeholders throughout all stages of the qualitative research process.

Despite the use of participatory and action-oriented research methods in emerging DC research, those who are most likely impacted by decision-making procedures (i.e., citizens or

service-users) are less often involved in the data analysis and dissemination stages in practice [146, 172]. This thesis argues that this can be broadly attributed to three overarching challenges: (1) that the latter research stages often draw from academic practices, which diverge from the familiarity of how citizens engage in qualitative practices elsewhere [115, 201, 281]; (2) that existing *digital tools* to support qualitative practices are primarily designed for academics, with limited work explicitly examining the perspective of citizen and civil society practitioners [172, 194, 209]; and (3) that decision-making associated with engagements can be opaque, which leads to participants feeling under-represented as their contributions may not be visible in outcomes [54, 60]. The remainder of this subsection briefly expands upon these issues and key literature that underpins these challenges and the research of this thesis.

Digital technology has impacted all aspects of how practitioners conduct qualitative research, from how data is captured, stored, and analysed, to how academics collaborate [194, 209]. Commercial qualitative data analysis software (QDAS) is primarily designed for data analysis activities and does not encompass multiple research stages, which can constrain how data is handled and shared between researchers [67, 279]. Prior research on qualitative practitioners has primarily examined the academics perspective, which has informed the design of bespoke digital tools to augment the data collection and analysis research stages [20]. Emerging *citizen social science* research has explored new ways for citizens to contribute to ongoing qualitative research projects through technology [6, 215]. Across this work, the use of technology and design is often to streamline how data is captured *for academics* rather than how technology might enable new ways for research participants to actively lead or contribute to all research stages.

In contrast, recent research has explored new ways to enhance public participation in community engagements, such as digitising participation in town hall meetings [141, 171] and deliberating on local issues [145]. While such digital innovations can increase opportunities for citizens to participate, they are often designed to capture data from participants, that can lead to feelings of tokenistic participation [60, 79, 172]. Mahyar et al. [172] highlight how decision-makers are increasingly outsourcing data analysis as the quantity of data captured increases and creates a "*civic data deluge*", calling for a need for scalable analysis tools. Given participants detailed knowledge of the data, its context, and its contents, there is an opportunity to draw from their expertise through more active involvement in data analysis as a potential solution to overcome the outsourcing of the data analysis stage [27, 60, 166, 258].

Prior digital civics and participatory media research demonstrates how citizens use technology to lead engagements where they contribute to activities that we[1]posit mirrors the qualitative research process [21, 31, 171, 268]. Key to structuring participation is designing interactions around the use of media to lower barriers to participation, i.e., participatory media [267]. For example, capturing community opinion in media format through bespoke technologies, analysing captured data by listening and tagging media content directly, and disseminating insights through producing a media artefact. Key to the success of these projects are both the use of media and

the structured guidance that academics provide to ensure process outcomes fit within existing modes of delivery of decision-makers [21, 267].

As public policy and academic research increasingly strive to address societal challenges through long-term partnerships between academics, citizens, civil society, and local government, there is a need to support multiple stakeholders in contributing evidence systematically beyond the current configurations that can limit participation to data capture. More active involvement in the complete research process could help ensure each stakeholder (i.e., citizen, academics, civil society staff or members) understand how their contributions inform decision making while ensuring the research outcomes are more meaningful to them as they become embedded within all research stages. There is a growing need to understand the qualitative practices of practitioners beyond academics to inform the design of digital tools to involve stakeholders in all research stages, while exploring the challenges and opportunities of such digital tools in practice.

In response, the research presented in this thesis investigates *how digital tools can be designed to enable more inclusive participate in all stages of a qualitative research project for all stakeholders involved*. Through synthesising literature across the qualitative practices of academics, civil society organisations and citizens, this thesis conceptualises the intersecting practices as a *qualitative research workflow* whereby data from each research stage – *preparation, consent, capture, analysis, curation, and reuse* – structures and informs participation in the subsequent stage that are familiar and practical to practitioners. Building on this, an interdisciplinary and multi case-study approach is taken across three distinct contexts with academics, citizens, and civil society organisations to iteratively explore each workflow stage in practice through the design and deployment of digital prototypes. Design findings from this work informed the design of **Gabber**, a digital platform that prioritises interactions with audio media to create inclusive opportunities for participation across the complete digital qualitative workflow. Gabber is then used as a research tool through two additional case studies that explored the challenges and opportunities from each in practice by a global NGO and a community-led initiative. Findings from each of the five case studies thus contribute new knowledge concerning how qualitative research is adopted and used by a broader range of practitioners than has been examined to date, which directly impact digital civics, HCI and qualitative methods research.

1.2. Research Objectives

The research described in this thesis examines how digital tools can be designed to make qualitative practices more inclusive for stakeholders involved, such as citizens contributing to a community engagement or research participants contributing to academic research projects. As such, the overarching research agenda is summarised under the following guiding research aim, which is divided into three subsequent research objectives (RO) outlined afterwards:

How can digital tools be designed to enable inclusive stakeholder participation throughout a qualitative research workflow?

[1]The subject *we* is used throughout this thesis to create a consistent narrative. The thesis author has undertaken all research presented herein unless otherwise specified.

Prior digital tools for qualitative research are primarily designed for academics and for data analysis [206, 209]. This is despite the increased uptake by other qualitative practitioners [201] and use of technology across the qualitative research process [194]. Existing partnerships between academics, citizens, and civil society organisations less often involve stakeholders beyond data capture procedures [146, 172]. Following the conceptualisation of a *qualitative research workflow* in chapter 5, an iterative design process was taken in chapter 4 that aimed to:

(RO1) Explore the design of digital tools to enable stakeholder participation in all qualitative research stages.

Following this, design learning informed the development of **Gabber** that aimed to realise this proposed workflow into one digital system. Given the limited prior research concerning how qualitative practitioner beyond academics engage in qualitative practices, Gabber was deployed as a research tool across two distinct case studies with a civil society organisation (chapter 6) and community-led initiative (chapter 7) aiming to:

(RO2) Explore how practitioners use digital tools across the qualitative workflow.

Insights from this work highlighted desires from practitioners to understand how their contributed data informed decision-making, mirroring findings from recent digital civics research [60, 78]. As such, we sought to explore how *paradata* – i.e., *data describing the processes of how people interact, access or engage with a system [59]* – might be captured through Gabber and used to enhance what prior research terms *process transparency* [256]. While paradata was captured in the initial case studies of this thesis to inform prototype development, how this was perceived by practitioners and the potential utility of it remained underexplored. As such, the final research objective sought to:

(RO3) Investigate the types of paradata meaningful to qualitative practitioners to enhance process transparency.

1.3. Research Approach

The research presented in this thesis aims to understand how digital tools can support inclusive participation for each stakeholder group (academics, civil society organisations, and citizens) who are increasingly engaging in participatory partnerships where their practices intersect. It was therefore critical to explore the design of technology in realistic contexts, i.e., field deployments within academia, civil society, and citizen-led research projects [249]. As a digital civics' researcher, it was important for me to develop research that creates social impact while generating new knowledge that is meaningful to the research community. As such, building partnerships and working *with* organisations underpins the research activities presented in this thesis where an *action research* (AR) approach was adopted as the overarching research methodology where possible [226]. Within this, a case study approach to conducting action

research was taken across five distinct contexts that provided direct insight into the practices of academics (two), civil society organisations (two) and citizens (one), and indirect insight into the practices of each stakeholder group as all were involved in each case study [64, 254]. As the case studies presented in this thesis varied in duration and research scope, a Human-Centered Design (HCD) approach was adopted alongside or instead of AR while ensuring to support action from the perspective of stakeholders involved. This action-oriented, HCD approach to case studies ensured that prototypes developed for one group of practitioners addresses real problems (i.e., *"workability"* [116]) while iteratively appling design learning to the configuration and design of digital tools in subsequent case studies to ensure the knowledge created has *"transferability"* to other contexts [122]. The methodological and epistemological approaches adopted for this thesis are detailed in the design chapter where the first three case studies are presented.

Across case studies, an embedded research approach was taken that motivated the adoption of primarily qualitative research methods to evaluate each research objective: *participant observations* to observe the use, impact, and challenges with each digital tool during field deployments and *semi-structured interviews* to understand participants experiences after using the digital tools. In addition, the *Wizard of Oz* (WoZ) and *speculative scenario* design methods were adopted to facilitate exploration of prototype development and reflection on anticipated prototype usage in chapter 4 and chapter 7 respectively. Analysis of paradata concerning system usage following each case study informed how semi-structured interviews were designed and are reported in each case study to provide insight into breadth and depth of participation in each workflow stage.

1.3.1. Positionality Statement

An *interpretivist* approach was taken during the conduct of research in this thesis with the aim to develop meaningful, localised solutions with stakeholders. It is therefore important to examine and reflect on my world view and how this influenced the scope of research conducted [34]. As such, this section provides a reflexive account on my background, work experience, and motivations to conduct this research, followed by describing my positionality in each case study.

I received my undergraduate education in computer science where I also undertook two software engineering roles that involved designing and developing digital technology to enhance the research practices of material scientists and clinicians in commercial and academic research environments. Following this, I joined the centre for doctoral training in Digital Civics (DC) at Open Lab, Newcastle University, a four-year programme combining a Master of Research (MRes) and a three-year PhD. This programme took a cohort approach where ten students with a range of academic and professional backgrounds enrolled each year for five years; I was the second cohort. This provided opportunity for collaboration amongst PhD students as I did in [24, 268] and access to research participants to explore preliminary studies as I did in case studies one and three presented in this thesis.

During the MRes, I was first formally introduced to design and qualitative research that included: research interviews, focus groups, design workshops, thematic analysis, and qualitative data analysis software (QDAS), etc. My dissertation project involved collaborating with a

local volunteering community group who were responsible with maintaining a local park, and who wanted to use technology to capture audio interviews and share their experiences in the communities where they volunteered. Through this collaboration, I observed the challenges of structuring participation to engage with qualitative data in audio form, and became interested in exploring how digital tools could be designed to capture and share voice as a resource to create action in communities. As such, the research presented in this thesis was conducted from my perspective as a software engineer and qualitative researcher in training, which provided a unique skill set to examine the research objectives outlined above through the design, development, and field deployments of digital systems "in-the-wild" [239].

1.3.2. The Case Studies

This thesis adopted a case study (CS) approach to systematically explore the research objectives across five distinct case studies. This section outlines how each case study occurred in practice, my role in gaining access to participants, and my research position in relation to the social context of the study and its participants.

Upon starting the PhD, my research focused on exploring the design of digital tools to make the capture and analysis of qualitative data more inclusive. One challenge in prior years of the MRes was that module feedback occurred at the end of the semester, which has no direct impact on those students. The HCI module leader wanted to capture and listen to student feedback to iteratively refine the taught material delivered as an alternative feedback mechanism that could impact student's learning. As such, I developed an initial digital prototype to explore the data capture workflow stage in practice. This case study (**CS1**) lasted one semester where my position was primarily observational: I attended each teaching session where the prototype was used by students. Alongside this, I applied a HCD approach weekly to obtain feedback from the teacher and students to iteratively refine the digital prototypes.

Alongside this, a manager from a local charity that helps connect individuals with complex needs with other local services (e.g., housing providers) delivered a presentation in Open Lab describing how they captured audio interviews with service-users and curated these to inform the delivery of training to other organisations. I presented my research to this manager that initiated a longitudinal, action-research case study (CS2) where I became embedded in the organisation to observe existing qualitative practices, e.g., interviewing service-users and training delivery. Due to CS2's duration, a range of design methods were applied to iteratively design, develop, and deploy digital systems "in-the-wild" to explore each workflow stage in practice.

CS2 resulted in digital prototypes for all workflow stages besides the final curation stage for which initial design ideas had been created. As such, I developed a digital prototype and sought a suitable context where this could be applied. A lecturer from Open Lab had an upcoming research methods and wanted to use these technologies to support peer learning between students (i.e., capture interviews following the same schedule and analyse these with the same codebook), and to listen and curate content to provide group feedback on interviewing technique. My role in this research was primarily observational due to a combination of participants using prototypes

for all stages of the qualitative workflow and the short duration of the case study, which provided insight into how the curation prototype was used in practice.

The prior three case studies had focused on design research to explore how digital tools could enable inclusive stakeholder participation in specific and multiple workflow stages. This resulted in multiple digital systems that provided an incomplete user-experience across the qualitative workflow. As such, I spent several months developing a digital platform, **Gabber**, that brought together design learning from across those case studies into one unified digital platform. During the development process, the International Federation of Red Cross Red Crescent (IFRC) had completed a collaboration with another researcher in Open Lab (see: WhatFutures [160]) and visited Open Lab where I demoed an early version of Gabber. From this, they were interested in using Gabber to obtain insights from their distributed network, and so plans emerged for how I might support such an engagement. Due the potential distributed scale of a deployment with the IFRC, additional time was dedicated to developing Gabber, e.g., multilingual support. Following this, I spend six months in the IFRC's headquarters in Geneva, Switzerland, where I led a Gabber deployment termed **TalkFutures** as outlined in chapter 6. During this, I was embedded within the innovation team where I was supported by two PhD students and an IFRC staff member who was instrumental in participant recruitment due to their connections across the IFRC.

Following the IFRC deployment, I returned to Open Lab where a digital civics PhD researcher was interested in using technology to support an ongoing co-research project. As such, a range of participatory platforms were demoed as potential options that could be reappropriated. Gabber was ultimately chosen and used as-is to support this co-research project where my role and position was primarily observational. Findings from TalkFutures highlighted desires from participants to understand how other stakeholders engaged with their data across the qualitative workflow. As such, I initiated a follow-on study with participants who had engaged in the co-research project to reflect on their participation across the qualitative workflow, and to explore perceptions of paradata and how this might enhance process transparency.

1.4. Thesis Structure

This thesis develops across *eight chapters* to explore these research objectives. Firstly, a *literature review* is presented in chapter 2 that examines the role of digital tools to support the qualitative practices of academics, civil society organisations, and citizens. Chapter 3 presents the digital platform, Gabber, that was developed as an outcome of chapter 4. The platform was presented prior to the design process to situate the broader context and design learning in the following design chapter. Chapter 4 iteratively examines each workflow stage through the iterative design, development, and deployment of digital prototypes across three distinct case studies that resulted in Gabber. Chapter 5 conceptualises a *qualitative research workflow* to unify how digital tools can support practitioners undertaking qualitative practices that are meaningful to all involved. Case study four (chapter 6) and five (chapter 7) examine the *complete workflow* in practice through partnerships with a civil society organisation and a citizen-led initiative that provided unique constraints and insights into workflow usage. Finally, chapter 8 draws together findings

in relation to the research objectives above, reflecting on the limitations of the thesis, and areas for future research. The structure, aim, and outcomes of each chapter are outlined below:

Chapter 2 (*Literature Review*) examines the distinct qualitative practices of *academics, civil society organisations, and citizens*, highlighting how digital tools are appropriated to structure participation and the challenges with enabling participation for external stakeholders in each research process. This shows how each stakeholder group is increasingly engaging in participatory practices that involve or are supported by other practitioners. This work illustrates how research participants more often contribute in an advisory capacity to ideation and data capture than the analysis and dissemination of qualitative data. Through examining distinct areas of research for each practitioner, such as citizen social science, community engagements, and civic media, an increased preference for utilising media to overcome barriers in data analysis and dissemination was identified. Moreover, existing research examines each stakeholder group in isolation whereas this thesis aims to explore the design at the intersection of these practitioners, thereby creating insights that have transferability and utility within participatory practices.

Chapter 3 (*Platform*) presents **Gabber**, the digital platform designed and developed as an outcome of the three case studies in the subsequent chapter. A comparison between existing research and commercial software that supports qualitative research are presented to position five unique distinctions of Gabber: (1) it encompasses all research stages in one digital tool (*end-to-end workflow*); (2) increases inclusivity through designing each stage around the reuse of the original captured audio media (*voice first*); (3) is *designed with practitioners*; (4) *data ownership* and dynamic consent is designed into the platform; and (5) offers *flexibility* as no epistemological or methodological decisions are made for how the platform is used by practitioners. The system architecture and technical design decisions that were informed by contemporary HCI literature are documented, including a description of implementation details of each workflow stage. The exploration of this end-to-end digital qualitative workflow is presented in the subsequent two chapters. *The Gabber platform is presented prior to the design process to situate and contextual the case studies in the subsequent design chapter.*

Chapter 4 (*Case Studies 1–3: Iterative Prototype Design*) describes the iterative design, development, and learning process undertaken across three distinct case studies with academic and civil society practitioners that examined their existing qualitative practices through real-world deployment and evaluation of digital prototypes (**RO1**). The research aims across these case studies was to iteratively examine the design qualities of digital tools to make qualitative practices more inclusive and meaningful to practitioners. A participatory action design research (PADRE) approach was taken to inform the iterative design and configuration of prototypes in response to the needs of each distinct context and associated stakeholders. Each case study extends design learning from the previous and shifted the research and design focus to the succeeding qualitative workflow stages. Observations of prototype use and interviews after each deployment provided insight into the perceived benefits and challenges of prototype use. A

chronological account of design learning of prototype use in relation to each qualitative stage is presented, which ultimately informed the design of the Gabber platform.

Chapter 5 (*Defining A Qualitative Workflow*) summarises the research practices of academics, civil society, and citizens to surface the distinct activities in each, how digital tools supplement these practices, and the overlap between practitioners. From this and informed by the literature review and design chapter, a cross-cutting qualitative research workflow composed of six stages – *Preparation, Consent, Capture, Analysis, Curation, and Reuse* – is conceptualised that structures how data output from each stage facilitates inclusive participation for *all* stakeholders involved. To achieve this, interactions with media at each stage underpins the workflow's design as it is familiar to all practitioners and increasingly used within participatory practices between stakeholder groups, such as participatory media research. Gabber provides one example of where this workflow is implemented and used in practice.

Chapter 6 (*Civil Society Case Study*) presents a collaboration with a *civil society organisation*, the International Federation of Red Cross and Red Crescent Societies (IFRC), where Gabber was used as part of an ongoing globally distributed *community engagement* that aimed to engage its members in all workflow stages: the capture of local opinion, distributed analysis, and reporting of insights across the global community. The Gabber workflow was adapted into a digital campaigned, termed **TalkFutures**, where unique roles and engagement activities were designed to structure remote participation. Analysis of paradata from platform usage provided insight into the breadth and depth of participation of each workflow stage and the limitations with how the digital qualitative workflow was used. Post-deployment interviews to understand participant's perceptions of taking part surfaced desires for increased transparency in how their contributed data was engaged with by the organisation and its members. Data analysis in this case study focuses on the impact and challenges of adopting and using a qualitative workflow, i.e., **RO2**.

Chapter 7 (*Citizen-led Case Study*) presents a *citizen-led* co-research project where Gabber was used by members of a local charity to gather and understand community opinion to inform service change. Observations throughout the partnership and semi-structured interviews following the deployment were undertaken to understand perspectives of engaging with each workflow stage, i.e., **RO2**. The focus of data analysis in this chapter examines the characteristics of paradata considered most important to build trust and feel represented in the research outcomes, i.e., **RO3**. Findings highlight the potential of paradata to increase agency in qualitative practices, to support governance of data contributed, and to demystify decision-making. These findings inform design implications for creating *personalised* interfaces that represent paradata to help close the feedback loop between stakeholders involved in qualitative projects, and surfaced challenges with privacy and consent when reusing paradata in digital qualitative tools.

Chapter 8 (*Conclusion*) reflects on findings across the five case studies in relation to the research objectives, its limitations and contributions, and outlines directions for future research.

1.5. Summary of Contributions

The research of this thesis resulted in two peer-reviewed publications and two additional publications through collaborations with academics that adopted the qualitative research workflow and platform developed as part of this thesis (see: Publications). This thesis offers four key contributions to knowledge in HCI, digital civics, and citizen social science research as follows:

1. A *conceptual contribution* through synthesis of a diverse literature on the qualitative research practices for each stakeholder group, including existing modes of participation for stakeholders involved and how digital tools are appropriated. Through characterising the distinct motivations and barriers faced across these practices, a *qualitative research workflow* is conceptualised that posits the use of media (in contrast to text) in each stage to increase opportunities for participation across practitioners. This framing of interactions around media creates a design space where the design of methodologies, processes, and digital tools can be explored with practitioners using a medium that is familiar to them all.

2. A *system contribution* through the iterative design of **Gabber** across three case studies with practitioners engaging in ongoing qualitative practices (chapter 3). Gabber is an open-source digital platform to capture audio conversations, analysis them as a community, and curate analysed media to report insights. The main contributions of Gabber include: (i) the iterative design process from the perspective of academic and civil society practitioners; (ii) the design prioritisation of utilising and preserving audio in each stage to lower barriers to entry for practitioners; (iii) a characterization of the issues faced by practitioners engaging in qualitative practices through three distinct field deployments; and (iv) design recommendations to inform future research on digital qualitative research methods.

3. An *empirical contribution* providing insights into the qualitative practices of civil society organisations and citizens through two distinct real-world field deployments of Gabber that examined the end-to-end workflow in both a globally distributed *community engagement* in a civil society organisation (chapter 6) and a co-research project (chapter 7). Insights gained across these case studies advances an understanding of the practices and digital mechanisms necessary to support qualitative research workflows and the associated challenges of configuring and supporting participation for practitioners. These case studies offer practical examples and insight into how citizen social science projects can be conducted.

4. A *design contribution* primarily through the final case study (chapter 7) that presents implications for designing interfaces and analysis processes to leverage *paradata* to improve process transparency and demystify decision-making for stakeholders involved.

Chapter 2. Literature Review

2.1. Introduction

The previous chapter summarised how three key stakeholder groups – *academics, civil society organisations, and citizens* – are increasingly engaging in qualitative research practices through public consultations, community engagements, and digital civics research. This chapter builds on this framing of these stakeholders as *qualitative practitioners* by examining how digital tools are appropriated to structure participation and the diverse ways external stakeholders contribute within the qualitative practices of each stakeholder group. This begins by examining the role of digital tools within the current practices of academics, highlighting emerging *citizen social science* research where participants contribute to ongoing qualitative research projects that aim to create social change. Community engagement literature is then examined to understand how civil society organisations engage communities in capturing and analysing qualitative data. Finally, citizen's qualitative practices are examined through discussing civic media and digital civics research that aims to reimagine how citizens participate civically and where digital tools are increasingly used to support alternative modes of inclusive participation.

Bringing these three strands of practitioner perspectives together, this chapter surfaces the distinct and overlapping challenges that motivate and underpin the concept of a *qualitative research workflow*. As such, this chapter identifies a gap in literature to design digital tools to structure inclusive participation across the qualitative research practices of all stakeholders. This review concludes that stakeholders are increasingly using a combination of participatory strategies and digital tools to engage stakeholders in capturing qualitative data, but less often in the data analysis and dissemination stages. Therefore, designing lightweight and inclusive ways for all stakeholders to engage in any and all research stages through technology underpins the research aim of this thesis.

2.2. Academic's Qualitative Practices

Qualitative research is concerned with understanding the human experience, behaviour, and opinion of people that Punch [214] succinctly defines as *"data not in the form of numbers"* to emphasise understanding the meaning of experiences rather than numerical representations, such as through photographs, video, or observations of behaviours. Despite being recognized as an interdisciplinary field, there is no unified theory or standard approach of doing qualitative research [236], which impacts the choice of digital tools and methodologies researchers take. This is in part due to the breadth of ontological and epistemological paradigms that unpin qualitative research practices and methodological choices available to the researcher, i.e., the beliefs, assumptions, values and practices shared by a research community [156].

The following subsections begin by describing how digital tools have augmented the data capture and analysis stages of the research process, and how data generated through the use of such tools is used within existing interfaces, i.e., *paradata*. Following this, citizen science research practices and derivatives of it are examined to highlight how technology is used to structure and support citizen participation in research through which the opportunities and limitations of existing technology in the qualitative research process are illustrated. While there are many levels of active stakeholder participation in research, i.e., participatory research [55], action research [226] and co-design [251], the focus on citizen science in this review is due to the integral use of digital technology to structure participation of research stakeholders.

2.2.1. Digital Tools for Qualitative Research

Over the past fifteen years, technology has transformed and impacted all aspects of the research process: from how participants are recruited and engage in research activities, to how researchers collaborate. Despite the breadth of digital innovations across the research process, discussions on the role of technology has primarily focused on how data analysis software is used, with less focus on how technology can support other research stages [68]. In their discourse analysis of introductory qualitative research textbooks, Paulus et al. [208] identify how contemporary authors often write short and outdated descriptions of technology that primarily cover three research stages: (i) *data capture* where Dictaphones are the technology of choice; (ii) *transcription* using bespoke software to transcribe captured media to text; and (iii) *qualitative data analysis software (QDAS)* highlighting how digital tools are primarily designed and used by academics in the *data capture* and *data analysis* research stages.

Moreover, Paulus et al. [208] note that the textbook authors often describe technology use with scepticism and caution, and attribute the associated *"myths"* on the impact of technology adoption as unsubstantiated. For example, that using QDAS adds *"distance"* between the researcher and their data that could lead to superficial analysis, yet this claim is never fully expanded upon by textbook authors. Gilbert et al. [109] provide a comprehensive historical overview of digital tools for analysing qualitative data that expands upon these continued tensions and the distrust between the use of technology and its adoption by practitioners. In more recent

work, Paulus et al. [205] posit that these claims have a cyclical consequence for new researchers who use these books to learn qualitative research and due to these myths can impact technology adoption. The authors argue that this impacts future scholars not having the technological skills needed to train their own students and therefore limits the potential choice, use, and adoption of technology for qualitative research. These tensions, as Paulus et al. [205] note, are compounded as digital tools have the potential to disrupt existing *"traditional"* qualitative practices, i.e., using a Dictaphone for data capture, a word processor for data analysis [194]. Building on these challenges and prior research [68, 205, 208, 209], Paulus et al. [206] published a book titled *Digital Tools for Qualitative Research* that aims to:

> *"Reframe how we talk about digital tools for qualitative research. We argue that just as they are an essential, inescapable part of our daily lives, digital tools can be an essential part of our research lives. We hope this book will help researchers conceptualise how the qualitative inquiry process in its entirety can be supported by digital tools in ways that can add robustness and depth to qualitative work."* [206]

This book provides a comprehensive overview of how technology impacts all stages of the research process as illustrated in Figure 2.1. This ranges from using cloud-based storage to handle research data, using video communication technologies for collaboration, using QDAS to review literature, and direct coding on waveform representations of data.

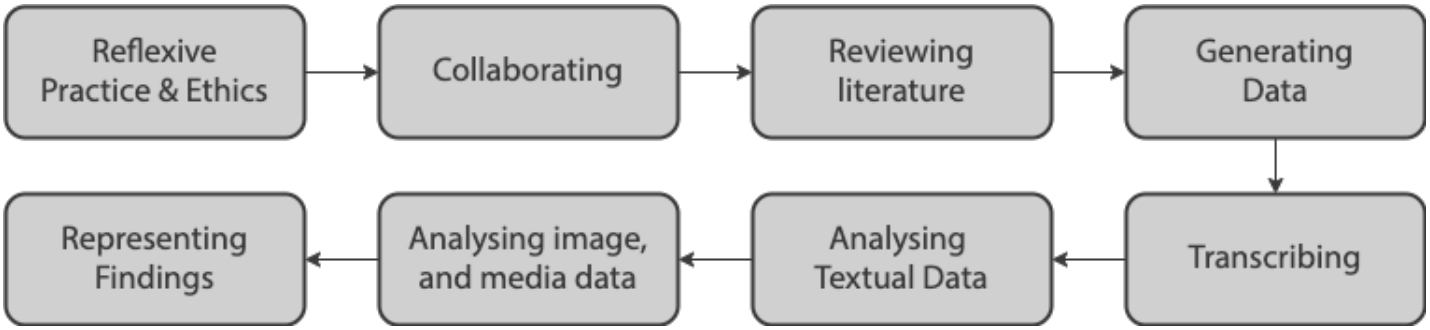


Figure 2.1 The stages of a researcher's qualitative process as represented by Paulus et al. [209].

Through reflecting on technology use across the qualitative research process, the authors posit three cross-cutting themes for consideration in the design of future digital tools:

- **Ethical dilemmas:** raised through the use of technology in the qualitative process, e.g., how data is stored and accessed, and by whom;
- **Transparency:** the researcher's decisions to create immediate audit trails;
- **Collaboration:** between researchers, participants, their communities and the public.

The authors note that modern qualitative research is now an inherently collaborative process that can involve external stakeholders in various ways, but primarily focus their discussions of digital tools from the academic perspective, with limited engagement in how research participants

might guide the choice of technology or their use of it when participating in research. Notably, prior research by Paulus et al. [206] primarily describe *commercial technology* (e.g., social media platforms for networking, QDAS, calendar software for scheduling meetings, etc.), which can require the researcher to learn a diverse range of technologies when undertaking more participatory approaches to qualitative research. Importantly, these platforms handle data independently and it can be difficult or impossible to transfer data between systems. This is a critical limitation when handling potentially sensitive data across research stages: capturing data, analysing it, and disseminating findings.

While QDAS are now being used at multiple stages of the research process (e.g., literature review, handling data, and data analysis) they are not designed with the goal of encompassing the entire research process. This further constrains how data is handled and shared and adds additional resource requirements (i.e., time, learning, etc.) to engage in each research stage. While digital tools are increasingly being used to supplement research activities, such as to coordinate communication, prior commercial applications and digital innovations have been primarily limited to the *data capture* and *data analysis* stages of the research process, i.e., the *"Generating Data"* and *"Analysing Textual Data"* from Figure 2.1. As such, existing digital innovations and their use by academics are described in the subsequent subsections.

2.2.1.1. Capturing Qualitative Data

Mobile smartphones are ubiquitous and are increasingly being used to capture qualitative data in audio or video format, such as through interviews and focus groups, or to support participants recording their own data, such as through audio diaries [194, 211, 276]. Academics have explored the design of alternative, bespoke digital tools to augment their existing data capture practices through the design of digital systems that *"ensures a good match between the tool and the researchers' needs"* [75]. Do and Yamagata-Lynch [75] reflect on their design process using a drag and drop application builder that enabled the authors to develop two bespoke mobile applications with limited programming experience: one for capturing audio interviews and the other for note-taking during ethnographic observations. The design of these systems was informed by their personal experiences as academic practitioners and the challenges that they faced in the field. The interview tool, which is most relevant to the research of this thesis, presented a list of pre-defined interview questions and a checkbox associated with each question. When one question was selected the application would begin recording an individual audio file in response to that question and upload this to a cloud storage service for retrieval later. The authors found that conducting interviews through their prototype encouraged the researcher to cover all topics but did not expand on how this impacted conversation dynamics when navigating between interview questions. Previous media production research [21, 42, 245] has shown that tags overlaid in mobile applications can disrupt the recording of video interviews, but less often when recording audio media, which the authors attribute to the intrusive feeling of being video recorded [21]. While Do and Yamagata-Lynch [75]'s digital interview tool responded to the needs of

academics, other researchers note that time, cost, and limitations of existing technologies are key constraints to consider when designing digital tools for qualitative practitioners [104].

Capturing media through digital tools can yield large, unstructured and difficult to manage media datasets, which often requires significant time to engage with [164]. The *manual* association of metadata (e.g., interview topic, date, time, participant details, etc.) with the associated media (or its transcription) is often not undertaken in a manner that makes these datasets searchable, accessible, and meaningful to collaborators. This is in part due to academics using traditional recording devices (i.e., video cameras or Dictaphones) or mobile applications, which by design does not store the relevant metadata associate with the recording. Media production researchers have designed technologies to overcome these challenges, but with limited uptake or application to qualitative practices [245]. There are notable exceptions within HCI research where digital tools have been designed with pre-analysis in mind and therefore leverage metadata to support the qualitative process.

Barkhuus and Brown [20] studied technology use in the fieldwork practices of social scientists and identified the challenges of replicating interviews between collaborators and the desire for a way to begin pre-analysis upon capture. Consequently, TagPad was developed, a tablet application designed for data capture and pre-analysis [19]. TagPad uses interview guides to structure data capture by creating metadata in response to each interview question, e.g., audio recordings, text entry, etc. The pre-analysis interface enabled custom tags to be applied to segments of audio interviews that were overlaid on a timeline that enabled preliminary coding in-situ following data capture. Tagpad differs from prior technology solutions (e.g., [75, 104]) as it also includes the pre-analysis stage and was informed by the existing qualitative practices of a broader range of academic practitioners. However, the authors of these digital tools did not explore how this metadata could help in stages beyond pre-analysis, e.g., when representing or disseminating findings. Nevertheless, this research highlights both a need and desire from academic practitioners for digital tools to encompass multiple research stages that prioritise lightweight modes of participation.

2.2.1.2. Qualitative Data Analysis Software

Friese [99] and more recently Silver and Lewins [250] have illustrated how qualitative data analysis software (QDAS) support a diverse range of functions and analytical approaches, with data management and analysis being two key activities of these digital tools. The analytical features of QDAS typically range from thematic coding of written transcripts (i.e., *memos* or *annotations*), associating codes across datasets, or visualization of codes on a per interview or dataset basis, and increasingly more technical features, such as automated transcription. Davidson and di Gregorio [67] provide a detailed historical overview of QDAS that outlines how data analysis has evolution from a manual, paper-based procedure to *"QDAS 2.0"* that aims to support distributed collaboration by using modern features of web-based technologies. This can be seen in several more recently developed QDAS that are entirely cloud-based (e.g., Condens [51] and Dedoose [71]), or technologies with a long history in this space offering cloud-based

alternatives to their standalone software such as NVivo [219]. However, current QDAS require the captured data to be stored on a remote server that the researcher does not control or possibly know the location of, which raises ethical and privacy concerns regarding which countries the research data is being stored or transported between [206].

QDAS are historically designed to accommodate a broad range of analytical practices, resulting in a complex feature set that is reported as making learning and using these tools challenging [209], such as Nvivo [219], Atlas.ti [14], and MaxQDA [183]. In response, recent start-ups have emerged that aim to simplify the feature set available in QDAS through creating more lightweight interactions that primarily focusing on data analysis of text from automated transcripts of media and collaboration through web-based platforms, e.g., Condens [51], Dovetail [77], and Quirkos [220]. This reduced feature set enables these companies to design digital tools for a larger audience outside of academia, such as user researchers in companies and NGOs.

To understand how QDAS are used by researchers, Woods et al. [279] undertook a content analysis of 763 research papers that reported on the use of QDAS between 1994–2013. Findings from this study show a small growth of QDAS usage year-on-year and that coding transcripts is the primary feature of QDAS used, with 96.8% of academics using QDAS for analysing transcripts from interviews and focus groups. This is despite features existing within QDAS to annotate media directly, which Woods et al. [279] note as *"frequently underused"* with only 2 from the 763 papers reporting on analysing media directly. This could be attributed to researchers being taught that working with transcripts is often considered the *"first step in analysing data"* [16] and that it simplifies the analysis process by making data easier to scan, search, share, view, compare, and anonymise [279]. However, transcription is a time-consuming process that can potentially alter the authentic voice of participants due to its reductive, interpretative nature [16] and may also remove nuances from voice that are challenging to represent as text, such as sarcasm, tone and subtle aspects of emotion [210]. While QDAS exist for working with media directly such as ELEN [83] or HyperRESEARCH [131], Woods et al. [279] note that they are primarily used in specialised research domains where working with voice or mannerisms in video is critical, such as linguistic analysis.

Moreover, Woods et al. [279] reported that other QDAS features are also underused, such as to visually represent findings. This could be attributed to these research stages being distinct activities from how academics perceive and use QDAS, i.e., *"Representing Findings"* in Figure 2.1. The limited usage of advanced features for visually displaying findings and working with media directly has been attributed in prior research due to three key barriers: (i) QDAS being primarily designed for data analysis then being retrofitted into other research activities that lack a well-defined user experience, such as data capture [206]; (ii) limited teaching of QDAS to prepare qualitative researchers for using such digital tools [68]; and (iii) that the complexity of these interfaces can create steep learning curves that can impede learning [88, 207]. This highlights a need to explore digital tools that accommodate qualitative practices across the research process that have a reduced feature set to make learning and using them quick and accessible.

2.2.1.3. *Metadata and Paradata from Digital Tools*

Across these digital tools there is potential to utilise different types of data to structure what raw data is captured and how it is interacted with through technology. The prior sections have shown how *metadata* is created as a byproduct during each stage of the qualitative process to enhance an understanding of other data, such as associating demographic data with an interview. Conversely, *paradata* describes data about *processes*: how people access, use, or engage with a process, system, or other data [58, 170]. Consider a thematic analysis undertaken by researchers on a single transcript where the *decisions* include: *highlighting text*, creating *comments* (notes) and applying *codes*. Metadata captures who highlighted a sentence or created a comment, while paradata can capture which text was skipped during reading, or the time spent on each page. An overview of two examples for each is outlined in Table 2.1. In this way, metadata describes what was done with an object or artefact, while paradata are the ways that the object were interacted with and describes a data trail of the human processes that enabled the artefact to exist. The difference then is that metadata primarily describes *properties of* an artefact, whereas paradata describes *procedures and interactions with* an artefact. Moreover, metadata can then be thought of as *data* ***about*** *data* while paradata as *data* ***next to*** *the data*.

Decision	Metadata	Paradata
Highlighting Text	Date Saved	% of transcript highlighted
	Creator	Time spent on each paragraph
Commenting	Total Comments	Time spent on comment
	Content Length	Date comment was deleted
Coding	Total Codes	How codes change/evolved
	Code Distribution	Time spent choosing code

Table 2.1 Examples of potential metadata and paradata that can be generated through a typical thematic analysis of a transcript.

While metadata is being used to support open science and increase transparency of quantitative research [196], limited research has explored the types of paradata that could be captured to enhance transparency for qualitative practices. This could be because the types of paradata likely to be most important and to which stakeholders (i.e., researchers, participants, the public) remain undetermined. While existing QDAS have the potential to record and visualise paradata, they are primarily designed to create outcomes from one research stage (data analysis) and so there are research opportunities to explore how paradata recorded within digital tools across qualitative practices are visualised to increase transparency of how data was engaged with, which takes the focus of the final case study presented in chapter 7.

2.2.1.4. *Summary*

This section highlighted how the capture of qualitative data is increasingly being performed on mobile devices using bespoke applications developed primarily by and for academics, e.g., [19, 20, 75, 104]. Data analysis is increasingly performed using QDAS with only basic features

being utilised that is in part due to existing interface complexity, cost, and training required to use these effectively [206, 209, 279]. Academics are increasingly using individual technologies within and across each research stage, which makes data management between these platforms challenging if not impossible. Paradata offers one potential opportunity to increase visibility of decisions made through the use of digital tools that could enhance the transparency of qualitative practices. This highlights a need for digital tools to encompass more stages of the qualitative research process than existing digital tools, and so: *what characteristics of technology would be important to encapsulate the entire process and is this desired*?

2.2.2. Citizen Science

Key to some research methodologies is engaging research participants in a range of activities to inform knowledge production where the participant's role can be a *passive* contributor of data (e.g., being interviewed) to an increasing *active* role (e.g., contributing to data analysis). There is a range of research methodologies that aim to democratise stakeholder participation in the research process, such as participatory research [55], action research [226], and participatory design [251]. This section focuses on citizen science and three derivatives of it – *Virtual Citizen Science* (VCS), *Community Citizen Science* (COS), and *Citizen Social Science* (CSS) – to illuminate the opportunities and limitations of participation through technology in the research process. The focus on citizen science was informed by the dependency of digital tools to structure participation in these practices and the emergent qualitative variations where the adoption of technology is limited, and thus provides additional opportunities to examine and augment these practices as in this thesis.

Citizen Science (CS) describes the practice of public participation in scientific research in both traditional research activities (i.e., data collection and analysis tasks [157, 275]) and external engagements (i.e., community action, awareness raising, or education [138]). This configuration of the research process enables researchers to draw from citizen's environmental, contextual, or social knowledge to contribute to research projects beyond geographically collocated tasks that would be infeasible otherwise. For example, observing and monitoring wildlife populations or environmental conditions within a community [138]. CS projects are often configured to address real-world problems with volunteers collecting datasets that enable researchers to assist policymaking processes [30, 92, 138, 275]. Irwin [138] has proposed integrating citizens into all stages of citizen science research projects that positions citizen volunteers as co-researchers to democratise projects that would potentially impact participants through policymaking. Bonney et al. [29] builds on this work by dividing citizen science projects into three types: (1) *contributory*: designed by researchers where volunteers primarily contribute to data collection; (2) *collaborative*: designed by researchers where volunteers contribute to project design, data analysis, or dissemination; and (3) *co-created*: designed with volunteers and where volunteers are actively involved in most or all steps of the scientific process. Rotman et al. [240] note that in practice co-created projects are idealistic and often face challenges of configuring and sustaining participation.

2.2.2.1. *Virtual Citizen Science*

An increasingly popular form of citizen science is virtual citizen science (VCS), a crowdsourced approach through digital platforms that primarily involves lightweight data analysis tasks that are currently not feasible through computer automation, but where humans intuition excels [119, 275], i.e., *"human computation"* [3]. This approach enables geographically distributed participation through lightweight contributions at times that suit volunteers and where they have freedom over which projects to contribute to. A common example of VCS is *Zooniverse*, a digital platform where volunteers classify telescope images of galaxies as either spiral or elliptical, which at the time was impractical for computers to automate [48]. VCS has proven to be a highly effective method with its success resulting in new discoveries and publications across a range of disciplines, from neuroscience [151] to protein folding in biology [22]. Despite its successes, VCS places a large burden on volunteers as participation is often unpaid and requires additional quality assurance tasks from other volunteers to validate contributions, therefore increasing the overall workload and time required to engage [227].

Across CS and VCS, a small proportion of volunteers make the majority of contributions, often intermittently and unpredictably [242, 262]. Several solutions have been explored to sustain VCS communities, such as gamification of participation [132, 154] or using attribution mechanisms to acknowledge volunteers' contributions [240]. Furthermore, VCS projects primarily utilise general human knowledge, such as determining the differences in images, and rarely leverage the contextual and experiential expertise of participants that traditional CS could, and nor does it often aim to address real-world problems as policymaking like citizen science.

2.2.2.2. *Community Citizen Science*

Citizen-generated data initiatives or more recently *Community Citizen Science* (CCS) [130] aim to address this need where citizens report issues through technology that affect their *local community*, such as issues with cycling infrastructure [162, 180] or air quality [129]. CCS projects are ideally designed to embrace participatory democracy, co-design, and rebalancing power from researchers to citizens [130], but like VCS they can position participants as contributors of small-scale quantitative data, with few projects supporting citizens engaging beyond data collection activities. One exception is research by Puussaar et al. [218] who co-designed a digital platform, *Data:In Place*, with community groups over an 18-month period that sought to more actively involve citizens in *"accessing, interpreting and making sense of open data"* for civic advocacy. Through this platform, citizens can access, contextualise (through comments and tags), and discuss open data in the form of quantitative metrics in relation to place, such as air quality or local budgeting. This research highlighted both an interest from community members to actively engage with quantitative data that has meaning to them and illustrated how digital tools can provide rich insight into local issues through empowering stakeholders to undertake their own data-driven explorations. However, this and other CS and VCS projects are primarily designed to facilitate engagement with quantitative data, and so there is opportunity to explore similar aims of stakeholder involvement through lightweight participation in qualitative practices.

2.2.2.3. Citizen Social Science

Participation in CS is designed to accommodate lightweight modes of participation often resulting in quantitative data, such as the geo-location of a bird identified or a binary value when identifying galaxies. In contrast, *Citizen Social Science* (CSS) aims to support citizens co-examining societal issues through the application of qualitative methods that draws from participants expertise of their environment and social context that researchers may not have access to [126, 215, 257]. CSS provides a unique response to Bonney et al. [29]'s ideal of co-created citizen science through creating opportunity for researchers to work with local community members and co-explore problems that they experience. Purdam [215] describes CSS as a *"new form of social science"* that could address ongoing debates in sociological research on the need for innovative methods that describe and classify experiences rather than looking for causality amongst the new forms of data being collected and analysed by private and public institutions, e.g., social media feeds [38].

To explore CSS in practice Purdam [215] present a pilot study with 13 participants that used participant observation and a paper-based protocol to catalogue characteristics of local beggars as they go about their daily lives, e.g., location, gender, time, age, etc. The author notes that this approach *"facilitates the researching of issues where resources are limited and where populations are hard to reach"*, making it possible for researchers to utilise data otherwise difficult to capture that could inform the preliminary stage of designing a larger research project.

While this research "democratised" data collection, it positioned research participants as human capital for use by an existing research team rather than a collaborative or co-created project where citizens engage in all activities. Furthermore, the authors discuss how CSS could take us further than community-based participatory projects to an age of *"a renewed idea of public sociology and a radical, emancipatory and social justice driven social science"* [215], but fail to critically discuss the ethical challenges of utilising CSS in such a way, particular in documenting characteristics of individuals in a difficult life circumstance. Additionally, the perceived credibility of the data collected is not discussed, which in current CS projects requires extensive time to validate from researchers or peer volunteers, and because qualitative data is not as easily verifiable, it may require new mechanisms to validate its credibility or utility. Finally, this approach was entirely paper based, although the author noted how digital recording devices that capture metadata (e.g., time, location) could *"enable the digital mapping of begging"* [215].

Building on this research, Heiss and Matthes [126] designed a CSS project where young adults used experience sampling through WhatsApp to report the communication channels, places, and content that peers share concerning their political views. Like Purdam [215], the authors note how CSS provided opportunity to gain insight into a study population that would be otherwise difficult to reach through traditional survey or interview methods [126]. Through reflecting on this study, the authors highlight three practical challenges to consider when designing CSS projects: (1) difficulty in *mobilizing research participants* that the authors attribute to participant's limited prior knowledge of social science research methods; (2) the need for clear instruction or/and professional training to ensure *data quality*; and (3) *ethical issues* of sharing potentially sensitive observational data. This study raises additional questions

concerning the associated ethical challenges of data sharing within an existing digital platform (WhatsApp) where this research data would be stored and used by a commercial company for other purposes. Moreover, these challenges mirror findings from Purdam [215], and similarly only engage citizens in data capture rather than more 'co-created' configurations of participation.

The CSS projects outlined above use data captured through CSS procedures by researchers rather than a mutual learning process that benefits volunteers contributing to the project. In contrast, Kythreotis et al. [159] propose how *"CSS can potentially transform citizen behaviour and enable citizens to become key agents in driving climate policy change"* and highlights the various social, political, and institutional barriers that prevent increased citizen participation in policy decision-making processes. The authors note that the current framing of CSS in literature (namely [215]) aims to create large datasets that can inform policy making, but it remains unclear how citizens can contribute beyond data capture. To address this, Kythreotis et al. [159] define levels of engagement and participation in citizen science and repositions CSS as a next step beyond the collaborative, science-problem definition to one where *"citizens are key agents of research, action and policy change at* ***all*** *levels of engagement and scales of the decision-making process"*. This resonates and resembles Bonney et al. [30]'s notion of co-creation projects but differs as CSS is framed by Kythreotis et al. [159] as a method for policy change and thus impacting local stakeholders. However, these findings highlight that CSS is not a *"one size fits all"* and there is scope and flexibility in how it can be adapted and applied.

Moreover, Kythreotis et al. [159] note that the success of their policy driven framing of CSS is contingent on the uneven power relationships between academics and citizens, and decision-makers and citizens, and that the scale of participation depends on country specific policy and politics. While this research suggests some solutions to these challenges (i.e., incentives to engage volunteers in this process as a *"duty"*), what the barriers are in practice and how CSS can be practically supported through digital tools is not discussed.

Other research domains, such as *participatory media* and *citizen journalism* (detailed in a subsequent section), parallel the aims of CSS whereby citizens engage in all stages of a qualitative research process to co-create media outputs with an aim of creating or informing societal change. For example, Manuel et al. [175] collaborated with two neighbourhood planning groups who used a participatory video technology to produce, edit, and curate videos to identify issues that impact their neighbourhood. This media then formed the basis of a debate between participants and local planning authorities with the aim of informing neighbourhood planning. While this research enabled participants to contribute to more stages of CSS than the aforementioned work and to feel more represented in the final output, the analysis and reporting stages required extensive facilitation by researchers to create material that could be presented to public officials. This research highlights the potential of technology to increase the inclusivity of participation in CSS projects, but also the continuing tensions with how to produce meaningful output for decision-makers (such as local government) to create action from citizen's contributions. While these research areas utilise qualitative practices that align with CSS ideals (e.g., Kythreotis et al. [159]'s citizen-driven approach to policy change), existing CSS research has been theoretical,

while participatory media research focuses more on engaging citizens in varying ways rather than augmenting and enhancing the qualitative research practices of these stakeholders. *As such, understanding the role of digital tools to support participation in CSS projects is the focus of the research presented in this thesis.*

2.2.2.4. Summary

Citizen science (CS) initiatives have created new ways to contribute to ongoing research projects through lightweight modes of participation that often leverage human's knowledge or expertise of the local context where the application of computing is not yet feasible. As such, research participation has primarily been designed as *contributory* rather than the idealistic *co-created* projects in partnership with citizens, although community-driven initiatives are emerging as will be discussed in a subsequent section [29]. While contributions to CS projects are primarily short, lightweight, and typically involve working with quantitative data, *citizen social science* (CSS) has emerged as a research methodology that aims to harness citizen participation in qualitative research that focus on societal issues that impact participants [126, 215]. Prior research highlights ethical and data quality challenges with implementing CSS projects [126], and to date participation has been limited to the data capture stage using paper-based data collection methods [215] or reappropriating existing technologies, e.g., WhatsApp [126]. Emerging HCI research has sought to facilitate more active participation in data capture and analysis through bespoke platforms that utilise media (e.g., [21, 175]), but in contrast to prior CSS projects, participation in the data analysis occurs primarily offline and with guidance from academics.

2.3. Civil Society's Qualitative Practices

The previous section outlined the qualitative practices of *academics*, the challenges of how digital tools are used, and how research participants contribute to a specific variation of qualitative research project that is most relevant to this thesis, i.e., *citizen social science*. In contrast, this section outlines how *civil society organisations* undertake qualitative research activities as part of ongoing community engagement and consultation processes where participatory research methods are often used to engage their service-users and citizens. Civil society is a multifaceted and multidimensional set of organisations that work at the intersection of citizen and government, such as non-governmental organisations (NGOs) [197]. They are increasingly working with local government to collect, analyse, and use qualitative data that includes the voice of their stakeholders to inform service delivery and public policy, such as town planning or decisions on who to devolve power to in local communities [96, 100, 146]. Underpinning policy making is the process of democracy and in turn, the type of democracy used determines the agency and configuration of participation for stakeholders to contribute and enact change in decision-making processes [80, 198]. Community engagements have emerged as a more diverse approach to public consultations that aim to democratise participation in the procedural aspects of democratic decision-making, such as data collection and analysis [54].

The following subsections outline the motivations of civil society organisations in choosing to use participatory methods to engage and involve communities in aspects of their qualitative practices, outlining how existing methods can hinder participation. Emerging HCI research supporting community engagements is examined to detail existing uses and limitations of digital tools to mediate participation in these qualitative practices. While there are increasing use of in-person participatory approaches, there is also an ongoing desire to engage the wider public with digital methods for which existing participatory strategies are not designed to accommodate, particularly in the analysis and dissemination of qualitative data.

2.3.1. Participant Voice in Participatory Governance

Over the past two decades, citizens across the globe have become increasingly disillusioned, distrustful, and alienated with how governments connect and respond to their civic needs [161], including the legitimacy of these public institutions [101]. Scholars have characterised this as a *"democratic deficit"* [95] and more recently a *"crisis of democracy"* [80]. In response, central governments have introduced policy reforms that devolve specific powers and policy decision-making to local government authorities, such as allocation of public funds and neighbourhood planning to civil society or community organisations [264]. This presents an opportunity to empower community members to participate in these processes while relieving civic authorities of unsustainable costs [146]. This has come at a time of austerity in many countries that have seen large deficits in public spending at local, regional, and national government levels, such as the Localism Act in the United Kingdom where the majority of the research presented in this thesis is conducted [168, 264]. Consequently, services that were once delivered by government are increasingly being supplanted by *civil society organisations*, defined as *"the space between government and citizens"* that typically include grassroot social movements and non-governmental organisations (NGOs) [94]. Examples of this include taking ownership of and maintaining public green spaces [60, 230] or community assets such as swimming pools [61], food provision [213], or providing health services to vulnerable citizens [24, 25, 252].

Prior research shows that including community members in the decision-making process enables better distribution of resources amongst the community, such as allocation of funding, than compared with traditional top-down strategies as the community needs are responded to more directly. At the same time, this enables transparency of decisions that leads to accountability and increased legitimacy of existing public institutions [95, 96, 100]. However, communities rarely have the strategies or infrastructures in place to support idea generation and action in response to public concerns, which require working closely with public officials through a process of *participatory governance* that Fung [100] describe as aiming to:

> *"... deepen the ways in which ordinary people can effectively participate in and influence policies which affect their lives ... They are participatory because they rely upon the commitment and capabilities of ordinary people to make sensible decisions through reasoned deliberation and empowered because they attempt to tie action to discussion."* [100]

Social movements and NGOs have pioneered participatory action research approaches in governance projects that include stakeholders from all levels of the community in an engagement to ensure it best responds to their needs [93, 95, 100, 265]. Researchers attribute the success of governance projects by NGOs to an early focus on drawing from community expertise to inform service delivery and improvement. Moreover, as these services typically operate in physical spaces between government and the citizenry, they are often best suited to host engagements between stakeholders [55]. Underpinning participatory governance is the process of *community engagements* that aims to build ongoing relationships between *decision-maker* and *community* to inform social or organisational outcomes [125]. For example, local governments engaging with their citizens [52, 163, 172], NGOs with their members [21, 78, 160, 167, 265], or businesses with their staff or service-users [24, 79, 125, 185]. In this way, 'community' represents the stakeholders being engaged. Ultimately, community engagements in participatory governance projects are initiated and facilitated by decision-makers. They can be both top-down or bottom-up processes depending on the project goals. As participatory governance projects aim to devolve power to and actively involve stakeholders in these qualitative processes, the remaining discussion in this section examines existing offline qualitative practices (i.e., 'traditional' approaches like workshops) before moving onto the digital qualitative practices of civil society organisations.

2.3.1.1. Traditional Community Engagement Strategies

Community engagements typically use qualitative engagement methods to involve, collaborate, or empower community members in aspects of the decision-making process, such as through focus groups, workshops, deliberative polling, citizen juries, consensus conferences, and citizen assemblies [95, 96, 106]. These methods facilitate participants deliberating on matters of concern that directly affect their everyday lives, such as planning policy. Integral to these methods is inviting experts to participate where their role involves responding to questions from community members on the basis that these discussions will inform participant's recommendations. In practice, participant's contributions and recommendations are typically used in an advisory capacity that raises concerns for how tokenistic their participation can be [95].

As the qualitative methods used involve physical attendance, participation can be impeded by time limitations, proximity, and the venue's size and cost, leading to only a small portion of the affected community attending [54, 100]. Participants are often self-selected and therefore typically unevenly represent those affected by the final outcome [93, 133]. Such methods can require community members to interpret technical details, communicate using technocratic language, and navigate complex bureaucratic processes, particularly for public planning and budgeting [11, 162, 277].

Prior research highlights the importance of in-person methods for building trust and fostering relationships between decision-makers and community members, which researchers attribute to informing more meaningful outcomes [11, 52, 121]. However, community members that attend these events may dominate the discussion or use it as an opportunity to release tension, grief, or frustration, which can lead to some participants not having an opportunity to voice their

perspectives [45, 175]. Central to these methods is enabling participants to discuss and analyse existing data and to produce an output that is meaningful to policy makers, which we categorise as the *qualitative practices of community engagements*. While there are existing barriers of power, representation, and participation to the aforementioned methods, they have shown to be more inclusive and representative than other models of democracy (i.e., representative democracy) as they present an opportunity to *"give a voice to those without power"* through how they are configured and co-led by participants [95].

2.3.1.2. Towards Empowered Participation

Seeking to understand and learn from real-world community engagements, Fung [100] examined successful projects across multiple countries including: (i) participatory city budgeting in Porto Alegre, Brazil that enabled citizens to determine where public funding was allocated through citizen assemblies and other deliberative methods resulting in budget reports created by citizens that outlined the community's needs; (ii) participatory planning reforms in India; and (iii) Chicago's Alternative Policing Strategy (CAPS) that devolved control of schooling and policing to neighbourhood councils composed of parents, community members, teachers, and principals that met monthly to deliberate on matters of concern. Although these projects differ in their organisational design, policy issues, and engagement methods used, the authors note that they all seek to expand the abilities of ordinary citizens to *"effectively participate in and influence policies which affect their lives"* [100]. Building on this work, Gaventa [107] describes that the outcomes of these experiments had a profound impact on local community members, ranging from a reduction in corruption and crime, increased transparency of existing political practices and by extension trust in local government, and a redistribution of resources and spending to the neighbourhoods that were in most need. Through their analysis of the common challenges and characteristics of these successful projects, Fung [100] propose a framework for *"Empowered Deliberative Democracy"* that aims to utilise citizens expertise to engage in action-oriented decision-making through broader collaboration with state agencies and civil society:

> *"... to discover and imagine democratic institutions that are at once more participatory and effective than the familiar configuration of political representation and bureaucratic administration"* [100]

This framework contains three *general principles* and three *institutional design considerations* that aim to increase the effectiveness, equitability, and support more sustained participation of engagements with citizens. The general principles posit for such projects to: (1) address practical problems for the community; (2) involve community stakeholders affected by these problems; and (3) use deliberative approaches to iteratively develop impactful solutions. The three institutional design considerations are: (1) devolution of decision-making and implementation of power to community stakeholders; (2) coordinated support, resources, learning and supervision from state to community; and (3) creation of new state institutions to guide the process instead of voluntary efforts, i.e., civil society. While these principles have been critical for guiding

subsequent community engagements, the authors note that they are idealistic in nature as the complexities of these processes inherently limit participation, which they argue as the fault of existing institutional design, i.e., the hierarchies and bureaucracies of governance [94]. Fischer [93] extends this analysis by focusing on the participatory planning case study in India and shows that participation is not only complex and uncertain but underpinned by social and cultural factors that requires advanced planning to be effective. Prior research shows that participation in such long-term projects must be carefully facilitated and *"cultivated"* to enable meaningful contributions from participants [55].

In recent work, Fischer [95] highlights the role of a *"new type of expert"* taken by academics or staff from civil society organisations whose responsibility includes brokering relationships and facilitating partnerships within community engagements. This resonates with recent work by Fox and Le Dantec [98] concerning observations in a community engagement project that outline the importance of *"productive partnerships"* when academics take on this role and the multitude of other roles that can be occupied by such 'experts' across the lifespan of a community engagement, which ranges from researcher, collaborator to project advocate. This work highlights the importance of involving community members in setting the project's agenda to strengthen relationships between decision-makers and community members and to help overcome institutional barriers to enhance the potential impact of the project.

In other research, Le Dantec and Fox [163] describe the key responsibilities of this 'expert' role including: training community members to have a deeper understanding of the technical aspects of the process (e.g., knowledge of the planning process), and facilitate them independently capturing and analysing the experiences of other participants in deliberative activities. Therefore, one aspect integral to successful community engagement is facilitating capacity building of participants in terms of both knowledge and qualitative practices, which Fischer [95] describes as providing participants with *"the tools needed to reflect on the principles that underlie the provision of public services"*. As such, in their current configurations, community engagements seek to include citizens in all stages involved in governance projects: *collective ideation, discussion, analysis, and reporting of community experiences*. However, community members are less involved in the analysis and reporting stages and when they are, extensive and additional capacity building activities are required [52, 93, 172]. Technology offers exciting new opportunities to broaden engagement and overcome existing barriers to structure qualitative practices for stakeholders in community engagements as detailed in the following section.

2.3.1.3. Summary

Civil society organisations are increasingly using participatory research methods to engage local community members in ongoing community engagements. Community members attend and share their experiences to inform decision-making processes that will impact their everyday lives. In practice, this contributed knowledge is often in the form of an advisory capacity, and participants are less often involved in the data analysis and dissemination activities associated with community engagements [95, 172]. Traditional community engagement methods are longi-

tudinal and often require in-person attendance that while builds trust, can impede participation. As such, attendance can be sporadic, leaving participants who contributed their data wondering how it informed decision-making. Academics are increasingly facilitating engagement processes through training community members to actively engage in data capture and analysis that mirrors prior citizen social science research activities. As such, there are opportunities to design lightweight forms of participation through digital tools to increase the modes of participation by citizens in community engagements as described in the subsequent section.

2.3.2. Digitally Mediated Community Engagements

Human-Computer Interaction (HCI) research has simplified how decision-makers can collect community input through the design of bespoke civic technologies that augment or complement existing community engagement methods. For example, situated voting devices to elicit public feedback [79, 110, 260, 269], or introducing turn-taking, fact-checking, or playful game activities to facilitate more fact-based deliberative discussion [114, 121, 150, 155]. However, these strands of research often examine one specific aspect of community engagements rather than the process in its entirety (e.g., to augment capturing community opinion), often utilise lab-based experiments or short field deployments to validate the proposed digital technology, and do not specifically examine the qualitative practices of stakeholders involved. Instead, there are three strands of HCI research most relevant to the research presented in this thesis: (1) *interview studies with decision-makers*, businesses, and participants leading or engaging in community engagements that surfaced challenges experienced through prior community engagements and the role of technology therein [27, 52, 54, 84, 121, 185]; (2) *digitally enhanced participation* where technology was designed and deployed as a component of community engagements [21, 79, 146, 228], often with an underlying goal of enhancing existing qualitative practices [172]; and (3) *crowdsourcing distributed participation* to understand the additional challenges involved in designing geographically distributed community engagements [18, 105, 111, 160, 171]. Each of these research areas are described in the subsequent sections in-turn.

2.3.2.1. Interview Studies with Decision-Makers

Prior interview studies with decision-makers who lead community engagements have provided rich insights concerning the methods used, how participation is configured, how technology is used, and the challenges experienced in practice [11, 27, 54, 84, 121, 142, 172]. For example, Boehner and DiSalvo [27] interviewed civic leaders from multiple organisations across a large US city with a focus on how they conceptualise and apply civic technology. These interviews outlined a disconnect between having data, and knowing what to do with it and an increasing need for improving *"data literacy"* amongst community members as a technique to increase meaningful participation [27]. The authors note that such data literacy is compounded when the data was qualitative as community members have less familiarity with it compared with quantitative data. Furthermore, they highlight how data access and data fragmentation across government departments duplicated efforts that increased time to deliver services, which compounded

existing tensions with the public. Building on this work and seeking to understand community engagements at a procedural level, Asad et al. [11] co-created a *"playbook"* that outlined best practices for the design of community engagements. This was achieved through using insights from interviews with decision-makers (municipal employees) and community members to structure the design of participatory workshops where participants co-created the best practices for the design of community engagements. Asad et al. [11]'s findings reiterate challenges outlined in prior work on participatory governance (i.e., [27]), such as tensions in configuring collaborations between decision-maker and citizens and call for increased transparency of decisions. The authors speculate on the need for new approaches to analysing data as:

> *"... it is not enough for a city department to release data to qualify as being transparent if other community and civic groups do not possess the resources or skills to make sense of those data."* [11]

Across these papers, while technology is described as aiming to broaden participation, it is primarily used to support communication between decision-makers and the public, or enabling information exchange. For example, through online websites, social media platforms or hackathons [54, 121], with similar technology practices mirrored in NGOs [78, 167]. Moreover, the reviewed research above highlights a preference for traditional, in-person engagement methods to more easily foster relationships and build trust between decision-maker and the public, with qualitative methods being the preferred choice to capture participant's experiences [27, 52, 53, 121]. Likewise, these papers are primarily concerned with understanding how the process of community engagements are enacted, which has limited the scope of discussion to how projects are prepared and data captured, with limited exploration of the data analysis or dissemination stages [53, 172].

Mahyar et al. [172] sought to address this gap through interviewing 21 civic leaders in San Diego (United States) to examine their data analysis practices in prior community engagements. Their findings highlight how decision-makers sought representative public input, but that existing data analysis approaches did not scale and thus they could not engage with all the captured data, which mirrors findings from prior research [27]. The authors argued that despite a desire to gather input from a more diverse and larger sample of the community, the existing analytical approaches would not manage with increased quantities of qualitative data. Civic leaders describe that this *"data deluge"* required outsourcing the analysis stage to overcome its bottleneck, which increased costs and made data analysis a *"black box"* that they feared could misrepresent community views or increase biases through inaccurate summary methods. In response, Mahyar et al. [172] posit *"hybrid approaches"* that combine offline and online engagement activities that could address the need for scalable analysis tools through creating and distributed tasks to research participants, while drawing from the benefits of relationship building and trust that offline participation affords. The authors do not provide examples of what this could involve in practice or the challenges of leading hybrid approaches, which makes adopting this recommendation challenging. This recommendation underpins the research presented in chapter 6 that supported an NGO utilising a hybrid approach of qualitative research practices within their globally distributed community.

2.3.2.2. Digitally Enhanced Participation

In contrast to interview-based studies, HCI researchers have undertaken action-oriented research projects as part of ongoing, long-term community engagements. The research aims of these projects are often twofold: (1) iteratively designing, deploying and evaluating technology with community members to best respond to their needs through an inclusive, action-oriented participatory research methodology; and (2) contributing a refined understanding of how technology is adapted and appropriated in context [21, 79, 84, 145, 146]. This research emphasises the hyper-local expertise citizens can contribute to research activities when capturing and analysing local data as community members can draw from their experiences and contextual knowledge to add additional meaning to the data, i.e., *"data-in-place"* [258].

Qualitative data produced by these digital tools can be difficult to integrate with existing policy practices that makes disseminating and creating meaningful outcomes for participants challenging [79, 84, 146, 174, 175]. For example, Johnson et al. [146] worked with three community groups that were invited by local government to engage in processes of devolved decision-making around town planning. The authors present a map-based, table-top game to structure group conversations about local places to enable community members to identify issues that the government should address. Sessions were audio-video recorded through a digital tool to track individual decisions on a map to present to decision-makers. Although this technology facilitated in-depth deliberation and streamlined ideation and data capture, the authors note that the recorded data (i.e., video media with `JSON` metadata) lacked meaningful influence over policy processes as the data produced lacked details that would make it suitable as *"evidence"* in existing practices [146], which mirrors prior community engagement research across a range of contexts [78, 145, 146, 172, 252]. This raises questions about the importance of making decisions made by decision-makers on data contributed during community engagements transparent to promote accountability, which this thesis explicitly explores in chapter 7.

In contrast to the digital tools outlined above that primarily facilitate participation in the data capture and deliberation stages of qualitative research, recent *participatory media* research has sought to increase participation in *all stages* of the qualitative process in community engagements through the deployment of bespoke digital platforms designed to overcome these challenges [21, 175]. This aim of democratising participation across the complete qualitative research process for participants underpins the research presented in this thesis, but as noted below is associated with a range of challenges. For example, Manuel et al. [175] collaborated with two neighbourhood planning groups who used a mobile application to produce and curate videos that identified issues that affect their neighbourhood. These then informed a debate between participants and local planning authorities (i.e., decision-makers) with the aim of improving neighbourhood planning policy. While this research enabled participants to feel more represented in the final output as all stages of the process were transparent to the community, the analysis and reporting stages required extensive facilitation by researchers to create material that could be presented to public officials as evidence in a format that was meaningful to decision-makers.

Building on these findings, Bartindale et al. [21] collaborated with the International Federation of Red Cross and Red Crescent Societies (IFRC) in two geographically distinct communities to iteratively design *Our Story*, a bespoke digital platform designed to empower participants to engage in all stages of the participatory video workflow that the authors define as: *"plan, ideate, capture, review, tag, edit, present"* (Figure 2.2). The plan and ideate stages occur offline between decision-makers and community members, while the remaining stages are led by community members through the digital platform to capture, analyse, and present community experiences on a topic of concern. Through an iterative design process across community deployments, a new workflow stage was introduced between review and edit videos named *"tagging"* that supports community members labelling video clips to streamline the editing process.

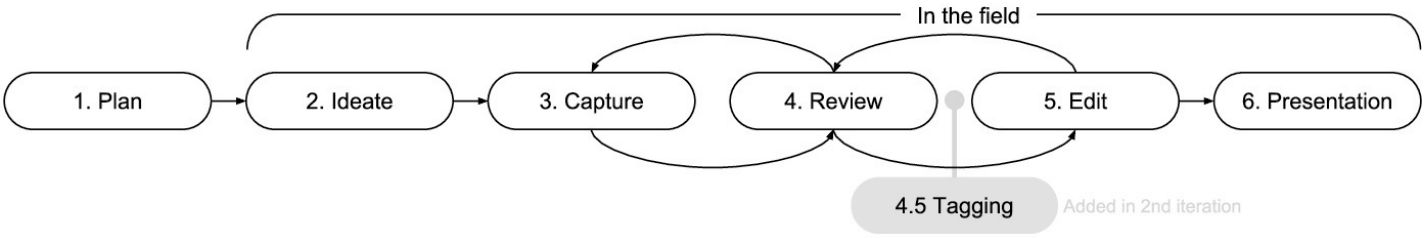


Figure 2.2 The six stages of a community-led participatory video production workflow [21].

This research raised concerns about representation of voice and how other stakeholders in community engagements, i.e., NGO members, local government, etc., can contribute to the final media outcome without *"diminishing the impact of the community voice"* [21]. The authors argue for the need to produce an additional, supplementary media artefact that brings together the voices of non-community members where they could reflect on the process and the media outcome delivered by the community. Moreover, this work highlights how designing community engagements around the types of data anticipated (in this case video) at the beginning of the engagement and empowering the community to contribute to all qualitative stages ensures that decision-makers can create action from contributed data [21].

Across these examples, community members required varying levels of in-person support to facilitate participation in the analysis and reporting stages. Bartindale et al. [21] argue that *"specialist knowledge"* of production processes is overstated in literacy as their research shows how citizen qualitative practitioners demonstrated high levels of media literacy through the process of engaging with a participatory media workflow. The authors note how tagging content was a familiar process to participants, paralleling academic practices of coding data. Conversely, other scholars show that once trained, participants can independently and meaningfully contribute to the capture and analysis of media artefacts [146, 175, 231]. However, training and support would be unsuitable for large-scale engagements where real-time assistance is not always possible, such as city-wide engagements [21, 146, 175].

2.3.2.3. Crowdsourcing Distributed Participation

Mahyar et al. [172] call for scalable methods of qualitative data analysis to overcome the challenges faced by local governments seeking to engage a broader population in community

engagements and posit *crowdsourcing* as a potential approach. Prior research highlights how crowdsourcing could be used to increase representation in community engagements through engaging a broader, more diverse demographics while reducing the time and expertise barriers of the traditional in-person approaches, e.g., [18, 105, 111, 171]. For example, Gooch et al. [111] developed a web-based platform to crowdsource local community member's ideas around sustainability issues affecting them, such as exploring ways to reduce food packaging waste. These ideas could then be submitted to a funding competition where the research team and external stakeholders would judge the application and help realise their ideas. Through analysis of these proposed solutions, the authors show that this engagement approach helped surface hyper-local solutions that responded to the needs of the community, mirroring findings from prior research on the importance of utilising local knowledge in community engagements [54, 258].

To date, crowdsourcing in community engagements is primarily used as a means to leverage community members as *"data sensors"* to contribute quantitative data often automatically through sensors on their mobile devices to inform local decision-making, such as reporting issues of local infrastructure [121, 129, 162, 171, 180], which mirrors the light touch mode of participation in citizen science projects. Limited research has applied crowdsourcing to involve distributed participants in activities that engage participants in individual or collective sensemaking of *qualitative data* [172].

One notable exception is the work of Lambton-Howard et al. [160] who utilised crowdsourcing in a *globally* distributed community engagement where participants undertook complex qualitative data capturing activities. The authors collaborated with the IFRC who wanted to understand the challenges faced by its members and use the data to inform organisational change. In response, the authors designed an engagement process that leveraged the messaging application WhatsApp as it was already used ubiquitously by IFRC members. They assigned participants distinct roles and created teams through WhatsApp groups to collaboratively produce rich media responses to the challenges set by the IFRC. This approach reduced barriers to participation by designing for engagement from the lowest levels of the organisation, i.e., volunteers. While this work illustrated the potential of distributed participants collaborating and independently *capturing* rich qualitative data for a collective goal, the research project relied on an expert judging panel to undertake data analysis, and therefore excluded members from this stage. As such, despite the potential for crowdsourcing to facilitate scalable qualitative methods, there is opportunity to explore how data analysis and dissemination can be structured and configured for remote participation in the context of citizen social science projects.

2.3.2.4. Summary

This section has shown how technology can mediate participation across all stages of community engagements that typically mirror the qualitative research process: *preparing a project, data capture, data analysis, and reporting findings*. Modes of participation at each stage varied by technology design and levels of assistance required by researchers. However, the use of participatory media enabled more in-depth participation in the analysis and reporting stages than

alternative approaches through utilising media for all qualitative stages. In doing so, barriers to participation were lowered and limited training required as the procedures were already familiar to participants, e.g., tagging media [21]. Mahyar et al. [172] outline a growing need for scalable or alternative methods of qualitative data analysis to overcome the challenges faced by decision-makers to engage with this data. Existing participatory governance processes are often designed to capture and use traditional forms of qualitative data that can exclude community members from participating, e.g., skills required to engage in thematic analysis of transcripts. Supporting community members engaging with raw media for analysis and reporting of their findings through participatory media platforms has shown potential to overcome these challenges. However, this requires that decision-makers lead such processes knowing that the end-goal will be a media output to supplement or replace existing reports [145, 146]. Finally, crowdsourcing has shown promise for increasing remote participation and sourcing opinion but has not yet been applied to data analysis and reporting activities in community engagements [172].

2.4. Citizen's Qualitative Practices

Citizens are increasingly using technology to create, curate, and share media to advocate for social and political change in both local and global communities that scholars' term *civic media* [115, 281]. The growing use of civic media has been attributed, in part, as a response to the ineffectiveness of existing forms of citizenship that restrict how change can be enacted that impacts citizens daily lives [281]. Prior research highlights a diverse range of civic media practices to achieve this, such as through networked social movements [115, 143], digital activism [143, 269, 281] and community radio [47, 65, 228, 229]. At the same time, there has been a growth of HCI research focused on the design of civic technologies that respond to *local* needs and problems where an emphasis is on the design of *participatory platforms* [201, 270]. This is in contrast to the often global or networked use of civic media. The use of media and resulting qualitative practices by citizens to capture, analyse, and share their experiences through technology takes the focus of this section.

The following subsection describes the role of technology in civic media practices, and an analytical framework to understand the motivations for digital participation that can guide the design of future civic media technologies [281]. Underpinning this framework and civic media more broadly is the process of giving voice, and the value it can offer to enable civic participation [57, 143, 190, 191]. Finally, HCI research is then described to showcase the associated challenges and opportunities where citizens engage in qualitative practices with media, such as through citizen journalism [70, 86] and emerging citizen-led and digital civics research [201].

2.4.1. Civic Media

A recent survey highlights how citizens feel ineffective when contributing through traditional civic processes (e.g., voting) and that youth are increasingly using new media technologies to engage with local and national politics that Cohen et al. [50] term *"participatory politics"* and

defines it as *"interactive, peer-based acts through which individuals and groups seek to exert both voice and influence on issues of public concern"*. This shift to *create, disseminate (analyse), curate and share media* to influence or make political change is what Zuckerman [281] describes as civic media. Examples range from tweeting a story that critiques the United States president [282], using online chatbots to source volunteers for civic projects [243], to using social media to disseminate and report on local war crimes [192]. A more recent definition of civic media by Gordon and Mihailidis [115] is one that aims to *"support connection through common purpose in civic, political and social life"* through framing it as an umbrella term that constitutes the *"common practices, dispositions and motivations that organise communities towards achieving civic outcomes around a* ***common good****"*, where common good is *"... actions taken that benefit a public outside of the actor's intimate sphere"*. In this way, the procedural activities associated with civic media (curating and sharing media) are arguably one way that citizen's engage as qualitative practitioners.

Traditional media literacy practices are often defined as being able to *"access, analyse, evaluate and create media in a variety of forms"* [43]. While effective for media-based projects, can lack concrete application to civic problems and require extensive training to meaningfully participate [191]. Consequently, researchers argue that such media literacy skills needed for *"effective civics"* [282] require extensive training as they are complex and opposing to traditional forms of civic participation [115, 143, 265]. In *Civic Media Literacies*, Mihailidis [191] expands on this argument and shows that contemporary approaches to media practices are insufficient for *"the realities of today's information environments"* as they rarely offer a clear pathway to *"impactful action in the world"* due to a lack of what the authors terms *"civic intentionality"*.

In response, two frameworks are offered that focus the design of media practices to bring people together to create positive social impact. Most relevant to this thesis, is a process framework comprised of *voice*, *agency* and *participation* along a continuum that places *"voice as a necessary precursor to agency and catalyst to participation"* [191]. Through applying this framework retrospectively to four civic media case studies, Mihailidis [191] highlights the importance of creating new opportunities for participants to become *"deliberative agents"* in setting the agenda and creating meaningful change for their communities. This framing of designing for inclusive and democratic agency resonates with the contemporary participatory action design research approaches taken by civic researchers to ensure technology design brings value to citizens, such as digital civics research [97, 201]. While this framework offers design considerations for media-based civic initiatives to enhance the sustainability of the process by focusing on civic participation, how these constructs and framework can be applied in practice and to the design of civic media technology remains to be explored.

2.4.1.1. Voice as a Value

Key to increasing agency and participation through civic media and therefore civic engagement is the value in designing civic projects that empower participants to share their voice to inform change. In response to the neoliberal economic and political policies that are reported to exclude

and devalue voice in political and democratic processes, Couldry [57] offers two distinctions of framing voice to aspire civic action. Firstly, *voice as a **process*** where voice involves *"giving an account of oneself and what affects one's life"* and *voice as a **value*** as *"discriminating in **favour** of ways of organising human life and resources that ... put the value of voice into practice"*. In doing so, Couldry [57] brings to attention the ways that voice is devalued through existing political and democratic processes and posits five principles that aim to reposition voice as a tool for civic change as summarised below:

- **Voice is socially grounded:** requires shared resources and collaboration with others;
- **Voice is a form of reflexive agency:** taking responsibility and reflection through narratives we hear and engage with;
- **Voice is an embedded process:** encapsulates our lived history and cultural identity;
- **Voice requires a material form which may be individual, collective, or distributed:** recognition of your voice through others, such as media artefacts;
- **Voice is undermined by rationalities which take no account of voice and by practices that exclude voice or undermine forms for its expression:** models that place no value on voice may inherently undermine it. Designing voice into processes enables value.

Building on these principles, Couldry [57] highlights how emerging technologies, such as social networks, have increased the scope for how citizens can engage civically, and in particular, how technology can create more inclusive processes through enabling *"new voices"* to be promoted, a *"mutual awareness"* of these new voices amongst their communities, and simplifying the *"scales"* in which voices can be viewed, analysed, and shared across digital spaces. Civic media technologies offer new possibilities for how citizens can engage in voice as a process where the value of voice can be realised in practice. Zuckerman [281] expands on this work to show how citizens are taking individual and collective action through new forms of civic media to enable *"participatory civics"* defined as *"forms of civic engagement that use digital media as a core component and embrace a post-'informed citizen' model of civic participation"*. Zuckerman [281] presents the use of social networks to mobilize and coordinate civic activism through anti-government protests as part of the Arab Spring as key examples of such uses of civic media. From this, the author posits that a key characteristic of this participatory version of civics is a need for participants to see the impact of and feel represented on issues they aspire to influence and change [281]. This desire is attributed to youth growing up with access to digital spaces that democratise access to voice and influence, such as through crowdfunding humanitarian projects in the developing world or the use of social media platforms to connect and share political views [281, 282]. To understand the diversity of practices and participation associated with civic media, Zuckerman [281] presents a cartesian plane where the x-axis represents the demands required to participate as *thin* to *thick*, and the y-axis represents the potential theories of change that create impact through contributing scaling from *instrumental*

to *voice*. This plane is augmented in Figure 2.3 to show where this thesis and specific methods of civic participation exist.

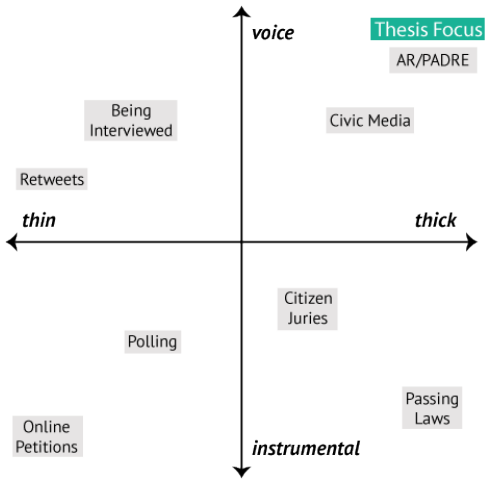


Figure 2.3 This thesis and other approaches situated on Zuckerman [281]'s axis of participatory civics.

Thin participation is described as *"actions that require little thought on your part; sign a petition, give contribution"* and *thick* as using your *"creativity"* to *"create media, research, deliberate or find solutions"* [281]. The author acknowledges the legitimate impact of thin participation, which critic's term *"slacktivism"*, and show how it can transform the public's perceptions, such as through sharing voices to raise awareness of systemic racism towards black people through #BlackLivesMatter. Conversely, *instrumental* refers to the specific steps required to make change, such as seeking signatures of support and voting as one part of many to pass a law. Finally, *voice* is *"the first step towards engagement in instrumental civics"* and used to set the agenda and build community to create change, such as changing the public's perceptions through #BlackLivesMatter. The key difference is that policy change can be enacted through instrumental means whereas voice can change it (albeit more slowly) outside of existing civic processes. However, Zuckerman [281] primarily describes thin forms of participation, such as utilise simple forms of media curation through online activism rather than the complex interactions of creation and analysis associated with other media practices and provides limited description or discussion of thick participation where voice is central. We contest that thick forms of participatory civics that utilise voice includes participatory and action research approaches as undertaken in this thesis and examples of which are described in the subsequent sections.

2.4.1.2. Citizen Journalism

One application of civic media most relevant to this thesis is that of *citizen journalism*, which Wall [274] summarise as news content that is captured, synthesized, curated, and published by non-professional journalists. Prior research highlights how participation in citizen journalism is multimodal, ranging from television, radio, newspapers, to more recently social media, which offer citizens opportunities to share insights that can inform independent or professional news production processes [197]. The ubiquity of Internet access, mobile devices, and digital platforms that can capture and automatically upload media in-situ has been attributed to the rise of citizen

journalism [197, 259, 274]. The use of digital tools adopted by citizen journalists has evolved from sharing user-generated content through blogging platforms to curating and discussing media through live radio, online broadcasting, and social media platforms [197, 274].

Citizen's unique insight of their local environment and access to community members often enables them to be the first reporters of local crisis or forms of activism through recording street-level footage that professional journalists may not be in place or have access to document [70, 192, 274, 281]. For example, recording police violence during protests in Brazil and sharing this through a bespoke citizen journalist platform [70], individual *"curators"* who aggregate and disseminate information to large audiences through social media concerning ongoing armed conflict in Mexico [192], and documenting the Egyptian revolution as described above [281]. In this way, citizen journalists can address gaps in mainstream media where events may be underreported due to existing politics or access, while empowering citizens to share, curate, and disseminate information that can be meaningful to their communities.

Despite the positive impact citizen journalism can have on citizens and their communities, there are significant challenges for both citizen and professional journalists. The content produced by citizens can be lightweight and in the form of images and videos that are spread amongst a disparate community of citizen journalists, which can result in a format that does not match the expectations of professional journalists [181]. This increases the workload required to incorporate content into the professional's production workflow where prior work highlights issues of credibility and trust of sources that further compounds collaborations between citizens and professionals [274]. Conversely, citizen journalists that collaborate with professionals can feel disillusioned as their contributions can be perceived to be tokenistic [274], which mirrors findings from research in citizen science as described above. Digital platforms have been designed to facilitate hyper-local journalism, such as Patch [39] and NINJA [70], without the constraints enforced by existing commercial social media platforms, e.g., word limits [274]. This has raised concerns from citizen journalists and scholars on the sustainability of these systems due to requirements of fundraising and preserving volunteer interest [70]. Concurrently, existing news outlets have developed systems where citizens can contribute user-generated content to ongoing reporting, thereby modifying professional's workflows to accommodate the growth and opportunity citizen journalists provide, but notably these organisations accept few contributions and therefore can act as gatekeepers [103]. As such, there is opportunity to further explore how digital tools could support citizen journalist practices within and outside of existing news outlets.

Prior HCI research has explored the design of bespoke digital platforms to empower community members who are typically underrepresented in citizen journalism literature, such as rural communities or youth [86, 90, 192, 259]. Figueiredo et al. [90] highlight the impact that utilising video over textual media can have on increasing inclusivity for community members to engage in citizen journalism practices. Through this research, participants took complete ownership of the process by documenting local issues, such as incorrect disposal of waste, and mobilised community members to capture and analyse video media that was presented to and actioned by local government [90]. During this research, one-week training was provided to

each community to upskill them in the video editing and production required to publish video blogs. Similarly, Taylor et al. [259] propose *insight journalism*, a method whereby citizens are upskilled in citizen journalism where they can work in partnership with academics to document hyper-local issues that represent issues they or their community members experience to inform the design process. Findings from this study also highlight the utility of using media to broaden participation amongst the community, but also how media was a preferred medium for academics to inform solutions as media was perceived to enrich the experiences shared [259]. Across these examples of citizen journalism and HCI research, the practices of citizens – i.e., *sourcing local insights, capturing community member's experiences, reporting those through blogging or social media, and curating content* – arguably parallel aspects of the qualitative research process concerning the capture, analysis, curation, and dissemination of knowledge while illustrating the media preferences and literacy that empower citizens to lead and participate in these practices.

2.4.1.3. Summary

This section highlighted an increased preference and use of a range of media by citizens with the aim of influencing political change or creating social impact, e.g., tweets, audio, and video [191, 282]. Underpinning participation in these practices is the application of media literacy skills that scholars highlight are increasingly prevalent amongst youth due to ubiquity of the Internet and social media [115]. While prior community engagement research calls for increased *"data literacy"* of citizens pertaining to quantitative data to more meaningful participate civically [27], this section demonstrates that media use can increase levels of participation in civic and participatory media practices [21, 86]. Civic media and political science scholars have emphasised the value and importance of designing processes where giving and sharing voice is central to civic participation through the design of theories of change [281] and process frameworks [57, 191]. Citizen journalism was one example described where citizens engage in civic media practices that illustrate citizen's qualitative practices, which parallel the aims of citizen social science projects [215]. This presents opportunity to design digital tools that prioritise voice through media while illustrating some of the existing qualitative practices of citizen practitioners that overlap with existing civil society and academic practices.

2.4.2. Digital Civics

Parallel to this growth of civic media adoption by citizens is the emerging research area of digital civics (DC) that aims to support citizens co-producing services, digital tools, and resources through participatory partnerships with local decision-makers who have the power or connections to enact change, such as local government and civil society organisations [201, 270]. Key to achieving this aim is building sustainable relationships between these stakeholder groups through participatory partnerships, which is often facilitated by academics [95]. Digital civics projects thus often encompass a range of stakeholders, from civil society organisations (as described above), local government, and grassroot and community-driven initiatives led by citizens. This section is concerned with the citizen perspective and begins through describing how prior research

has supported civic participation in existing service design processes before moving on to more citizen-led practices, such as *political activism* [10, 216]. Following this, how citizens use *participatory platforms* are described to showcase the role of digital tools in preparing, capturing, and curating media to inform civic advocacy and change [218, 228]. Across a reflection of this work the diverse ways that citizens engage in qualitative practices are elucidated.

Olivier and Wright [201] characterise digital civics as aiming to impact four areas of service provision: public health, education, local democracy, and social care. Prior research has sought to include citizens in the refinement of existing service provision, such as the delivery of health services to vulnerable citizens [17, 24, 25, 252], collaborations with transport authorities to inform the design of light rail carriages [31] to deliberating on the impact of public planning [145, 277]. These examples are typically part of larger community engagement activities where the agenda is often pre-defined by decision-makers and refined through citizen involvement to improve service delivery. In contrast, other digital civics research supports *civic advocacy* that aims to raise awareness of local issues because existing mechanisms of civic participation (e.g., town halls) are perceived to be ineffectual for some citizens, e.g, [10, 62, 143, 218, 238].

Digital tools have been instrumental in coordinating participation and facilitating the capture and dissemination of local experiences for civic advocacy [146, 218, 269]. For example, Vlachokyriakos et al. [269] designed and deployed PosterVote, a voting technology consisting of two parts: a laminated poster containing a question and several options that a passerby could interact with it, and a small piece of hardware that sits behind the poster so when an option is pressed a tally is incremented. PosterVote was deployed across multiple communities who took ownership over creating the questions to capture evidence for, which was seen to motivate participation and engagement with the use of the digital tool by activists [269]. Other examples include using technology to crowdsource local experiences of places that were breastfeeding friendly [17], using sensing data from smartphones to advocate for new cycling infrastructure [162, 180] to working with public datasets to reflect on local air quality [129]. Across this work, citizens are setting the agenda for causes they want to advocate for, but in practice existing digital tools to support collaborative analysis of captured data and therefore transform that into action that is meaningful to decision-makers remains an open problem [145, 216].

Most relevant to this thesis are *participatory platforms* that prioritise active citizen participation in setting the agenda for how a service is provisioned [201]. For example, OurPlace is a mobile application designed with a range of citizen stakeholders that facilitates the creation, sharing, and completion of mobile learning activities, such as taking a photo of a place of interest within a local park [230, 231]. This platform is feature rich, enabling participants to capture a range of media in response to an activity, including video, audio, photos, and writing [230]. Critical to this technology and other participatory platforms (e.g., [21, 102]) is the design choice to ensure the platform is highly configurable so it can be adopted across a range of contexts and the use of media to increase inclusivity for all participants. Recent research on community radio illustrates how older adults source local experiences to raise awareness of issues through radio broadcasting while enhancing digital skills that can enhance civic participation [228, 229].

Central to these radio projects is sourcing local opinion and curating broadcasts to engage a broad local audience. In this way, the participatory partnerships and platforms that underpin digital civics research resonate with qualitative practices more generally: *capturing* lived experiences in media format, *analysing* captured content to choose what to include in broadcasts, and *curating and disseminating* insights through social media and other platforms.

This section has highlighted how citizens are increasingly using varying forms of civic media practices through participatory partnerships typically with academics to enhance and create more resilient local service provision [270]. The projects described were chosen to highlight the diverse practices that citizens engage in when advocating for change. Key to these projects is using digital tools to structure varying modes of participation that is meaningful to citizens, and like community engagement literature, the use of media is central to broadening citizen participation. As the aim of digital civics projects is often to create social impact for citizens, it is critical to design solutions where the output from participation is meaningful to decision-makers to ensure change can be enacted while empowering citizens to more actively contribute.

2.5. Summary

This literature review examined a range of distinct methodologies and digital tools that underpin the qualitative practices of *academics, civil society organisations, and citizens*. The increasing adoption of participatory practices by practitioners often aspire to create social impact and involve external stakeholders in the qualitative research process: citizens being engaged by academics in citizen social science [215], civil society organisations engaging both academics and citizens in community engagements [78], and academics brokering partnerships between citizens, government and civil society [201]. Across these practices, when citizens contribute it is more often in a *"contributory"* [29] or *"advisory"* capacity [95] in the preparation and data capture stages, with less research examining how the data analysis and dissemination stages could be designed to draw from participant's local knowledge and expertise, although there are exceptions in emerging digital civics research [174, 216]. The adoption of digital tools by academics and civil society is often to supplement their existing data capture and analysis procedures [19, 20, 79, 146]. In contrast, civic and participatory media research demonstrates how citizens contribute to a diverse range of activities that this thesis contests mirror aspects of the qualitative research process [21, 281]. Practitioners are increasingly using technology to capture large quantities of qualitative data but often struggle to analyse these media datasets in practice with researchers calling for scalable methods of qualitative data analysis [172].

The following chapter describes **Gabber**, a digital platform that aims to make all qualitative workflow stages more inclusive for practitioners through a single digital platform. Gabber was refined and developed as an outcome of the three case studies presented in chapter 4 in preparation for subsequent research that examined the *complete qualitative workflow* in practice for both a globally distributed community engagement (chapter 6) and a community-led engagement (chapter 7). The technical characteristics of Gabber and the design rationale of the technical

response to each stage of the qualitative workflow are described prior to the design chapter to contextualise how the research was conducted.

Chapter 3. Gabber: A Digital Platform for Inclusive Qualitative Practices

3.1. Introduction

The previous chapter synthesised a diverse range of distinct research areas to identify how *academics, civil society organisations, and citizens* undertake qualitative research practices, how participation can be configured to engage external stakeholders, and how digital tools are used to supplement these practices. Through this, opportunities for research were identified to enhance existing qualitative practices and in particular a need to design digital tools that more actively involve stakeholders in the data analysis and dissemination research stages. Design learning from three case studies presented in chapter 4 informed the iterative development of independent prototypes to explore each workflow stage in practice.

In response, this chapter presents **Gabber**, a digital platform designed and developed as an outcome of the design research undertaken in chapter 4 that encompasses the complete qualitative workflow and aims to make participation in each stage flexible and inclusive for all stakeholders. The Gabber platform is presented before the design process to help contextualise the prototypes that were developed and extends the workflow presented in chapter 5 through showing how technology can augment each research stage. The development of the Gabber platform required significant software development to create a unified user experience across each workflow stage, and was primarily undertaken by me. For the purpose of this thesis, I have chosen to emphasise Gabber's use and role in participatory research rather than the evaluate or compare technical design choices with existing QDAS.

This chapter begins by describing the overarching challenges with designing digital tools for qualitative research and situates and compares our technical contribution, Gabber, within existing literature. Alongside this, an overview of the Gabber workflow is presented to detail how the digital platform enables inclusive participation across the end-to-end workflow. A technical overview of the system architecture underpinning Gabber and interactions between technologies is then described. A detailed description of the design rationale and technical decisions of Gabber and how it is used in each workflow stage is presented.

Related Publication and Acknowledgements

- The Gabber platform presented in this chapter extends the system outlined in a CHI'19 publication, Rainey et al. [225], through grounding the technical features in literature and providing detailed technical documentation of all technologies used.
- Acknowledgements go to *Thomas Nappey* for redesigning the styles and colour scheme of the Gabber website, and *Robert Anderson* for supporting the frontend (website) development of Gabber.

3.2. The Gabber Workflow

In chapter 5, the growing adoption of *qualitative practices* and associated procedural aspects of participation by practitioners were highlighted to structure a qualitative *workflow* consisting of six distinct research stages: *Preparation*, *Consent*, *Capture*, *Analysis*, *Curation*, *Reuse*. In doing so, this chapter has shown the overlapping practices between academics, civil society, and citizen practitioners as a design opportunity to explore how technologies can supplement the proposed workflow. This chapter builds on this workflow to show how a digital platform, Gabber, can enhance existing qualitative practices while lowering barriers to participation in each research stage. As such, the existing challenges with digital tools for qualitative research for practitioners are subsequently discussed prior to describing Gabber.

Qualitative practitioners are increasingly using a diverse range of technologies to enhance their research practices, such as recording interviews with a mobile smartphone or sharing insights with the public through social media [206]. Using a range of distinct technologies and online platforms makes accessing and managing research data challenging as there is often no unified way to access or share stored data between technologies. While there are many different approaches to qualitative research, there is no standardized process for how captured data is prepared, handled, and managed. As such, practitioners often dedicate their time, labour, and resources to manage raw data (i.e., an audio recording) and manually associate metadata generated through digital tools (e.g., the time and location an interview took place) or by the researcher (e.g., field notes or annotations made on a paper-based interview schedule). As detailed in the literature review (chapter 2), existing commercial software for qualitative research primarily accommodates data analysis and offers an abundance of features that are reported as underused by researchers [279]. Recent commercial platforms, such as Dovetail [77], Quirkos [220], or Condens [51], build on these challenges through designing simplified interfaces with a smaller feature set (i.e., coding of transcripts), but which also primarily focus on the data analysis stage for academics. Prior HCI research has explored the design and use of bespoke digital tools to overcome the challenges associated with handling and management of qualitative data between the data capture and analysis stages [19, 75, 104]. Like commercial software, they are designed specifically *for academic practitioners*, but in contrast, encompass both the data capture and analysis stages as outlined in Table 3.1.

In recent years, there has been a significant rise in the use of participatory research practices of academics, governments, and civil society organisations that aspire to involve participants in all stages of the qualitative research workflow. Such approaches necessitate alternative modes of participation to mobilise distributed research participants contributing to research activities on flexible schedules. Emerging digital civics research has explored the design of digital platforms to enable civic organisations and communities to capture their lived experiences in media format, code this data, and share their thoughts with partner organisations [21, 79, 146, 175, 218]. Importantly, this work highlights how designing technology to utilise media can enable citizens to contribute to the data capture and analysis stages with facilitation from academics [146, 175]. Moreover, when media is used it often introduces unique challenges with how it can be engaged,

analysed, and purposefully reused due to the large quantities of recordings captured, and the associated time required to consume media compared with text [79]. Finally, such technologies are often adopted by both civil society and citizens to engage in relational and participatory forms of qualitative practices because media is a format familiar to both parties while preserving the original voices of participants. Across this work, participatory media has been successfully utilised to engage everyday people across all stages of the qualitative research workflow, but their success often depends on the specific technology configuration and project goals. An overview of the workflow stages each technology accommodates is outlined in Table 3.1, which highlights how innovation has been made to accommodate the practices of civil society and citizens rather than academics but are not without their own limitations.

Digital Systems	**Qualitative Research Workflow Stages**					
(Chronological)	*Preparation*	*Consent*	*Capture*	*Analysis*	*Curation*	*Reuse*
NudgeCam [42]	✓		✓			
TagPad [19]	✓		✓	✓		
NewsPad [181]	✓				✓	✓
ThoughtCloud [79]	✓		✓			
Interview Tool [75]	✓		✓			
Community Conversational [146]	✓		✓			
Data:In Place [218]	✓		✓	✓	✓	
OurStory [21]	✓	✓	✓	✓	✓	✓

Table 3.1 Comparison of how existing research technologies support participation in each stage of the proposed qualitative workflow.

In contrast to the design of bespoke technology for academics, recent participatory media platforms, such as OurStory, were designed *with* participants and use video media to enable inclusive participation in the capture, review and editing (analysis), and presentation (reuse) of participants experiences [21]. Key to configuring participation in such projects is using interactions familiar to participants, such as tagging video content at point-of-capture to streamline the editing stage and using tagging in the analysis stage similar to coding practices of academics. In practice, OurStory requires significant assistance by researchers in co-located environments to support research participation. Moreover, although Table 3.1 outlines that OurStory had a consent stage, this was *not* directly incorporated into the associated technology and instead mediated offline by the collaborating organisation who adopted the research technology. Ultimately, this restricted how content could be used as it required returning to participants for their approval of alternative future uses of their contributed data. As such, aspects of the qualitative research workflow continue to require manual input from academics that restrict how community-led organisations can adopt such technologies.

Responding to these challenges and building on the design findings in chapter 4, this chapter presents **Gabber**, a digital platform that aims to make all stages of the qualitative workflow inclusive, accessible, and participatory to practitioners and research participants in *five ways*:

1. **End-to-End Workflow**: in contrast to prior digital systems as outlined in Table 3.1, and building on the workflow posited in chapter 5, Gabber encompasses the *end-to-end* qualitative research workflow through a single technology. Each research stage is designed to capture *metadata* that is used to structure participation in the subsequent research stage, and in doing so lowers existing data management, resource, and cost barriers associated with prior participation in qualitative research through technology.

2. **Voice First**: building on prior participatory video research [21, 42, 175], Gabber was designed to prioritise interactions with *audio media* across all workflow stages. As such, participant's voices become a central *resource* to the analysis, curation, and reuse stages, while reducing layers of interpretation by staying closer to the data source. Interacting with human experiences through audio is a familiar practice across practitioners and thus more accessible to all stakeholders.

3. **Designed *with* Practitioners**: the digital prototypes in chapter 4 were designed *with* and *for* practitioners that informed Gabber's overall design. This ensures each research stage responds to existing qualitative research practices for a diverse range of stakeholders.

4. **Data Ownership**: Gabber includes a dynamic consent model and a data embargo period to provide ownership and control to participants over how their experiences are (re)used.

5. **Flexibility**: through designing the Gabber platform around a workflow no epistemology or methodological decisions are made for participants, therefore how Gabber is used remains flexible for all stakeholder groups. Moreover, through designing the platform onto a workflow participants can contribute to research stages that suit their interests.

The Gabber platform is composed of two technologies: (i) a *mobile application* to facilitate distributed data capture and consent; and (ii) a *web application* where data preparation, consent, analysis, curation and reuse occur. Figure 3.1 provides an overview of the six workflow stages and the key *actions* that occur within the Gabber platform. Through Gabber, participants can prepare a *project* that contains metadata to guide participation in all research stages, such as setting up *discussion topics* to structure data capture similar to an interview schedule and a *codebook* for data analysis. The Gabber mobile application is used to capture and tag an audio conversation using the discussion topics between one or more participants. Informed consent for how the data is used and who can access it is taken through the mobile application alongside a dynamic email consent model where participants can update their consent at any time. Recordings are then uploaded to the website where the data is accessible to all project members if consent has been granted. Discussion topics are then overlaid onto the audio to enhance how the conversation is represented. Project members can then write textual comments with associated codes in response

to segments of the audio conversation, thereby making *participant voice* central to the analysis stage. Data curation, dissemination, and sharing occurs through a separate interface on the website where participants can view all snippets of coded audio data, filter those by topics or codes, and curate these snippets into individual playlists to represent a narrative that draws from voices across the dataset.

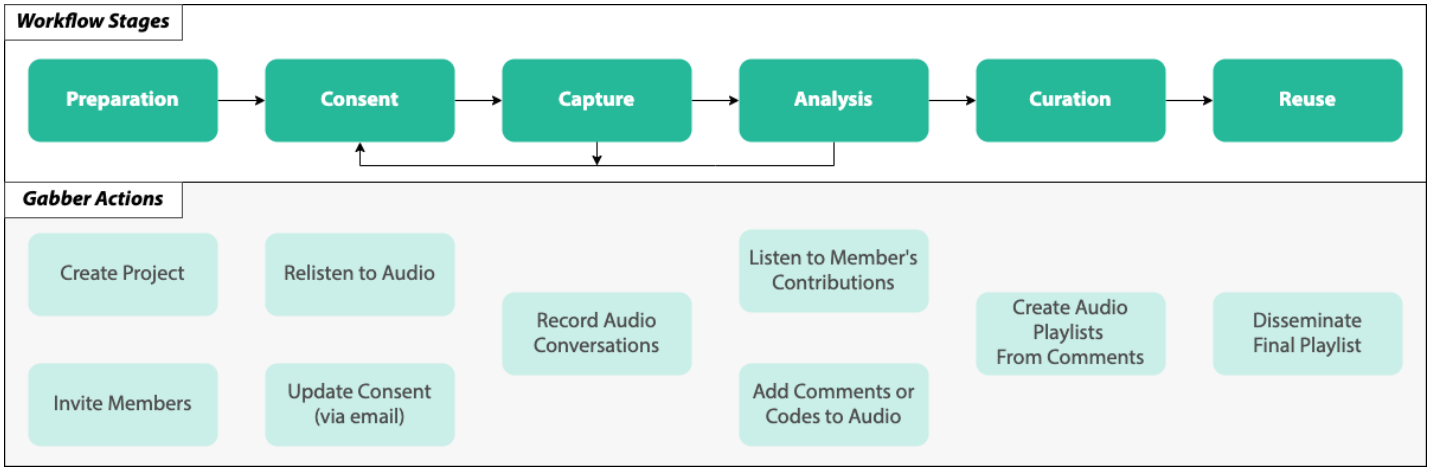


Figure 3.1 The key *actions* in the Gabber platform overlaid onto each workflow stage posited in Figure 5.4.

The subsections that follow describe the technical architecture underpinning the Gabber platform, and the motivation, design, and technical rationale of each workflow stage.

3.3. Architecture Overview

Gabber is an open-source digital platform composed of five technology stacks [222]: (1) a *web application* to support the preparation, data analysis, and curation stages; (2) `Android` and `iOS` *mobile applications* for data capture; (3) a RESTFul Application Programming Interface (*API*) to provide functionality for the website and mobile applications; (4) external services for email, storage and analytics; (5) and *containerisation* of all internal microservices to streamline development and deployment. The following discussion outlines the technical decisions across each technology stack and how they interact with external and internal services.

A microservice architecture was utilised to facilitate development, deployment, and scalability of the services and technologies that underpin Gabber and was deployed on a containerised environment using `Docker`. Each service is encapsulated in an *image*, which is a lightweight, standalone package that includes the codebase and all dependencies for running a service, including a virtualised operating system [76]. Images for both the API and web application were created in their associated codebases to provide a standard and portable way to run the code on any machine [76]. A containerised approach supports multiple, independent instances of the Gabber stack (i.e., API and web) to be deployed simultaneously, enabling a custom instance of Gabber to be ran for subsequent deployments as outlined in chapter 6.

In practice, all containers run on a single server to enable vertically scaling (i.e., adding more CPU or RAM), reduce costs, and to simplify maintenance. As such, all external traffic that arrives to the server goes through an *API gateway* that sits between a client (the mobile or

web application) and service that automatically forwards requests to the appropriate container as illustrated in Figure 3.2. The Gabber *backend (API)* and *frontend (Web)* images each use their own reverse proxy server (`nginx`) to leverage caching requests and compression of responses. This is required as the default server provided by the framework used in the API (`Flask`) is not intended for production and the web application needed to serve static content. Separate containers of the API and web application are run for development and testing purposes with different configurations. The `MySQL` container is used by all deployed API containers that each have a separate database for reuse of internal services. A separate cron job is run nightly through a container to back up the `MySQL` database to `Amazon S3` (*nightly backup* in Figure 3.2).

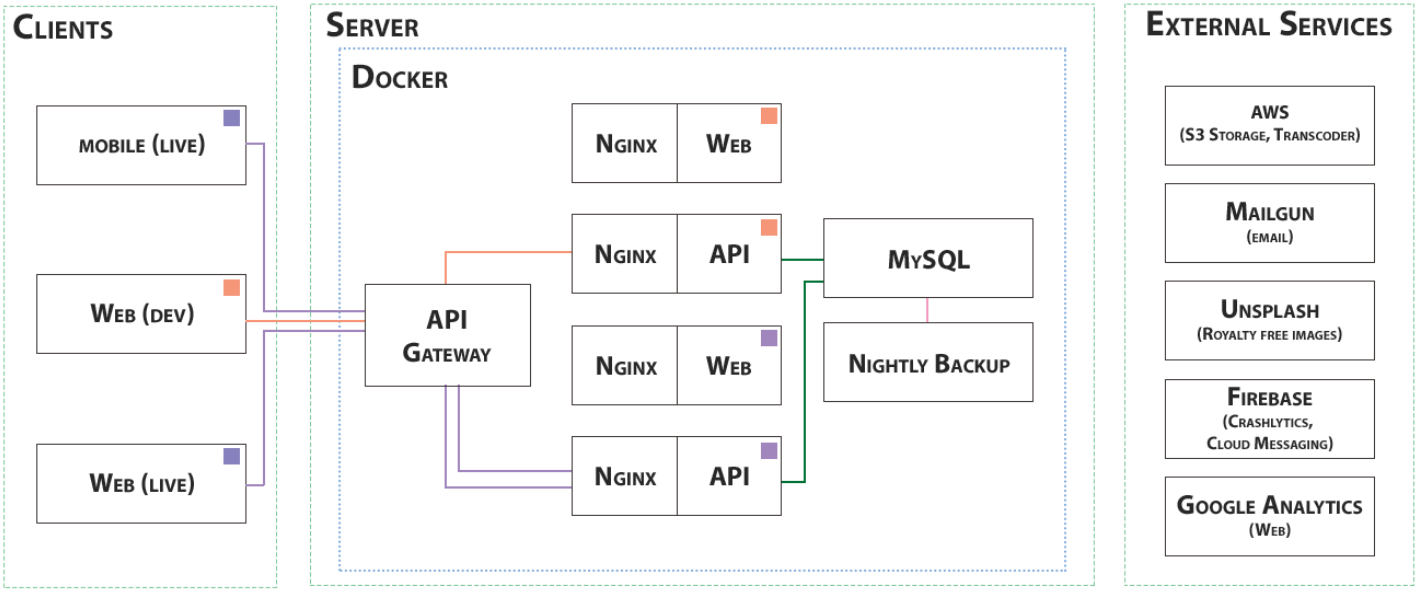


Figure 3.2 The architecture of the Gabber platform is designed to support running multiple instances.

The API and web application were completely redeveloped from the prior prototypes that was a single application (i.e., server-side rendering) into two distinct systems to improve the development experience, promote reusability of the API between clients (mobile and web application), and enhance the user experience. The API contains a set of endpoints that handle all intended user interactions with the mobile and web applications, ranging from user authentication to comment creation during data analysis. The API stores all associated data in a `MySQL` database. Any interactions with *external services* through the mobile or web application that require authentication go through the API, including: generating credentials for push notifications (`Firebase Cloud Messaging (FCM)` [112]), sending participants emails (`Mailgun` [173]), storage of audio recordings (`Amazon S3` [9]), or searching for royalty free images (`Unsplash` [266]). The API was written in `Python` using the `Flask` web framework due to the wide range of available libraries and tooling to streamline software development [203]. Security was paramount during the API design to ensure any conversations or metadata recorded are only provided to those with authorised consent and access. `JSON Web Tokens (JWT)` are used to handle authentication with the API: *access tokens* are generated for each user upon logging into the mobile or web application that authenticate them when accessing specific endpoints. The API

returns JSON using the JSON:API [148] specification to structure the return response as two keys: data containing relevant data for that endpoint such as data about a conversation, and meta containing a list of messages that contain error keys to ensure client applications know which errors to display if one occurs. For example, querying the projects endpoint for a non-existent project returns no projects and the associated error message, which the client can then use to determine and provide a human readable message to the user:

```
{
    "data": [],
    "meta": {
      "messages": ["general.PROJECT_404"],
      "success": false
    }
}
```

The Gabber website uses a Single-Page Application (SPA) architecture where the first visit to the website downloads the complete application code (i.e., JavaScript) and related static content (i.e., CSS/HTML) to the browser that handles presentation of data and user interactions. All subsequent user actions are sent to the REST API through HTTP requests (e.g., when viewing a conversation) and cached in the user's browser. Other interactions can be performed and updated within the UI without making any external web requests as the associated static content had been previously downloaded, such as changing the application's language. This approach enables quick loading times of webpages and simplifies development of complex interfaces as the backend logic is uncoupled from the user interface. The application code is written in JavaScript using the Vue.js framework [280], which offers a set of libraries necessary for local routing and state management. Designing a responsive and seamless user-experience was fundamental as the user interactions associated with the preparation, analysis, and curation stages are complex, such as listening to and coding an audio recording. Vue uses a component-based architecture design that enables individual interface elements (e.g., a project) to have the associated logic and interactions isolated, encapsulated, and shared across the application, which provides a consistent user experience, enables reusability of code, and affords agile development practices to quickly address any feedback from participants. Google Analytics (GA) is used on the website to log user interactions across the website.

The prior capture mobile application prototype was developed for only Android due to the time constraints associated with developing multiple mobile applications. Across the three prior case studies many participants requested an iOS application. To reduce development time and afford sharing code across mobile application implements, the Gabber mobile applications are written in Xamarin [187], a cross-platform framework designed for building applications in one programming language (C#) that can produce native Android and iOS applications. In the Gabber mobile applications, business logic was implemented once and shared across Android and iOS applications to reduce code duplication, including: *application configurations* (i.e., API endpoint URL, local database name, etc), *consuming the API* (i.e., viewing projects,

authentication, etc.), *local database storage* (i.e., to store conversations created for upload, etc.), and *internationalisation* (i.e., sharing string resources). Although it is also possible to design interfaces in `Xamarin` that compile to both `Android` and `iOS` applications (i.e., with `Xamarin.Forms` [188]), this can restrict which design elements can be used or lead to a less native user experience. As the use of the Gabber mobile application may be the first time a participant is exposed to the digital qualitative workflow, providing a native user experience was desired. As such, the Gabber mobile interfaces and associated logic are implemented through Xamarin's associated `Android` and `iOS` frameworks that expose the associated native interface APIs. In addition, two external services are used across applications: (i) `Firebase Crashlytics` to view real-time analytics and crash reporting [113]; and (ii) `Firebase Cloud Messaging (FCM)` to receive push notifications in the mobile application from the API in response to user actions on the web application [112].

3.4. Workflow Stages

The Gabber platform consists of six stages – *Preparation*, *Consent*, *Capture*, *Analysis*, *Curation*, *Reuse* – to realise the end-to-end qualitative workflow posited in chapter 5 that incorporates design learning from chapter 4. Key to the technical contribution of Gabber is designing each stage of the workflow around the reuse of the original captured audio media that utilises captured metadata to support inclusive participation. The Gabber workflow begins by enabling an *administrator* (e.g., a qualitative practitioner) to **prepare**, create and configure a *project* through the *Gabber website*. A project defines *discussion topics* that structure the data capture stage through a *mobile application*, and a *codebook* to structure analysis and curation through the same website. The administrator can then add members to the project using an email addresses or promote it publicly for others to begin capturing and contributing data following the same structure defined by the administrator. Participants that have downloaded the Gabber *mobile application* can **capture** audio conversations for existing projects in three steps: (1) add participants to the conversation (including their name and email); (2) agreeing to **consent** as a group; and (3) capturing the audio conversation follow the project's discussion topics.

Once the conversation is uploaded from a participant's smartphone, a **dynamic consent** model is initiated that provides ownership and control to participants over who can access and use their captured conversation. If consent is granted, any other project member can listen and **analyse** the audio conversation using the *codebook* and free-form textual responses to *snippets* of audio conversations on the *Gabber website*. Participants can view each other's comments and create threaded discussions. The conversation snippets are then represented as an audio playlist where participants can listen to each in turn and **curate** personalised playlists to represent their insights from across the project's dataset. Playlists can then be shared and **reused** from within the same interface to represent the original voice of contributors, such as during the delivery of training. The following subsections document the technical and design decisions made in each workflow stage, including how data flows through the Gabber platform. A demonstration of the Gabber platform is available online [222].

3.4.1. Preparation

The qualitative research workflow typically begins offline when stakeholders who are already actively engaging in qualitative practices have an idea or specific objective to explore, such as understanding the experiences of service-users in an organisation [79]. At this point, stakeholders often already know the types of data they intend to collect, and the methods to capture and analyse this data. Prior citizen science research has explored the design of technologies for citizens to initiate research projects using pre-defined templates, but these exist primarily to supplement existing data collection practices for academics, e.g., [152]. Acknowledging the diversity of qualitative practices associated with the ideation and preparation of research projects and the challenges associated with engaging stakeholders in community commissioning through technology [102], this stage aims to support the outcome of existing offline practices to structure the subsequent workflow stages.

This stage is realised through a *website* where any registered members can create and configure a research *project* that acts as a container for the captured, analysed, and curated data and associated activities. Projects can be configured to include all necessary metadata to support the remaining workflow stages: *discussion topics* to structure data collection through an associated mobile application, and a *codebook* to scaffold analysis through the website. The following subsections detail how projects can be created and configured, including inviting and adding members to scale out participation.

3.4.1.1. Project Creation

The Gabber website supports creating and configuring *projects*, which contain all the necessary metadata to structure the data capture, analysis, and curation stages. This metadata includes: a *name*, *description*, *image*, *discussion topics* (used in the capture stage), a *codebook* (used for data analysis), and a *privacy setting*. Participants in prior deployments described difficulty identifying projects in the mobile application and on the website as only the project name was listed for projects. Consequently, a detailed description of the purpose of the project and a unique image are used to represent the project on the Gabber website and mobile applications to resolve these concerns while making projects easier to explore for everyone. Project *creators* can use the search feature when creating a project to browse high-quality, royalty free images that can be associated with a project, which uses the `Unsplash API` (Figure 3.3). Creators can otherwise upload an image to support personal or organisational branding of their Gabber project. If no image is selected the Gabber logo is used.

3.4.1.2. Discussion Topics

The capture stage is typically undertaken by one person who record a conversation with one or more other participants, but can also be undertaken by multiple, geographically distributed or co-located participants depending on the project's goals. As such, it was critical to design participation to produce a consistent data format to structure the capture of comparable data

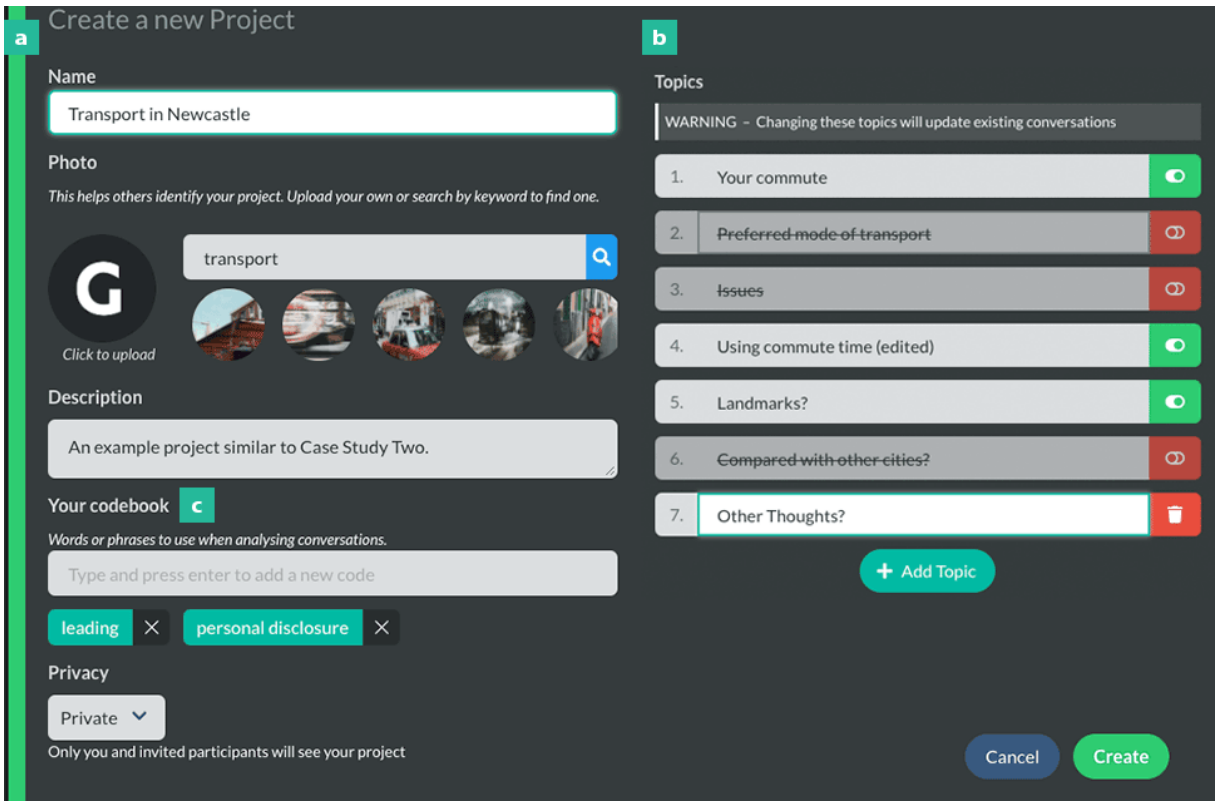


Figure 3.3 Creating a *private* project including: (a) adding a codebook, discussion topics, and searching for a photo; and (b)when a project is created topics topics can be toggled from active to disabled and new topics can be added.

across participants within a single project. Drawing from prior media production research [42, 245], discussion topics can be added when configuring a project that later appear in the capture stage to annotate the audio recording at point-of-capture. Prior research undertaken in chapter 4 had shown mixed usage in how topics were configured, ranging from short, informal textual prompts to interview-style questions with images. In response, creating topics was designed to not impose any length or format to accommodate a range of qualitative practices. Project creators can add any number of topics to provide ownership and control over what is discussed during the conversation capture stage. Topics configured on the Gabber website are automatically updated in the Gabber mobile applications when a project is created or updated. Once topics are created, they cannot be deleted as they are used to visualise the conversation during data analysis. Topics can be *disabled* through the web platform, which removes them from the data capture stage as illustrated in Figure 3.3.B. Topics that were previously used in the analysis stage remain unchanged.

3.4.1.3. Codebook

Prior research on qualitative practices highlights the use of coding data as a key analytical process for practitioners [34, 210]. Qualitative data analysis software builds on these practices through enabling association of codes directly onto transcripts or the raw media data [279]. Conversely, tagging of data is a familiar practice for everyday people, ranging from facilitating information retrieval (e.g., hashtags on social media platforms [177]) to supporting collaborative

interpretation and reflective discourse (e.g., debating the meaning of song lyrics [108]). Building on these overlapping qualitative practices, a codebook can be optionally added when creating a project. Codes can be composed of a single word or phrase, and similar to topics can only be disabled once they have been created as illustrated in Figure 3.3.C. Project administrators can add new codes at any time during the qualitative workflow.

3.4.1.4. Configuring Privacy

Each project has a privacy setting that determines who can view the project on the web and mobile platforms, and therefore who can record conversations in the mobile application and analyse these on the website. Restricting access control through a configurable privacy setting enables the capture of sensitive data in a safe and secure way. There are two privacy options when configuring a project: *public* and *private*. Public projects are available for anyone to view across the Gabber platform including those not logged into the website. Any registered user can contribute recordings to a public project. Conversely, *private* projects and conversations associated with them can only be viewed on the Gabber platform by *project members* who have been explicitly invited and authorised by the project creator or administrators. Regardless of privacy setting, participants who were added during the capture of audio recordings automatically become project members, allowing them to view their own and other members' conversations and contribute to additional conversations in the future. Automatically enrolling members was designed to promote inclusivity in the subsequent data analysis and curation stages through making those stages available to everyone involved by default. If a project administrator changes a project's privacy setting from private to public, consent provided by participants during data capture remains unchanged. A warning is displayed to the administrator when editing a private project to ensure they understand the implications of who can view the project when being changed from public to private as illustrated in Figure 3.4.

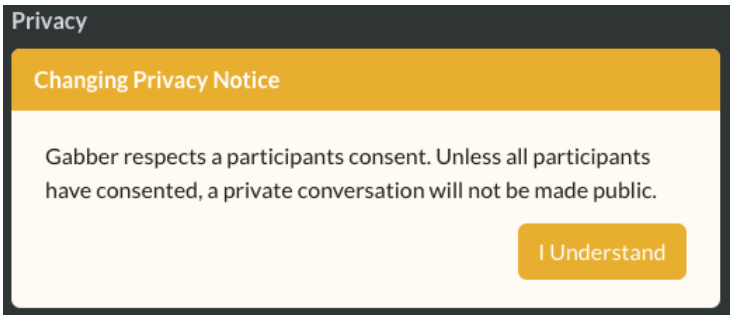


Figure 3.4 Project administrators are informed of the impact of changing a project from private to public.

3.4.1.5. Viewing Projects

Public and private projects that a participant is a member of are listed on the Gabber website. Each project displays metadata (i.e., name, image, description), avatars to represent its members, and two buttons to navigate to the data analysis (*conversations*) and curation (*playlists*) interfaces (Figure 3.5). Project members are displayed as a list of coloured *pseudonymised avatars* to

conceal personal identifies while providing a visual representation for who has taken part in and across multiple projects. The decision to introduce pseudonymised avatars was informed by prior findings in chapter 4, but differs from the prior prototype as participants names are not used and are instead represented in randomly assigned icons. Project administrators can update projects directly using the same interface as creating a project when clicking the *Edit* button.

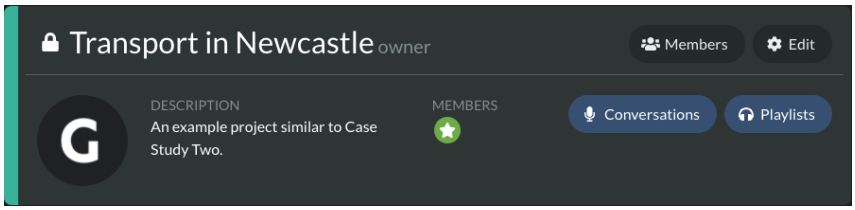


Figure 3.5 Metadata represents each project alongside navigation buttons to data analysis and curation.

3.4.1.6. Project Membership

Once a project is created, project administrators can invite members to take part by adding their *full name*, *email address* and assigning them one of three roles as illustrated in Figure 3.6. Roles provide access control to data across a project: a *participant* can access their own and public conversations; a *researcher* can access every conversation of the project; and an *administrator* can access all recordings and modify the project. Once added, the new member is sent an email describing who added them, what the project is about, a hyperlink to engage in data analysis, and hyperlinks to download the mobile application to capture conversations. The members full name is revealed in the capture and consent stages to show who has access to the data as detailed in the consent section, and enables administrators to remove participants by name.

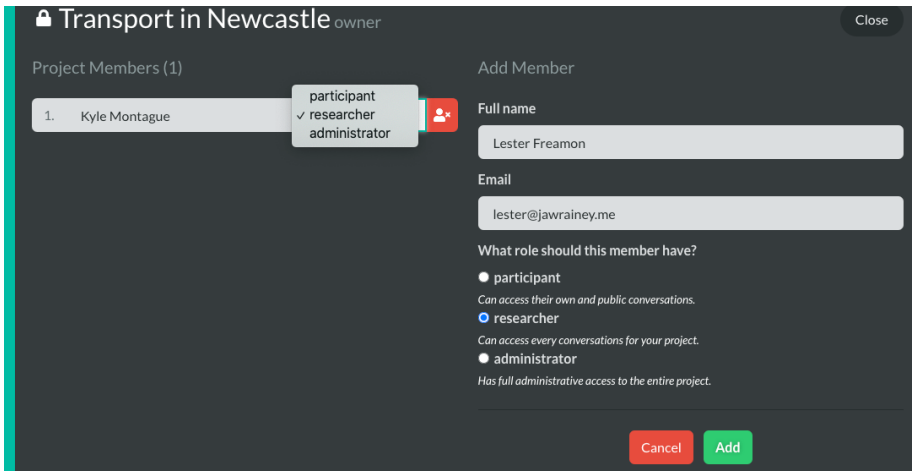


Figure 3.6 The *members* interface lists active members and their roles and supports inviting new members.

A Gabber account is automatically created for a member if their email is not currently known on the Gabber platform, i.e., they have not previously registered or participated in a conversation. This design choice ensures members can more easily create an account through one click to begin contributing to data capture and analysis after being added to a project. When the unique invite URL is clicked an account creation page appears where the participant can view metadata about

the project and setup an account as outlined in Figure 3.7. It is not possible to update the email address as it is used to verify the authenticity of the user and prevent other individuals' using their email, i.e., registering on a different email address. After updating a members' credentials, they are automatically redirected to the data analysis interface to view existing conversations to begin contributing. Likewise, if the member exists in Gabber, then the email contains a direct link to view project conversations to begin participating in the project. Invited members can initiate account registration through the mobile application or website, which invalidates the URL in the previous invitation.

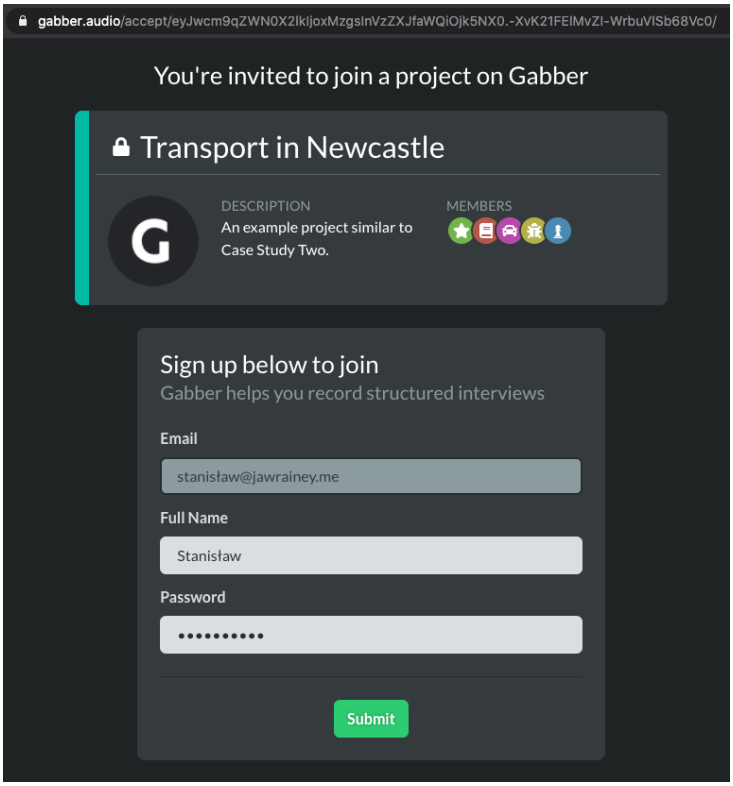


Figure 3.7 A Gabber account is pre-created for invited members that must be verified before use.

3.4.2. Consent

Informed consent is an integral step of the ethical conduct and regulation of qualitative research to ensure participants understand the implications of participating in research activities and how their contributed data will inform research [199]. The static, paper-based consent form is the primary source of recording individual consent in research and is typically stored in a separate location from the source data that adds an additional complexity if participants wish to withdraw from a study. After data collection, participants can request to retract their consent from a study, which is typically via email or phone and is a long, multi-step process. If the data is to be used for an alternative research purpose or new collaborates to have access, then reconsent must be sought from the participant, which is costly and time-consuming due to the challenges associated with locating participants [149]. Prior digital systems for qualitative practices typically do not incorporate consent mechanisms directly and instead follow the current research protocol of

paper-based consent [19, 75, 79, 117, 147, 175]. Likewise, recent legislation requires explicit consent from users of digital platforms concerning how personal data is collected, e.g., GDPR [85] and CCPA [40]. As such, how consent is delivered and managed by users is critical to digital systems where control and ownership of voice data is provided to others.

In response, the Gabber workflow offers two interaction points for participants to tailor and manage their consent preferences: at *point-of-capture* where consent is agreed by the group having a conversation, and individual *post-capture* configuration of consent via the Gabber website that is initiated by email. In this way, consent is stored and associated with raw recordings and can be dynamically configured on a per-participant level, thereby giving ownership and decision-making control to participants over their contributed data. The subsequent sections detail the user experience associated with the dynamic consent mechanism and an embedded embargo period to provide additional access control of when others can view captured data.

3.4.2.1. Dynamic Consent

Informed consent at point-of-capture was designed in response to challenges experienced with using only email-based, dynamic consent in chapter 4. However, having only this form of consent could lead to members overriding the preferred consent of others or the accidental selection of the incorrect consent. As such, once the recording has been successfully uploaded, each participant receives an email containing a unique, *signed URL* to review the recording and modify their consent at any time, giving ownership and dynamic control of the data to participants. A signed URL is generated using a 'secret' known only to the API and provides a secure way to transport private data by embedding it in the URL. This was implemented using a pre-existing cryptography library [202]. The session and participant IDs are embedded with the hashed URL allowing for unique, individual consent to be provided, and requires no authentication to visit and change consent to reduce additional barriers of logging into the platform. One limitation with using a persistent URL is that it could be shared with others. While a potential challenge, this could be empowering for users in gatekeeper scenarios who may prefer for others to manage their consent and access to recordings as experienced in chapter 4.

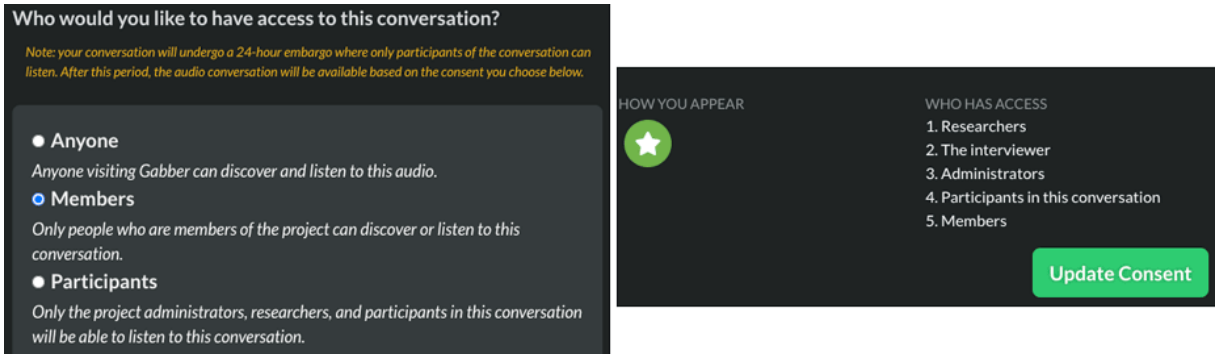


Figure 3.8 Consent page displays who has access and which metadata will be revealed through Gabber.

The consent webpage is divided into three columns that show personal data, conversation and consent data, and metadata of the conversation respectively. The left column displays

personal information about the participant that is stored on the platform, e.g., full name and email address. The right column shows metadata of when the conversation took place, who took part, its duration and topics discussed. The full names of researchers and their pseudonymised icon are listed to inform the user who has access to the recording. The middle column presents the captured audio recording, project details that mirror how it appears elsewhere on the website to provide context for the recording, and a short textual statement describes how the recording may be used to inform research. Finally, a form displays the available consent options outlining who will have access to the recording. When the user selects a different consent option the 'who has access' list automatically changes to inform the user before they commit to changing their consent. The strictest privacy consent option given by an individual user drives the way the website uses the data Figure 3.8.

3.4.2.2. Data Embargo

Drawing from existing academic publishing and data archiving practices, the web-based consent process includes an embargo period where access to the recorded conversation is only available to participants of the conversation for a set period of time. The embargo period can be configured by each project and has a default value of 24-hours. After this period, the audio conversation becomes available depending on the privacy consent selected as described above. An embargo was designed into the consent process for two reasons. Firstly, participants may feel obliged to choose a consent option they disagree with when recording a conversation as agreement is determined as a group, but may feel uncomfortable raising their voice and as such offers an opportunity to retrospectively change consent if desired. Secondly, as illustrated in chapter 4, participants divulged personal or sensitive data unintentionally and may wish to retract consent before anyone not present in the conversation can listen to the recording. For example, service-users being critical of peers or services they use. An embargo period gives participants additional control over who can access the recording and when.

3.4.3. Capture

Recording audio or video media is a standard practice in capturing qualitative data, which yields large and unstructured media datasets that can require extensive time to engage with, such as through interviews and focus groups [164]. Paper-based forms are typically used to capture informed consent and guide data capture, e.g., interview schedules. This capture stage typically involves manually creating metadata that is manually associated with the captured media or its transcription for it to become searchable and meaningful to collaborators, e.g., the time, location, and participants involved. There is no standardized way to handle data, and as such the management of data is ad-hoc, which adds additional time and costs barriers to engaging in these practices for qualitative practitioners.

Responding to these challenges, this stage aims to design inclusive participation by reconfiguring data capture from a structured interview to an informal conversation while capturing the minimum metadata necessary to structure the subsequent data analysis and curation. The capture

stage presented here is distinct from other workflow stages as it is undertaken entirely through a *mobile application* available on `Android` and `iOS`[1]. The application enables participants to contribute audio conversations to projects created in the preparation stage. To record a conversation, participants add metadata denoting who else will participate, agree on informed consent as a group, and use the discussion topics to structure data capture.

The prior capture prototype was entirely redeveloped to enable anyone that downloads the application to contribute to existing projects with limited assistance from researchers, which was a key limitation of participation in prior qualitative practices of citizens and community engagements [21, 175]. This also provides flexibility in how stakeholders can configure projects and use the complete Gabber workflow, such as using the capture application in existing interviewing practices or enabling citizens to independently lead and record conversations with community members. Moreover, several new screens were designed to enhance the general user experience including: application onboarding, authentication, project representation, uploading of projects, and internationalisation. In contrast to prior data capture systems used by academics [19, 75] and communities [21, 245], the Gabber mobile application utilises a built-in informed consent mechanism that provides ownership and control of contributed data to participants who can change their consent at any time, impacting who can access the data in the subsequent stages. The following subsections detail the key design and technical decisions of the mobile application.

3.4.3.1. Mobile Application Onboarding

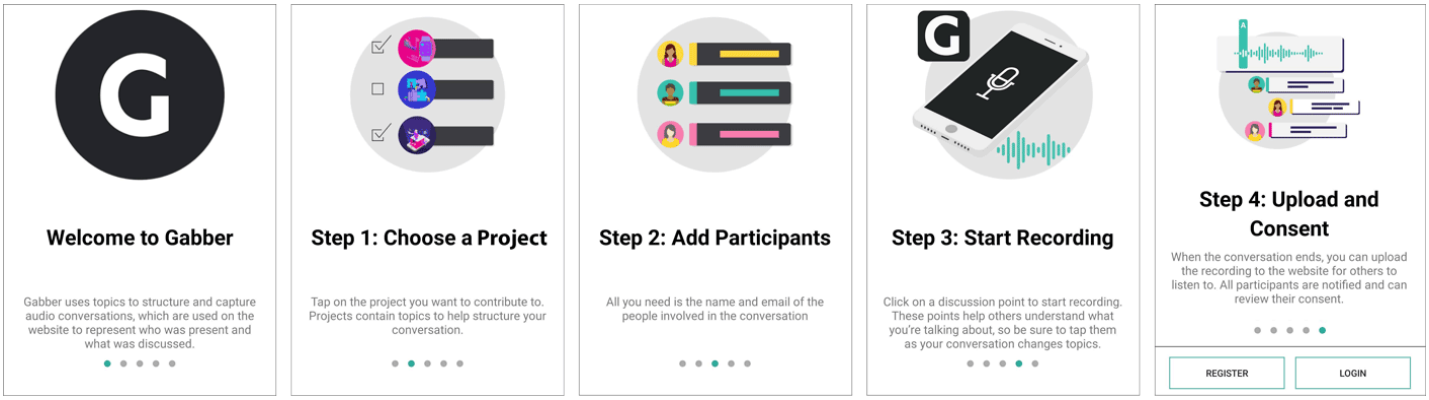


Figure 3.9 The onboarding screens displayed when first launching the Gabber mobile application.

When first launching the Gabber mobile application the user is presented with five screens that include a welcome message and the four steps involved to record and upload a conversation to the Gabber platform (Figure 3.9). Onboarding was designed in response to feedback from prior case studies as participants wanted to know what the complete capture stage entailed before taking part, including how their recording would be used. This was particular important in the context of teaching and learning where students were asked to use an unfamiliar application that had been explained to them by their teacher who may not have been familiar with the complete workflow. As such, onboarding was an opportunity to design instruction into the capture stage.

[1]The **Gabber** mobile applications are available on the Google Play Store (Android) and Apple Store (iOS).

Key to facilitating flexibility of who and when participants could contribute to data capture was having a technology independent of the other systems (e.g., the mobile application) and clear instructions that document how the contributed data informs the larger workflow.

3.4.3.2. User Authentication

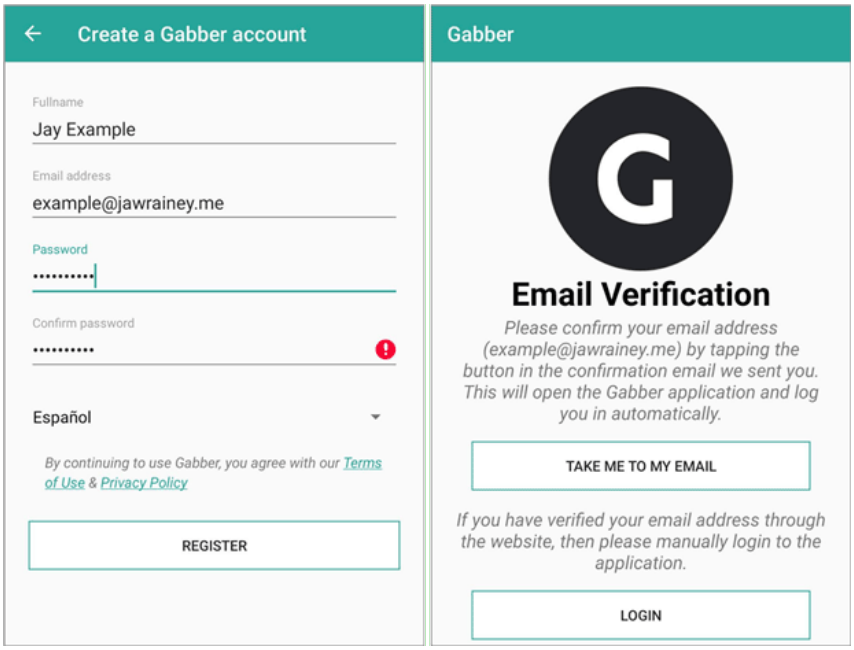


Figure 3.10 The mobile registration and authentication workflow occurs through email.

Making the onboarding experience seamless was critical as contributing to the data capture stage was often participant's first experience of the Gabber workflow. As such, after onboarding participants can tap create a Gabber account by providing their full name, email and a password as illustrated in Figure 3.10. The *email verification screen* is then shown where participants are asked to open their email application from within Gabber to verify their account. The API then sends an email to the participant with a button that contains a unique URL to verify the user. Once tapped, the Gabber mobile application automatically authenticates the user and shows the projects screen. Importantly, when a user successfully authenticates, a unique `API token` is created using `Firebase Cloud Messaging` [112] that enables push notifications to be sent to individual or groups of participants at any time. This token is then subsequently used to send automated notifications to participants based on the actions of others, such as when their conversation is coded during data analysis.

3.4.3.3. Viewing Projects

The home screen lists projects with their associated image and title, sorted by creation date and with the projects the user is a member of shown first. This allows participants who have contributed to one project to contribute to additional public projects if they desire. When a project is tapped, its description and discussion topics are displayed with a button appearing at the bottom of the card that initiates the capture stage as illustrated in Figure 3.11.

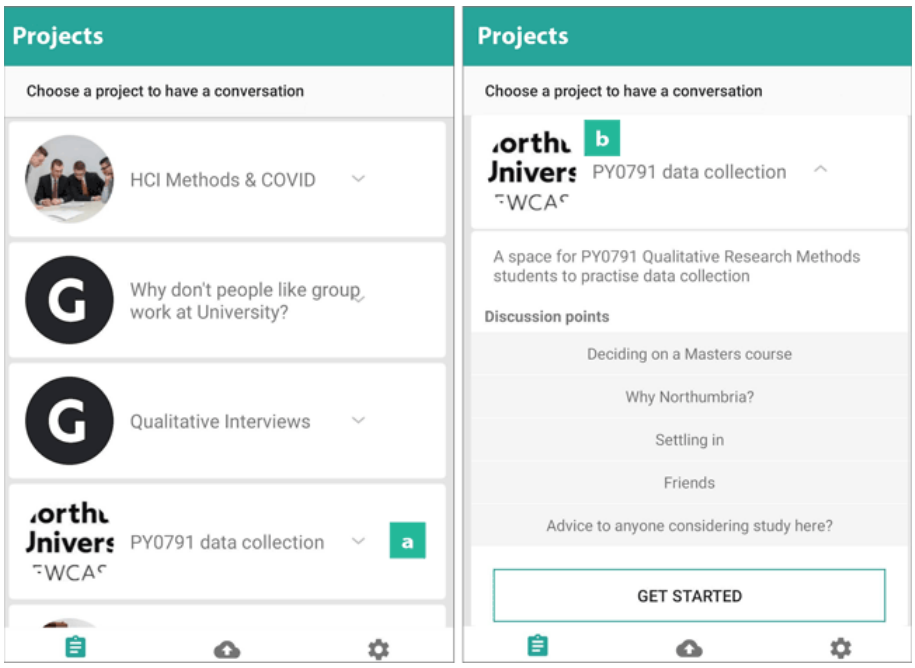


Figure 3.11 (a) Gabber projects are listed in the mobile application's home screen; and (b) when a project is tapped the associated *discussion topics* are listed.

In contrast to prior prototypes, the home screen contains three navigation tabs: projects, uploads, and settings. Users can view all recordings that remain to be uploaded in the *uploads screen*, which are automatically uploaded when the user has an internet connection. The *settings screen* displays three options: to log out from the application, change the application language to one of the six supported languages, and to change the default language to associate with a conversation when recording. As noted above, the language of a conversation can be chosen before recording, which facilitates filtering of conversations by language on the Gabber website.

3.4.3.4. Adding Participants

After selecting a project, users are taken to the *participants screen* that lists the names of participants who contributed to previous conversations with the logged in participant. Each name is displayed as a button that changes colour when pressed to indicate if a participant is selected to participate in the conversation. Listing participants allows convenient reselection of the same participants if multiple conversations are recorded within or across projects, such as when using Gabber during workshops, which was a common issue raised in chapter 4. Tapping the icon in the top-right corner of the screen invokes a dialog to add a new participant to this list as illustrated in Figure 3.12. Participants *full name* and an *email address* are required, and once entered the participant is added to the aforementioned list as an active conversation participant. Limiting metadata to only data necessary for consent simplifies this stage. There is no limit on the quantity of participants that can be in a conversation to facilitate a range of uses, from one-on-one interviews to focus groups.

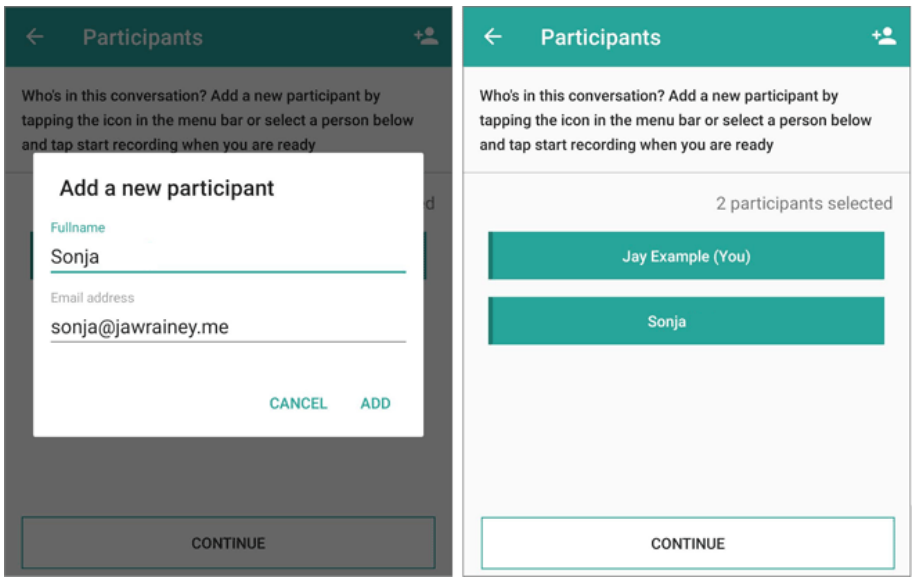


Figure 3.12 Multiple participants can be added to a conversation.

3.4.3.5. Informed Consent

Our prior research had surfaced several design challenges surrounding the ethics of reusing data and consenting for how it may be used in the future. In response, two additional screens were added to the capture application in contrast to prior prototypes: *research consent* and *conversation consent*. Firstly, all projects in Gabber are research projects and as such participants must agree to informed consent for their data to be used in research to proceed to the subsequent screen (Figure 3.13). The research consent screen details the project's title, the administrator's name, describes the implications for sharing the audio recording with a Gabber project, and presents a button that when clicked opens a browser and details the research terms on the Gabber website. This ensures participants are informed of both the implications of their contributions to (potential) research use and personalises who can access their conversation.

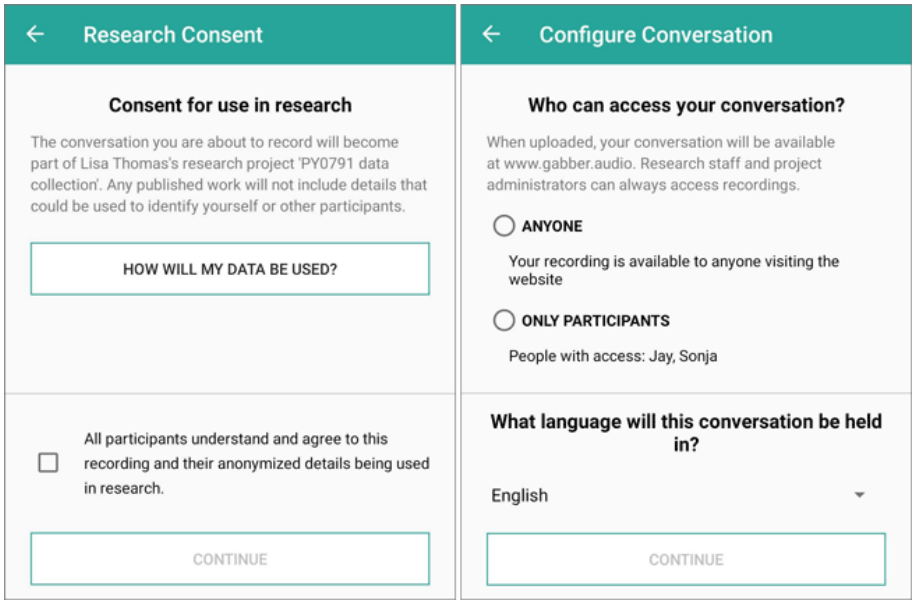


Figure 3.13 Consent for data to be used in research and accessed by others is first agreed as a group.

Design research outlined in chapter 4 identified the complexities of using only email-based consent that restricted the use of data across the workflow. Building on these findings, the consent options were simplified to two choices when a project's *privacy setting* is *public* and three when it is *private*. The exact phrasing presented to participants through Gabber is illustrated in Figure 3.8. In the mobile application, the *conversation screen* displays three options that impact who will have access to the recording across the qualitative workflow: (1) *Anyone:* users without accounts can access recordings on the Gabber website; (2) *Members:* only project administrators, researchers, and participants in the conversation can listen to the recording; and (3) *Only Participants* can view the recording and metadata. The *members* option only appears when a project is configured as private.

3.4.3.6. Recording Conversation

The *record conversation screen* presents the title of the project to remind the participant what project they are contributed to, instructions describing how to begin recording, and the list of discussion topics as cards as illustrated in Figure 3.14. Similar to the prior prototype, when the first (or a new) topic is selected it changes colour indicating that it is active (green) and when a new topic is selected a colour change indicates that the prior topic was covered (grey) as highlighted in Figure 3.14. Timestamped metadata is created when a topic is selected that denotes the start and end of a topic discussion. The associated metadata of who took part (the participants), their agreed consent, and which topics were discussed is stored and associated with the recording. This metadata is later used on the website to display when each topic was discussed. Topics are designed to use only text as the prior case studies illustrated that imagery often distracted the conversation flow that added complexity to the analysis stage. The decision to record metadata at point-of-capture that annotates the recording builds on prior video production [2, 42, 69] and participatory media research [21, 245] that has shown success in using pre-defined heuristics (i.e., topics) to guide video recording and subsequent information retrieval.

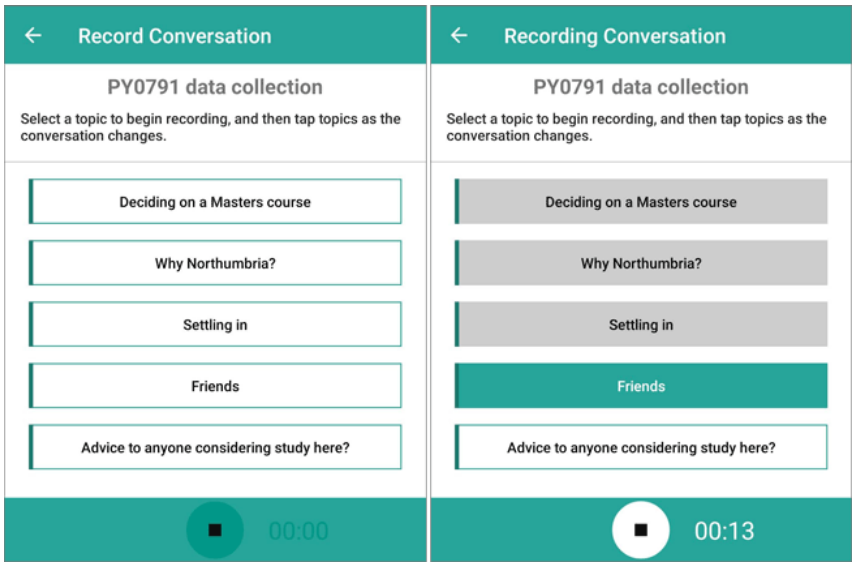


Figure 3.14 Tapping a topic begins the conversation and the colour changes based on the topic's state.

3.4.3.7. Uploading Conversations

Once a conversation is recorded the participant is redirected to the *uploads screen* and the recording attempts to automatically upload if Wi-Fi is available. If Wi-Fi is not available, a popup is displayed to request uploading on their mobile data due to the potential recording file size. An HTTP request is then made to the API containing the conversation metadata (e.g., participants and topics discussed), which stores the metadata and returns an `Amazon S3` URL to the smartphone [9]. The URL is used to upload the recording directly to Amazon's servers, thereby offloading upload bandwidth of potentially large recordings to an external service. Once the recording is uploaded, an `Amazon Elastic Transcoder` [8] service is automatically invoked that converts the recording to an audio codec that is accessible in browsers for the proceeding data analysis stage while reducing the file size by 70% on average. Recordings are stored in two folders per project, raw data and transcoded data, with only transcoded data being made available on the Gabber website. When a user views an uploaded conversation the API generates a URL to make the associated recording accessible for 60-minutes to ensure that if consent is changed, any cached URL by participants doing analysis is no longer available.

3.4.3.8. Internationalisation

During the development of Gabber, collaborations were initiated with an international organisation (see chapter 6) who wanted to use the platform as part of a global, multilingual community engagement. As such, it was critical to internationalise the platform to maximise the potential reach, uptake, and inclusion of participants in future deployments across the complete workflow. Consequently, this involved translating all content across the mobile and web applications, and API (for emails and in-app notifications) into six languages (*English, Spanish, Arabic, French, Russian, Italian*), and developing the associated mobile and web applications to support internationalisation of content, bidirectional text, and Unicode character sets, i.e., `i18n`. To tailor the mobile and web application user experience, a user must select their preferred language when registering to ensure that any notifications or emails they receive are in their preferred language.

Content for all languages is distributed in the mobile and web applications to enable instant switching between languages without having to fetch and download any additional data. This was implemented using standard approaches to `i18n`, such as designing string resources to be shared across mobile applications and choosing the participants phone's system language as the default for use in the Gabber application. Due to the late addition of internationalisation to the development process and the complexity associated with interface design when creating new projects, adding and updating project details (e.g., title or discussion topics) can currently only be created in English through the Gabber website. Multilingual project is possible but currently requires administrative support to setup. An example of changing languages through the settings page and viewing the application in Arabic is outlined in Figure 3.15.

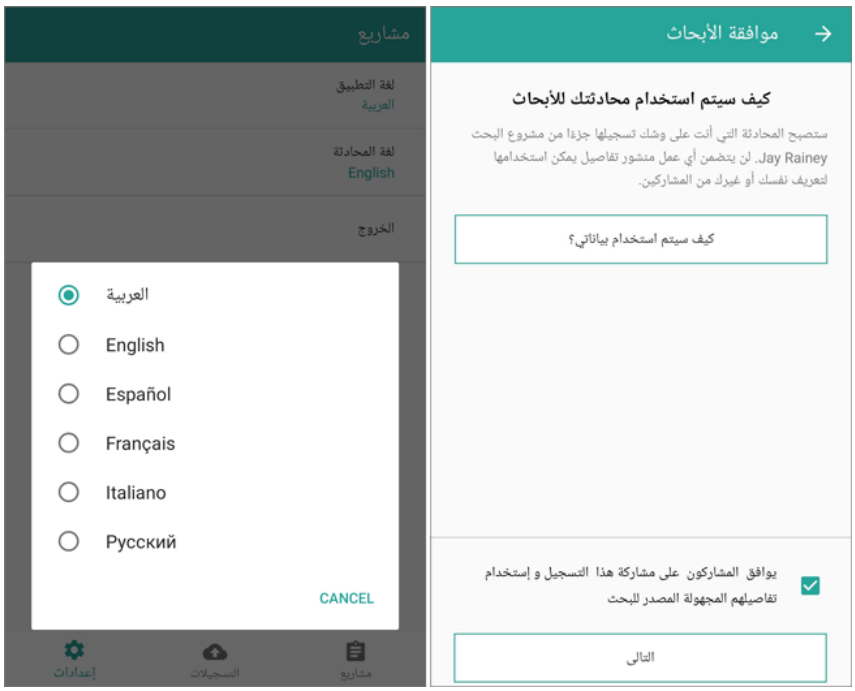


Figure 3.15 The Gabber mobile and web applications support multiple languages.

3.4.4. Analysis

The qualitative practices associated with data analysis vary between practitioners, ranging from manual coding of data on printed transcripts to using sophisticated Qualitative Data Analysis Software (QDAS) to annotate and manipulate raw audio. QDAS is costly, has a steep learning curve, and a complex user experience that is reported as underused by academics [279]. Moreover, QDAS is less often used by non-academic practitioners due to cost and training required to effectively use them. Stakeholders that contribute data in the capture stage are rarely included in data analysis, despite their local knowledge and expertise that has shown to enhance the data analysis stage in community engagements [218, 258]. Where they are involved, participants usually undertake analysis activities with the guidance of academics [21, 62, 175].

Key to the interface design in this stage was supporting participants as independent, active contributors to data analysis. In Gabber, data analysis occurs through the website to increase accessibility of who can participate. Metadata recorded in the preparation and capture stage are presented alongside the raw audio recordings to provide context when analysing. Choosing to use audio media over transcripts for data analysis enables the nuanced characteristics of voice to be heard, listened, and discussed during analysis, while facilitating qualitative practices that are familiar across practitioners. Commenting and coding of data are used in Gabber as the analytical tools due to its familiarity across practitioners as outlined in the literature review (chapter 2) and prior design learning (chapter 4). The following subsections document the experience of viewing, listening, and engaging in the analysis stage through the website.

3.4.4.1. Viewing Conversations

Existing conversations are listed for each Gabber project on the web application. Similar to the projects and consent pages, the conversations page is composed of three columns as illustrated in Figure 3.16. The left column can be used to *sort* and *filter* conversations by date and by participant of the conversation using their pseudonymised avatar. The right column displays metadata about the project – i.e., *the title, description, creator and project researchers by name* – so that anyone who visits this page directly will have context for where the conversations belong, who created the project, and its associated researchers. The middle column lists a grid of components that each represent a single conversation with associated metadata, including the full name and avatar of who recorded the conversation, avatars representing members that participated in the conversation, language spoken, number of comments, and its duration. The full name of the participant (interviewer) that recorded the conversation is revealed to make identifying and relating to specific conversations easier. Clicking on a conversation navigates to a webpage where that specific conversation is displayed and where data analysis can occur.

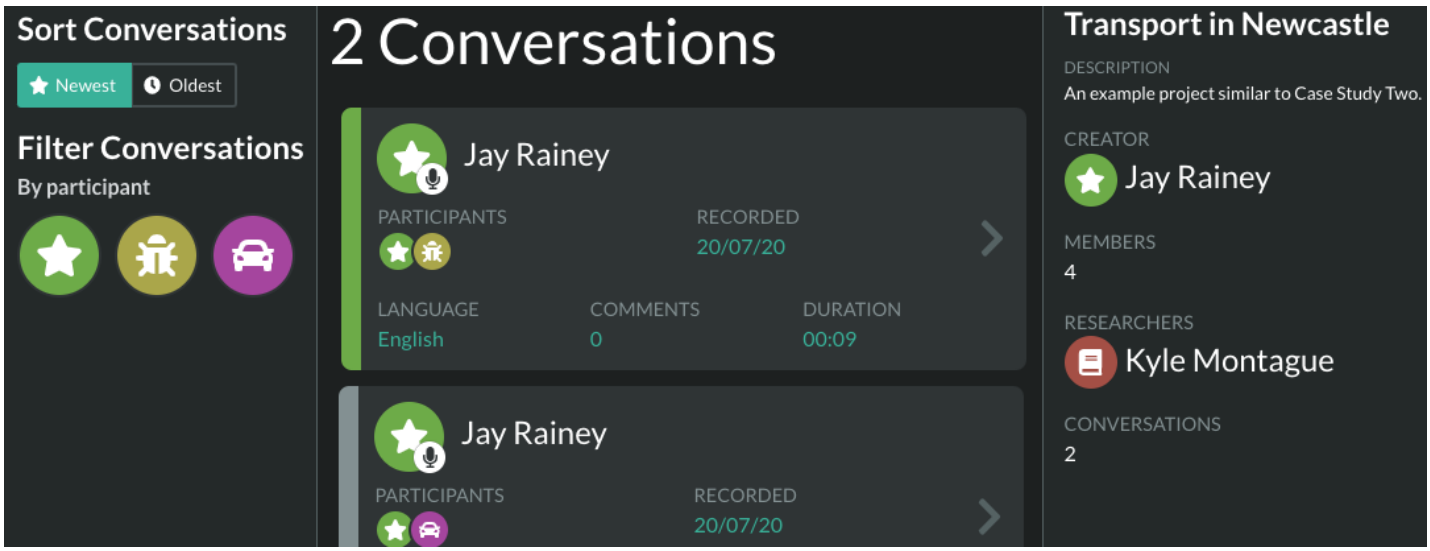


Figure 3.16 Users can view, filter, and search for a conversation while viewing relevant metadata.

3.4.4.2. Listening to Conversations

The conversation page shows the recording and associated topics and is where analysis occurs. Consistent with the projects page, this page is split into three columns (Figure 3.17). The left column was designed to quickly search, sort and filter comments, particular when there are many. In the search field, text entered will filter comments automatically based on word similarity. Comments can be sorted by 'Newest' or 'Oldest' based on the comment's creation date. Individual or multiple topics, codes, and commentators can be selected to filter the comments. The right-sidebar shows conversation metadata, including: the date the conversation was created, the name and pseudonymised icon of the creator, a list of pseudonymised participants, and summary statistics of the conversation such as number of comments.

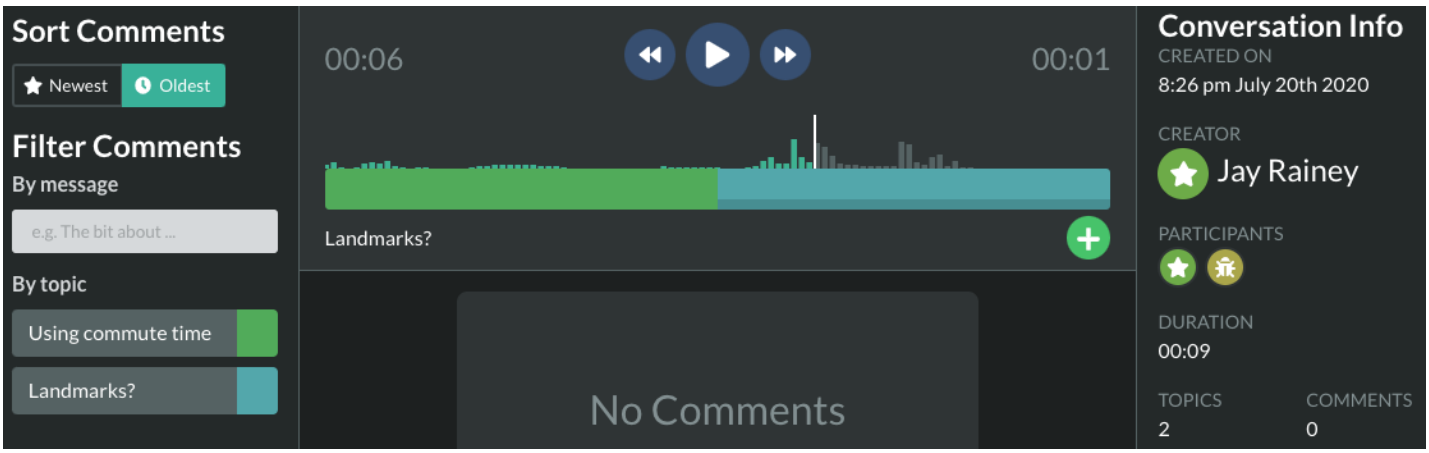


Figure 3.17 Discussion topics are overlaid onto the conversation to contextual the recording.

The central column is divided into two parts: the recording and associated media and discussion topics; and comments below. The audio recording is displayed as a waveform similar to existing qualitative data analysis software [14, 83, 219] and popular music streaming services [108, 253]. Audio waveforms are typically used in media production software to represent audio as a glanceable way to gain an overview of the acoustic characteristics, which requires technical expertise to meaningful engage with them [200]. Building on these constraints, coloured-coded rectangles are overlaid onto the recording's waveform at the intervals where discussion topics were applied during data capture to visually represent what and when topics are discussed as illustrated in Figure 3.17. This adds context to the recording, enabling users to skip to sections of the recording the are interested in, such as when particular topics are discussed. The text of the topic is only displayed for the topic being discussed and changes as the recording transitions into the time the next topic occurs or when a user hovers onto a different topic.

Building on the ubiquitous interactions with media player interfaces, clicking anywhere on the recording begins playing from that point, and the next and previous buttons seek 10 seconds in either direction. Access to the transcoded audio recording from `Amazon S3` is retrieved through the Gabber API, which provides temporary access that expires after 60-minutes. The recording is cached in the user's browser and invalidated once the time period ends or they visit a different webpage. If a participant updates their consent while a person is listening it only comes into effect once the user leaves the page to not interrupt any ongoing analysis.

3.4.4.3. Comment Threads

Comments are used for data analysis in Gabber to facilitate free-form textual responses with the possibility of applying codes to segments of audio conversations. Textual comments were chosen for data analysis as they are commonly used by researchers during data interpretation across a range of digital tools [209], and everyday people to discuss and disseminate textual and audio content online [108, 241, 253]. All comments appear in a horizontal list below the associated recording and show the timestamp that the comment refers to, the member's avatar, and a button for participants to create a response to the comment. Hovering over a comment

visually highlights where in the recording it occurs and clicking the timestamp jumps to that time in the recording. The prior analysis prototype showed comments dynamically as the recording was playing, but feedback and observations of its use interrupted the listening experience and as such all comments are now shown by default.

Users can create a new comment by tapping the plus button below the audio, which opens a web form that displays the project's associated codebook – *if one exists* – and shows a text input where participants can write a response (Figure 3.18.a). Codes can be selected by clicking on them, which changes their colour from black to green to indicate active selection. Creating a comment adds an overlay onto the audio recording to represent the region the comment is responding to. This has a default length of ten seconds but can be dragged in either direction to change its length. When creating a comment, the content of the selected region is played in a loop (Figure 3.18.b). Once a comment is created it is visible to all participants that can view the conversation and has a colour-coded sidebar to indicate which topics it is associated with Figure 3.18.c. All participants can create textual *responses* to a comment that creates threaded discussions (Figure 3.18.d). Users can delete a comment or response at any time, which removes any applied codes and replaces the original text with `[deleted]`. To encourage discussion of content, when a comment or response is created the API automatically sends an email (using `Mailgun`) and an in-app notification (using `FCM`) to participants of the thread that a response has been created by another participant.

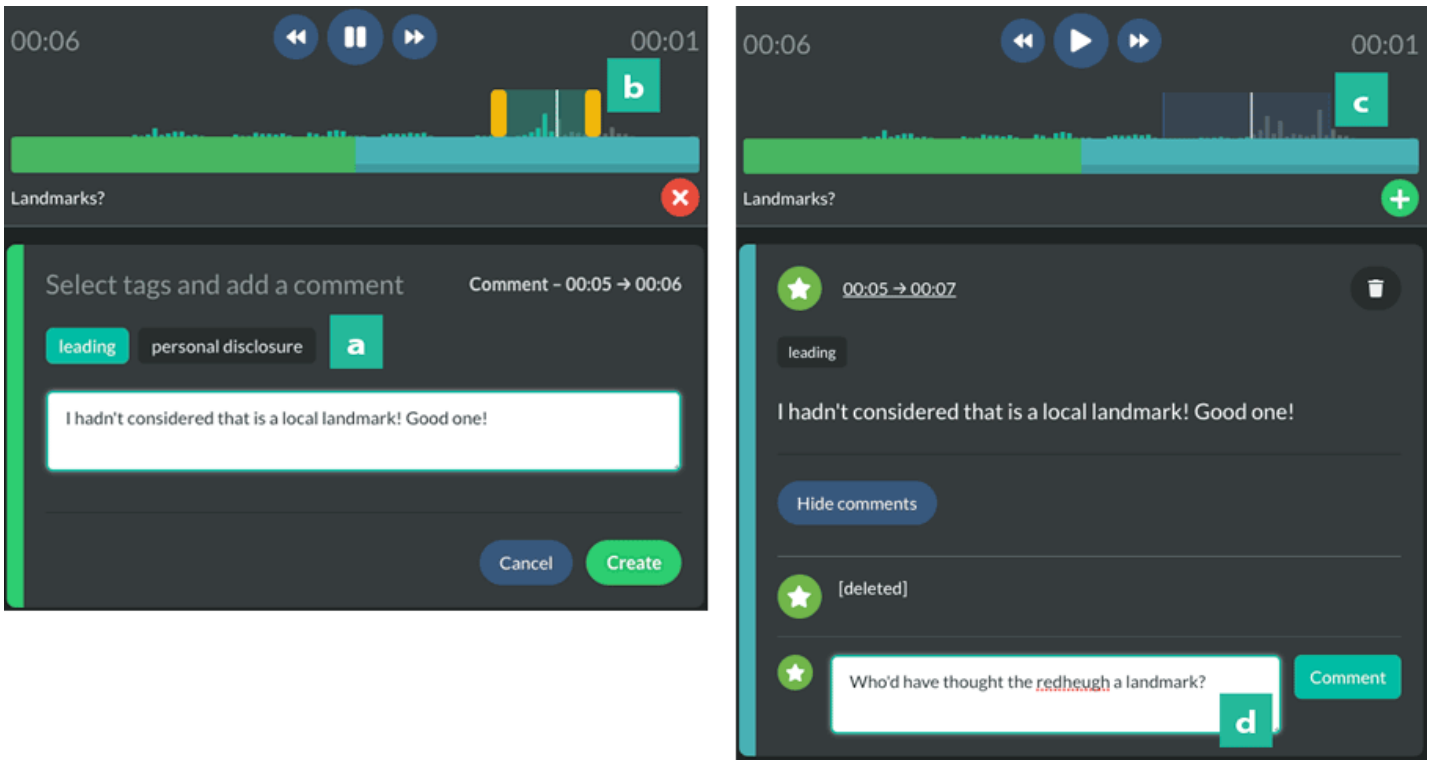


Figure 3.18 When *creating a comment* users can select codes and write a textual response (a) while selecting the exact region of time to respond to (b). Once created, a region is overlaid onto the audio waveform (c) and other participants can respond to create *comment threads* (d).

3.4.5. *Curation*

Dissemination of findings by practitioners typically take the form of written reports, adding additional barriers to how citizens can contribute. Participants that contribute to the data capture stage can feel alienated or excluded from the final output of engagements as decisions made during analysis and dissemination can feel opaque [60, 79, 172]. Recent participatory video research shows the potential to involve citizens in curation activities when working with media directly as a means to lower barriers to participation [21, 175]. As such, the curation stage is designed for participants to view analysed snippets of recordings chosen by all participants and curate *audio playlists* from these. This stage occurs on the Gabber website and was entirely redeveloped from the prior prototype to enable curation and reuse from within the same interface while providing similar styles and user experience as the preparation and analysis stages. The following subsections outline key activities and interfaces of the data curation stage.

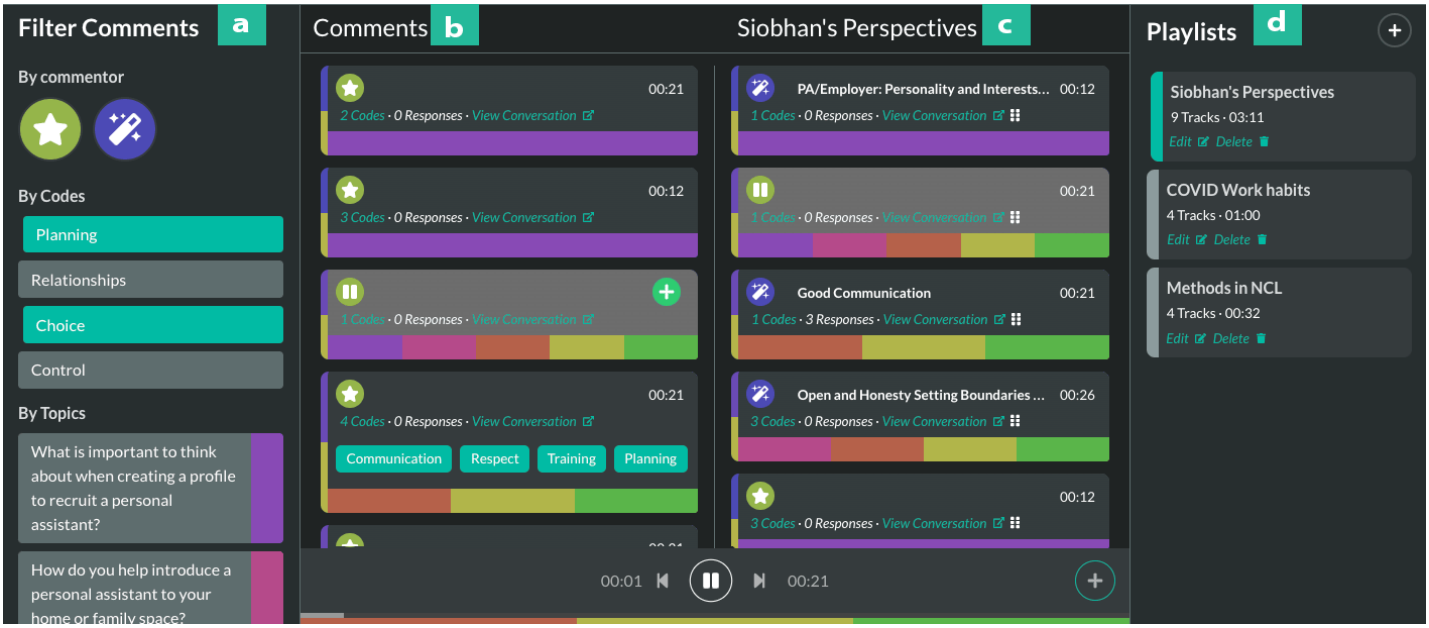


Figure 3.19 All commented snippets from a project are displayed in a list (b) that can be filtered with a range of options (a). The audio recording from the comment snippet can be played and added to a playlist by click (c). Many playlists can be created for one project to share distinct insights from the data (d).

3.4.5.1. *Viewing Analysed Snippets*

The playlist interface was completely redesigned and developed, drawing on design learning from the prior case studies, and consists of one screen that encompasses all interactions to listen, select, and organise commented snippets of conversations into audio playlists for a chosen project. The design draws on the component-based principles applied throughout the web application to create a consistent user experience. Consequently, the left column contains filters that reduce the comments displayed depending on the selection (Figure 3.19), and the right column contains participants existing playlist and a button to create a new one. Informed by design learning from the curation prototype, the central column adapts a similar design and displays all commented snippets of audio conversations for the associated project in list format

inside a scrollable container. The right column shows the selected snippets contained in the active playlist. A media player is positioned at the bottom of the central column where a recording snippet is played. Once a snippet finishes playing there is a short pause before the next snippet is played. The media player shows the coloured discussion topic and in contrast to the analysis interface shows no audio waveform to draw focus to the commented snippets being played.

The conversation component differs dramatically from the prior prototype to provide more informative, glanceable metadata to help users quickly filter or skip content to simplify curating snippets. This conversation component is composed of two rows: the first shows the commenter's avatar, a snippet of the textual comment that changes depending on screen size or comment length, and the snippet's duration. The second row displays the number of codes that when clicked, lists the codes, the number of comment responses, and a hyperlink to 'View Conversation' that opens the conversation interface in a new tab and plays ten seconds before the comment on the recording. This was designed in response to participants wanting to know who created comments (avatar), why (the comment text), and to expand on the recording's context (view conversation). The final row displays the colours of topics where the comment occurs in the original conversation and the codes applied to the comment are coloured on the left-side of the component. This is consistent with the conversation interface to enable association between otherwise independent comments that could help streamline the filtering activity.

3.4.5.2. Curating Playlists

The curation interface supports reviewing project recordings and making playlists from the annotated audio to allow users to capture points of interest for a specific project. When the 'Create playlist' button is pressed in the right sidebar, a dialog opens where participants can write the name and description of their playlist (Figure 3.19.d). Users can edit the playlist's metadata through clicking the 'edit' button associated with the playlist component, which displays the same dialog but in edit mode. The playlist is then created and becomes active, changing the text in the playlist column. Users can then add commented snippets to the active playlist while listening by either clicking the plus button in the media player or when hovering over the snippet, which then automatically appears on the playlist column. Participants can arrange the order of snippets by dragging them to their desired location similar to existing media player interactions. This feature was previously requested by participants to improve how insights were represented when sharing or reusing the playlist. The prior case studies identified the utility for participants in creating and associating textual memos with playlist snippets to provide a reminder for why snippets were chosen, although this feature was not heavily used. As such, memos are optional and can be created after adding a snippet to a playlist by hovering over it and tapping the writing icon, which creates a dialog similar to "Create Playlist". All data resulting from actions created by users are cached in their browser and automatically sent to the API to synchronise state between the client and server, e.g., adding a snippet to a playlist.

3.4.6. Reuse

Findings from chapter 4 highlighted how practitioners wanted to use the playlist interface to support in-person discussions that centred around the lived experiences of participants. Key to this and distinct within the Gabber workflow was the reuse of participants voices to structure a range of use cases, from educational training to reflective practice. Due to this stage being the last in the platform development and overlapping with the deployment in the following chapter, less time was spent on its development. As such, the playlist interface was reused through the inclusion of a 'sharing' view that when enabled, the participant's selected playlist expanded into one column where each annotated region would be played in-turn as illustrated in Figure 3.20. This reuse of the curation interface sought to promote a familiar and seamless transition between stages that is familiar to participants, therefore requiring less time from the participant to learn it.

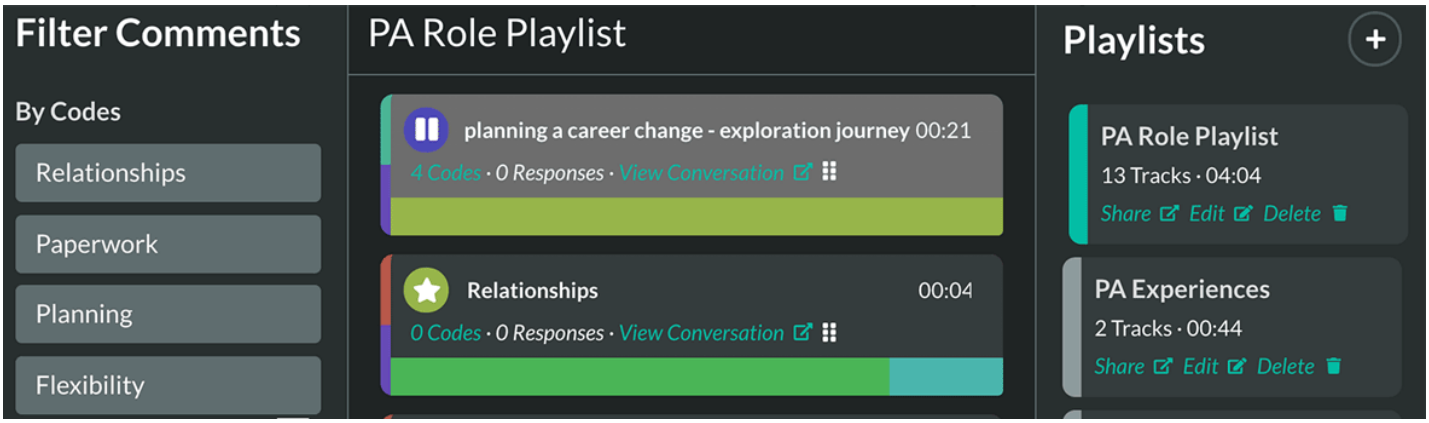


Figure 3.20 Participant's voices play a central role when reusing a playlist in the Gabber platform.

3.5. Summary

This chapter described the rationale behind the technical and design decisions underpinning **Gabber**, a digital platform designed to realise the qualitative workflow proposed in chapter 5 that builds upon design learning from findings across three prior case studies as outlined in chapter 4. Gabber is distinct from prior research and commercial systems in three ways: (i) by reusing the original captured audio media to increase the inclusivity of each workflow stage; (ii) by encompassing the *complete end-to-end workflow*; and (iii) by being designed with and for multiple stakeholder groups. Moreover, an overview of the platform's architecture and how each technology stack interacts was also outlined. Following this, Gabber's mobile and web applications, their functionality, user interactions, and design motivations were described.

The following chapter documents the iterative design research undertaken across three distinct case studies to explore how digital technology can facilitate inclusive participation in each qualitative workflow stage. Design learning across these case studies informed the iterative development of independent prototypes to explore each workflow stage in practice, which ultimately resulted in the development of the Gabber platform as outlined in this chapter.

Chapter 4. Designing and Prototyping A Digital Qualitative Workflow

4.1. Introduction

The previous chapter described **Gabber**, a digital platform that aims to make all qualitative workflow stages more inclusive for practitioners through one technology. Gabber was refined and developed as an outcome of the three case studies presented in this chapter in preparation for subsequent research that examined the *complete qualitative workflow* in practice. In contrast, this chapter explores the iterative design of digital prototypes to examine each stage of the qualitative workflow – *i.e., capture, consent, analysis, curation, and reuse* – through three distinct field deployments in real-world contexts where stakeholders were either interested in, or already actively engaging in qualitative research and who wanted to make their practices more inclusive.

This chapter begins by describing the overarching methodology taken throughout the thesis – *Action Research (AR)* – its rationale and limitations. AR was adopted to create research insights through practice while improving the situation under study – i.e., qualitative practices for practitioners. As the focus was on the iterative design of digital prototypes, a design research approach was adopted that applied AR that is then documented in detail, i.e., *Participatory Action Design Research (PADRE)*. This approach was applied to the iterative design of digital prototypes across three distinct case studies over a two-year period. The context, research focus and data collection procedure of each case study is then described in succession. Each case study examined a specific stage of the qualitative workflow to inform the design of a prototype for use in the subsequent case study while deploying iterated prototypes based on prior design learning in the current case study. Findings are then grouped by qualitative workflow stage to illustrate the chronological design learning from of each prototype, how they were adopted, and the challenges experienced in practice. Finally, reflections on findings across case studies and the design process taken are discussed.

Related Publication and Acknowledgements

- The research presented in this chapter extends a prior CHI'19 publication, Rainey et al. [225], which is heavily modified to be consistent with the overall narrative of this thesis. The research undertaken within each case study and the associated study design, engagement, analysis, and writing were undertaken by the thesis author with support from supervisors and collaborating organisations unless otherwise specified below.

4.2. Research Approach

An aim across this thesis was to understand how digital tools can augment existing qualitative research practices to make them more inclusive and meaningful to practitioners across all stages of the qualitative research workflow. Understanding and improving stakeholders existing practices through a collaborative, action-oriented research approach motivated the choice of Action Research (AR) as the overarching approach taken *where possible* [226]. This section outlines AR, its benefits, and limitations in the production of research knowledge, and in particular the challenges of producing design artefacts across multiple contexts. In response, and due to the design focus of this chapter, a Participatory Action Design Research (PADRE) approach was adopted. PADRE is distinct from AR through its focus on iterative cycles of reflection and learning that emphasis *design learning* to refine a digital artefact through real-world deployments in organizational contexts [118]. This ensures that digital prototype designed respond to stakeholder's needs whilst the technology outcome can be reused and applied across contexts outside the initial AR project.

4.2.1. Action Research

Reason and Bradbury [226] describe Action Research (AR) as *"a participatory process concerned with developing practical knowing in the pursuit of worthwhile human purposes"* while Hayes [122] succinctly frames it as to *"learn through doing"*. Key to AR is working *"with"* stakeholders rather than *"for"* them to iteratively and incrementally produce social change that improves the situation being studied [226]. AR is often characterised as a cyclical process of *Plan, Act, Reflect*, summarised in the context of designing technology with communities as:

> *. . . cyclical in nature, with an emphasis on problem formulation, design of an intervention, action (e.g.,, deploying the intervention), observation of the effects of the action, reflection, and then redefinition of the problem to start the cycle again.* [122]

AR projects involve close partnerships with community members where the researcher often becomes immersed with participants in their local environment to better understand the research being examined. This involves prolonged engagements by the researcher into the community that enables *"tacit knowledge"* to surface that is not possible through other methods (i.e., interviews) and provides an opportunity for data collection through field observations, making the data collection process value-laden [122, 123]. Consequently, the solutions and associated knowledge created through AR is less concerned with generalizability of research findings [122] and instead is evaluated on the credibility and validity on whether actions address real problems for participants (i.e., *"workability"* [116]) and whether the project outcomes can be applied, in part, to another context with similar aims, i.e., *"transferability"* [122].

AR is open-ended and iterative as a methodological process, and democratic and collaborative in its orientation towards knowledge production. Knowledge created through AR is socially co-constructed with community members to generate pragmatic solutions to real problems they

experience [122]. AR when adopted in HCI research is thus an approach to research that has a duality of purpose: (i) improving the situation for participants through real-world problem solving; and (ii) creating new, contextually grounded knowledge through practice. As such, the epistemological view taken across this thesis is that of an *interpretivist* with the goal to develop meaningful, localised solutions with stakeholders. This involves working *with* participants to understand the problems they face and determining which problem to tackle (plan), designing and deploying a technology intervention to respond to this problem (action), and reflecting on the outcomes of this intervention to iteratively refine a new or augmented approach to further improve the situate under study (reflect). The case studies presented in this chapter show how AR was adopted to enable design insights across three distinct communities – described as case studies below – while responding to real challenges faced by participants through deploying digital prototypes to enhance existing qualitative practices. Through these AR case studies I observed how technology was adopted through real-world use at specific or/and multiple stages of the qualitative workflow and reflect with stakeholders – *academic researchers, citizens (service-users), civil society organisational staff* – on how the digital tools could be refined to improve their qualitative practices. Critically, while an overarching AR approach guided the research presented in this thesis, a *human-centered design* (HCD) approach was adopted to the iterative design and development of digital prototypes in the case studies presented below. While all case studies adopted HCD and aspired to create action for those involved (i.e., teachers and students), in practice only case study two was an action-research project due to its longitudinal configuration and my embedded role as an action researcher.

4.2.2. Participatory Action Design Research (PADRE)

Key to the research goal of this chapter was understanding the requirements of each context to inform the iterative design of digital prototypes that respond to the real-world challenges of stakeholders, whilst gaining practical knowledge to iteratively inform prototype design. Participatory Action Design Research (PADRE) is a design research method that draws from Participatory Action Research's democratic philosophy that aspires to include stakeholders at each stage of the research process [23] and to configure research with the aim of designing systems with stakeholders and allowing for the system requirements to emerge and develop in an organizational context [118]. As such, PADRE involves *"reciprocal dialogues between stakeholders and researchers"* to ensure the design outcomes respond to real-world needs of systems developed [118]. PADRE is composed of four components – *Plan, Implement, Evaluate, Reflect* – where each produces design learning and research knowledge through practical experience that is documented in a *"learning nexus"* that can be applied to future PADRE cycles [118]. The *Implement* stage is distinct from Action Research (AR) through focusing on designing prototypes that specifically respond to stakeholder needs identified in the prior stage [122]. The key differences between PADRE and AR are its focus on incorporating iterative reflection across each stage of the process to encapsulate practical design learning for digital systems, and the focus on implementing and deploying digital technologies. In this way,

PADRE can be applied as a specific strategy undertaken as part of a larger action research process. This emerging design approach has been successfully applied in HCI to the co-design of web platforms to support citizens accessing, exploring, and disseminating public statistics to reflect upon amongst their communities [218]. PADRE is adopted in this chapter as a design oriented approach to action research where the digital prototypes developed respond to real needs while producing practical knowledge. Moreover, when applied across multiple contexts, as in this chapter, design learning from PADRE can be further validated and reflected upon, producing transferable and workable solutions to overcome concerns of generalizability of research findings raised in AR research [122].

4.3. Case Study Approach

A case study provides *"in-depth appreciation of an issue, event or phenomenon of interest, in its natural real-life context"* that creates a *"multi-faceted understanding of a complex issue in its real-live context"* [64]. Stake [254] posits three types of case studies: *intrinsic* (to study a specific social phenomenon), *instrumental* (in-depth study in one context), and *collective* (studying multiple cases to generate a broader understanding of a particular issue). A collective case study approach was adopted within this chapter to observe and explore how digital prototypes at each stage of the qualitative workflow were adopted and used in naturalistic settings. This approach offers the advantage of making comparisons between case studies, iteratively building upon and reaffirming findings across each case, thereby overcoming methodological limitations of a single context-specific case study (i.e., intrinsic) [64]. This enabled our research to be action-oriented while examining qualitative practices in natural settings, and where we could iteratively design digital prototypes that respond to a diverse range of stakeholders needs, and in doing so develop digital systems that are meaningful across contexts.

In HCI, *field deployments* (elsewhere termed *"in-the-wild"* deployments [239]), are the counterpart to case studies that focus on *"the trial of a newly developed or created technology (often a prototype) in situ"*, and provide insight into how digital systems are used by people in a natural setting and where the system is designed for an intended use [249]. Field deployments are thus an application of case studies with a focus on technology development and are widely used in HCI, ranging from the iterative design of a feedback technology to improve the provision and delivery of services by care organisations [79] to the deployment of smart watch application to support citizen feedback on urban planning [277]. Similar to case studies, field deployments are a primarily qualitative methodological approach to research but can include quantitative findings such as analysis of paradata generated through system use [249].

The following subsections presents three distinct case studies conducted over two-years with stakeholders who either desired to or were already actively engaging in qualitative research practices and who wanted to use technology to make these practices more inclusive. Within each case study, the study design and data collection procedure are detailed. Following this, how participants were recruited across case studies and the data analysis approach undertaken in this chapter is described prior to documenting the findings. An action-oriented *PADRE* approach

was taken across case studies to iteratively design and refine a set of digital prototypes that examined each stage of the qualitative workflow in practice. Design learning from the previous case study informed prototype development, shifting the research focus of each case study to the subsequent qualitative workflow stage as outlined in Table 4.1. Our collaborator's goals varied across case studies: the first (CS1) aimed to capture informal conversations between university students weekly for the lecturer to augment the taught pedagogy, the second (CS2) to capture, analyse, and reuse service-users experiences to inform reflective training delivery in a social care work environment, and the third (CS3) to support peer feedback on interview training in a postgraduate class.

	Qualitative Research Workflow Stages				
	Consent	*Capture*	*Analysis*	*Curation*	*Reuse*
CS1	△	△	□	□	□
CS2	◯	◯	△	□	□
CS3	◯	◯	◯	△	△

Table 4.1 Initial prototype *development and deployment* (△), *design learning* (□), and *iterative design and deployment* (◯) across each stage of the qualitative workflow per case study.

The research of this thesis explored the characteristics necessary to support qualitative practitioners in the conduct of all stages of the qualitative workflow, from capturing an interview, analysing the media directly, to reusing the audio recordings as a form of dissemination, i.e., **RO1**. The subsections below expand on the context of each case study, the design focus in each, and the study design and data collection methods used. Following this, the recruitment and analysis procedure used across case studies is described.

4.3.1. Case Study 1 (CS1): Augmenting Pedagogy Feedback

Feedback typically involves sharing opinion in either written or media format and analysing and using this knowledge for a specific purpose, such as improving service delivery [79] and is typically composed of varying qualitative practices. Student feedback on teaching and learning during university courses generally occurs at the end of the semester through surveys or questionnaires, which has no direct impact on the students learning. How this feedback is used, actioned, and impacts the curriculum for future students is also often unclear, making this feedback process and the associated data disappear into a *"black hole"* similar to what is experienced with providing feedback on public services [79].

To explore alternative feedback processes and by extension the associated qualitative practices, we collaborated with a Newcastle University lecturer, **Sami** (pseudonym), who was preparing to teach a one semester (ten-weeks) postgraduate course on Human-Computer Interaction. Sami wanted to explore new ways of capturing and using student feedback to iteratively refine and augment their teaching. Key to this was a desire to audio record students having short, informal, peer conversations on the prior week's teaching and reading material as part of the class. Recording audio media was inspired by Sami's desires to capture informal, natural, and

rich dialogue, and to rapidly listen and engage with this content drawing from their expertise as an academic qualitative researcher. Prior to the course commencing a mobile application prototype was designed to structure the *consent and capture* of audio conversations as illustrated in Figure 4.2. The research focus in this case study was two-fold: evaluating the prototype through real-world use and observations, and to gain *design insights* into how audio media was *analysed, curated, and reused* (Table 4.1).

4.3.1.1. Study Overview

12 students took part and were divided into unique groups of three each week, termed *"learning triangles"*, which ensured that all students could converse at least once with all other students. Students were given 20-minutes to find a quiet space to use the digital prototype to audio record conversations in their groups. Topics, which were textual phrases used to structure the capturing of audio conversations in the prototypes, were set by Sami prior to the class each week. These topics appeared in the prototype to help structure student conversations, such as *"Something you've found out about this week that surprised you."* (week one) or *"Are we researchers, or are we activists?"* (week ten). Each week had a different theme to mirror the taught material, for example, conversations recorded in week one discussed *"Your Experiences with HCI"* while in week seven they were *"Tangible User Interfaces"*. Feedback on teaching was provided by students in 7/10 weeks due to student workload and preference on the other weeks. In total, eight hours of conversations were recorded with an average of 70-minutes across groups per week (SD=11m, min=47m, max=85m). Consent was provided through email by each participant for each conversation recorded to give ownership and control to participants on what conversations to share with Sami. Prior to the following week's lesson, Sami listened to the consented audio conversations to understand the shared challenges across students. Each week Sami disseminated the 'analysis' at the start of the lecture to show how this week's teaching had changed, and adapted the planned material to be delivered to better accommodate the student's needs and desire.

4.3.1.2. Data Collection

I attended each class where group feedback was delivered by Sami based on their analysis and where the digital prototype was used by students. This enabled an in-depth understanding of how students perceived the feedback delivered and how they used the digital prototypes to capture conversations. Informal conversations took place with students following their recording and with Sami each week to gain insights into how the prototypes were used and perceived by participants. These observations were written up following each session as field notes. Finally, semi-structured interviews were recorded with Sami during week one and ten to understand the initial and overall experience analysing audio conversations and their perspective on how the use of digital prototypes augmented the feedback process.

4.3.2. Case Study 2 (CS2): Reflective Feedback in a Sensitive Context

From September 2016 to November 2017, we collaborated with FL, a charity organization based in North East England that helps connect individuals with complex needs with other local services, such as housing providers. An individual with complex needs is defined as experiencing a combination of at least three out of four of these problems: homelessness, re-offending, substance misuse and mental ill health. Consequently, FL's service users are both extremely vulnerable and difficult to engage with. During the early stages of FL, a systematic evaluation of their service found that service-staff lacked a shared understanding of what complex needs meant and the types of care and services that service-users should be offered. In response, a senior staff member, **Ray**, began audio recording interviews with service-users to document their experiences and narratives of complex needs, and then produced long videos where an analysis of the interview was presented. These videos were then curated by Ray and offered as a training package on complex needs and reflective practice and delivered to external organisations to help them better understand their shared client base. This entire workflow was being run by one employee, Ray, necessitating similar material being used across training activities, which restricted what could be used and discussed in training. This was primarily due to time limitations in listening to and curating interviews and the time required to learn new media production software, all of which took place on a tablet device. Moreover, this also meant that each workflow stage was inaccessible to other staff, who would have gained value from participating.

FL had previously collaborated with our research lab and shown desires to create a new collaboration to explore new ways of making their existing practices more open and accessible for their staff and service-users, and to help identify insights that could be used as training resources. This collaboration was led by me and Ray, who had hoped this would result in a more diverse and relevant dataset that could be used for training and where different stakeholders (staff and service-users) could engage with all stages of these informal qualitative practices. Our research focus was three-fold through this partnerships: (i) gaining an in-depth understanding of civil society practitioner's *complete qualitative workflow*; (ii) to *deploy and evaluate* the existing prototype for *data consent, capture, and analysis*; and (iii) to utilise design methods to gain *design insights* into how audio could be *curated and reused* (Table 4.1).

4.3.2.1. Study Overview

To gain insights into existing qualitative practices I began meeting and attending interviews between Ray, service-users, and their support worker, observing Ray's analysis and media production process, and attending and observing internal and external training delivery by FL. In contrast to CS1, CS2 encompassed the *complete qualitative workflow* with prototypes deployed for *data consent, capture, and analysis* and design methods used to examine alternative practices for *curation* and *audio reuse*.

Observations of FL's existing qualitative practices informed the iterative design of the capture prototype developed in CS1. FL configured the capture prototype to mirror their existing interview schedule: 11 themes were used with associated images to structure a reflective dialogue

between a service-user and a staff member, including: *'direction', 'motivation', 'side-tracked', 'stuck', 'problem', 'emotion', 'conflict', 'help', 'plan', 'act' and 'reflection'*. As an example of the textual topic used for 'side-tracked', participants were asked *"What sort of things do you think get you side-tracked when you have plans?"*. Ray took the lead for capturing conversations, recording five conversations with service-users who discussed their lived experiences with complex needs (mean=40m, SD=25m, min=10m, max=70.5m). Based on prior design learning, a simplified web-based prototype was developed where participants could view, comment, and code directly on audio conversations as the analytical process. We then assisted FL to iteratively create a codebook to structure data analysis, resulting in 26 codes, including: *"hope"*, *"direction"* and *"relationship"*. The analysis stage was undertaken by five staff and one service-user at different points of time. In total, six participants created 110 comments, comprising of 320 codes across four 45-minute conversations: one service-user created seven and five staff created 103 (of which Ray created 72). One conversation was excluded due to ethical considerations by Ray as outlined in the consent findings.

To explore alternative practices for *data curation and reuse*, a Wizard of Oz (WoZ) design activity [182] was held with Ray with the aim of using the tagged corpus of commented audio conversations to create a structure, schedule and select material for use in training delivery. This session lasted 88-minutes and the application of WoZ enabled unconstrained exploration of audio segments that provided design insights to inform the creation of a future prototype. Our research aim was to understand the types of questions that would be asked of the coded corpus of data to produce design insights.

Following the curation session, five snippets of audio were chosen from three participants and retrieved from the digital prototype, then ordered to mirror the timeline created in the WoZ activity. These recordings were sent to Ray in preparation for an internal training delivery on reflective practice delivered in the same week. This session lasted two hours and was attended by four staff, including Ray who delivered the session. I attended to observe how the audio media and training structure created in the previous design session worked in practice.

4.3.2.2. Data Collection

Of the three case studies presented, CS2 was the most longitudinal, covered the most qualitative workflow stages, and therefore generated the most research data. Throughout the duration of this study, I worked directly with Ray who was responsible within the organisation for our collaboration. Consequently, I met service-users (including the five interviewed with the digital prototype), staff that worked directly with service-users, and senior management to build rapport, better understand the organisation structure and how they serve their service-users to ensure the design of prototypes suited their existing working practices. Field notes were written up following these informal meetings to document my understanding of their existing practices and use of technology.

I observed the capture prototype being used for each interview recorded by Ray and interviewed one service-user, Walter (pseudonym), and five staff following their use of the analysis

prototype. Recordings lasted 45-minutes on average (SD=9m, min=37m, max=57m). The focus of these interviews was to understand the experience of listening to service-users or the participant themselves, and the perceptions and potential value felt through commenting on audio snippets and using technology in this way. Prior to each interview, paradata was analysed to understand the time and contributions each participant made to inform more meaningful discussions about *why* they made specific decisions when using the analysis prototype, for example, *"What made you choose these codes?"* and *"What made you choose to create a comment at this point [in the audio]?"*.

The Wizard of Oz curation session with Ray was audio recorded and provided insights into the decisions made when prioritising and selecting audio media for reuse. Finally, the internal training delivery session centred around the reuse of audio snippets to understand how the data was reused and the types of discussions it supported. This session was audio recorded to provide insights into how each aspect of the qualitative workflow was augmented through using the designed digital prototypes alongside an in-depth contextual understanding of how the organisation appropriated the technology.

4.3.3. Case Study 3 (CS3): Peer Feedback on Interviews

In September 2017, we collaborated with a university lecturer, **Tony** (pseudonym) to deliver a postgraduate course on research methods to 12 students who would be introduced to qualitative research, the techniques for interviewing, and taught how to conduct interviews. In previous years, the course had been designed to give students practical experience of conducting interviews and analysis through formal assessment, but Tony found giving individual feedback time-consuming and repetitive across students. Instead, Tony wanted to support peer learning by having students *capture* conversations following the same interview schedule and provide peer feedback through *analysis* of interviews, such as highlighting the positive (i.e., intended pauses) and negative (i.e., leading) aspects of interviewing. Tony also wanted to be able to listen and *curate* a subset of audio interview snippets to showcase and *reuse* content to inform group feedback on interviewing technique. In preparation for this case study, a new digital prototype was created – informed by design insights from CS2 – to enable the curation and reuse of audio media in the form of **audio playlists**. This interface presented snippets of audio that were commented on during the analysis stage and could be filtered by code or textual topic. Participants could then listen to snippets and create a media playlist from these for reuse output of the prototype (Figure 4.7). The research focus in CS3 was two-fold: (i) to *redeploy and evaluate* our existing prototype for *data consent, capture, and analysis* in a new context to refine existing features; and (ii) to gain *design insights* into how a new digital prototype was adopted in practice to support *curating and reusing* analysed audio data.

4.3.3.1. Study Overview

This case study was conducted over four two-hour classes split into two *sessions*: (i) one class where the student and lecturer familiarised themselves with the *capture and analysis* prototypes

through real-world use; and (ii) three classes were all qualitative stages and associated prototypes were used by Tony, including the new *curation and reuse* prototype. These sessions emphasised teacher-to-student and student-to-student feedback on interviewing technique respectively. I attended all sessions to observe how the prototypes were used and to discuss the challenges and thoughts participants had after their use and interactions with the prototypes.

The first session involved co-designing an interview schedule, recording short conversations in six groups of two to familiarise themselves with the capture prototype and co-creating a codebook to structure peer feedback through the analysis prototype. The codebook was comprised of 17 codes including: *"Open/closed ended"*, *"Leading"*, *"Personal disclosure"*. Before the next session, Tony used the analysis prototype to provide individual feedback to each student's conversation, creating 65 short textual coded responses, for example *"Interesting case of empathy 'backfiring'?!"* with the codes *"Rapport"* and *"Interest/empathy"*. The curation prototype was not used in this session as it was planned to be used with content where students analysed data during the second classroom session. Having Tony engage with data analysis provided additional insights into how academic researchers adopt this prototype.

The second session involved three classes. The first class involved co-designing an interview schedule on the subject of *"Transport in Newcastle"*, which had ten topics that were split into three *"main"* and seven *"probe"* questions, for example, *"(main) tell me the story of your commute?"* and *"(probe) what other transport would you prefer to use?"*. Students were asked to conduct interviews using the capture prototype with participants from outside of the classroom prior to the next lesson, e.g., flatmates, members in the research lab, or friends. In total, ten interviews were recorded lasting 2-hours 52 minutes (mean=18m, SD=6m, min=6m, max=24m). Two students did not record interviews as they were either ill or not assessed. The second class involved students listening and providing *peer feedback* onto segments of the interview where they thought that the interviewer could improve using the previously co-created codebook and the digital prototype. Students worked in pairs to provide feedback to peers and used the analysis prototype to create a total of 55 comments using 93 codes. Three of these conversations were not made available for analysis because consent was not provided. Prior to the final session, Tony used the *curation prototype* to listen to the snippets of audio that students had commented on through the peer feedback process. One *audio playlist* was created by Tony that contained 12 audio snippets totalling two minutes, which were from five student comments and three unique interviews. In addition, short textual notes were created by Tony that appear alongside the audio snippet to contextual the choice of data, for example *"flow of conversation interesting here"*, *"Nice example of steering the conversation"* and *"Ask: what are gremlins?"*. In the final class, Tony used the curation prototype to play audio snippets to support the delivery of group feedback and a reflective discussion on interviewing technique with the students, which lasted 25-minutes.

4.3.3.2. Data Collection

Data collection in this case study was primarily observational due to a combination of participants using prototypes for all stages of the qualitative workflow and the short duration of the case study.

Field notes were written to outline observations of prototype use – i.e., capturing interviews in class, analysing interviews, and Tony using the prototype in class to provide group feedback – and discussions with students during and after each class. These were analysed and used to refine the interview schedule in CS3 prior to interviewing three students and Tony about their experiences using each prototype feature, which lasted 18 minutes on average.

4.3.4. Participant Recruitment

Recruitment in each case study depended on its configuration. Stakeholders in CS1/3 were from the same university department and with no direct relationship with the thesis author or their supervisory team. The class, students, and lecturer differed across each case study. CS1/3 aimed to create change – student feedback and teaching delivery respectively – through embedding the digital prototypes into the delivery of teaching and learning as part of a module, therefore participation by students was required. Separate recruitment was taken at the start of each case study to obtain consent for observational research and to agree for informal discussions on prototype use.

Due to the sensitive nature of the services delivered by the partner organisation in CS2, all recruitment of service-users was undertaken informally through a gatekeeper, FL. This necessitated a range of service-users whom FL thought would gain personal benefit from engaging in this process. The inclusion of service-users at each stage of the workflow was fundamental throughout this engagement and consequently led to a more long-term engagement due the inherent difficulty in arranging meetings with individuals with complex needs. Staff were self-selecting, either because they were support workers of the service-users who engaged in the collaboration or were interested in hearing and learning from the experiences of service-users they did not otherwise meet. The final internal training was an exception as all FL staff and service-users who took part at any stage of the engagement were invited to participate.

4.3.5. Qualitative Data Analysis

The quantity of data collected varied drastically across case studies, primarily due to their duration, i.e., one, 14, and one month respectively. CS1/3 were comparatively short compared with CS2, and as such the associated fieldwork was primarily observational due to a combination of participants using prototypes for all stages of the qualitative workflow and the short duration of each. In contrast, CS2 was a more longitudinal collaboration, therefore accommodating interviews within specific stages of the qualitative workflow. Consequently, data analysis was therefore an incremental, continuous, and iterative process during each case study, with the aim of reflecting on and learning from prototype usage to guide the design process prior to the subsequent engagement, similar to other research undertaking field deployments [249]. Analysis focused on design challenges with prototypes that were confirmed through informal member checking with participants and data triangulation based on similar challenges experienced in the previous field deployments to ensure transferability of our findings.

4.4. Findings

This chapter emphasises the design process associated with each workflow stage, therefore grouping findings by workflow stage – *preparation, consent, capture, analysis, curation, and reuse* – enabled more meaningfully illustration of how the design characteristics of the prototypes evolved over time, i.e., **RO1**. A chronological account of how each case study informed design decisions, design learning, and how the digital prototype for each stage evolved across case studies is presented. These findings draw from observations through fieldwork across case studies with an emphasis on design learning for iterative prototype refinement. The labels defined above (CS1, CS2 and CS3) and the participants role in the study (lecturer, student, service-user, or staff) are used to distinguish between participants across case studies when reporting findings.

4.4.1. Preparation

Determining what topics to capture data for and how to configure the data capture and analysis stage is often taken offline in both top-down and bottom-up practices depending on the context [21, 174]. Likewise, this stage occurred offline between stakeholders with varying degrees of deliberation. The data capture stage requires *topics* to be configured that appeared in the mobile application to structure data capture. In CS1, *topics* were created weekly by Sami to obtain informal feedback on taught material that was used to refine the delivery of the module. For example, in CS1, topics ranged from aspects of taught material (i.e., *"giving feedback to others"*) to learning outside the classroom (i.e., *"the workload"*). While in CS2, Ray created topics once at the beginning of the collaboration to mirror the existing reflective framework that the organisation had developed and used Figure 4.2. In contrast to the prior two case studies, CS3 involved the co-design of topics with participants, and with the use of the capture prototype in mind. This resulted in shorter, more focused topics, such as *"landmarks?"* and the use of a catch-all question (i.e., *'any other thoughts about transport?"*). Topics began with *'(main)'* and *'(probe)'* to indicate their focus with the lecturer noting to students that the main topics must be covered. Due to the potential variation of offline practices, the focus of design of this stage was understanding the minimum requirements necessary to support the subsequent stages that could be configured by individuals prior to digital prototype use.

In summary, the creation of content to structure data capture and analysis took place offline with a diverse use of practices across practitioners: from bottom-up co-creation and configuration of topics (CS3), drawing from an existing framework (CS2), to top-down selection by decision-makers (CS1/2). This highlighted the flexibility in how data capture could be tailored to individual needs in both top-down (CS1/2) and bottom-up (CS3) procedures. Likewise, the data analysis stage was similarly configured offline through the creation of a codebook as detailed in the subsequent workflow stage.

4.4.2. Consent

Informed consent processes are critical in research practices to inform the participant about the risks and benefits from taking part and requesting their permission for use of the data produced through the workflow. This is typically taken in written form, and as such we wanted to explore how digital technology could be used to supplant the informed consent stage and the challenges this might raise in practice. To that end, during CS1 an email assent workflow was developed where after capturing a conversation each participant would receive an email containing a hyperlink to a website where they could view the conversation and change their consent. There were initially *four* consent options:

1. **None (the default):** participants of the conversation can view the recording & its metadata.
2. **Transcription:** an anonymised transcription of the audio will be made available.
3. **Audio:** only the audio recording will be publicly shared.
4. **Public:** anyone on the website can discover and listen to the recording.

Across CS1, most participants chose the public option that allowed for their data to be made accessible to Sami. The *"audio only"* and *"transcription"* options were chosen three times over the duration of the deployment. When asked why these options were chosen, students noted that they wanted to see what would happen rather than concerns for anonymity. Moreover, Sami's teaching slides identified that consent was *"All shared publicly"* and when participants did not respond to the consent email, Sami would question specific students on their decision during their class. This was problematic due to the small number of students in the class, Sami could determine which students did not upload content and the power dynamic between teacher and student meant that consent may be induced rather than freely given, thereby nullifying the existing email consent stage. How the email and website appeared is illustrated in Figure 4.1:

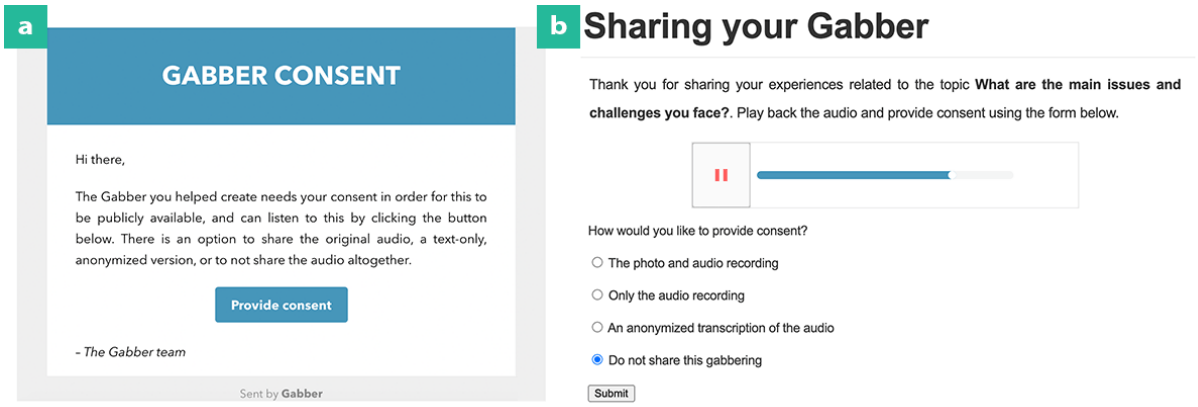


Figure 4.1 The email consent workflow involved: (a) each participant received an email with a unique URL where (b) they could view the recording and update their consent at any time.

For CS2, the consent stage was simplified by removing the *"transcription"* option, however, due to the sporadic nature of the service-users lives and their limited access to technology,

paper-based consent was used to mirror the other three options. During conversations recorded in CS2, participants often revealed personal, confidential, and potentially incriminating details, or expressed views and accusations that were potentially damaging to other individuals and organisations, such as reflecting on their previous experiences using a local homeless shelter service. This raised concerns from FL about whether these conversations could be reused for training as was their current practices. These sensitive conversations included describing multiple, identifiable characteristics of family members (e.g., name, age, place of work, location), experiences participants had breaking the law – including activities they had not been prosecuted for – but also incorporated critiques of services used. For example, one participant revealed personal details that could be used to locate their sister:

> *"If you look at my life you think . . . how'd you end up like that [sisters name]? Cause' she's a manager at [restaurant] in [city] and she's been working there for 8 years now and started at 18."*

In addition, one participant relapsed four weeks after having recorded their experiences, which made FL staff reluctant to use their recording during the analysis stage. At their request, the consent of this conversation was changed to *"none"* to appear hidden from view within the prototype. The issues of consent provided in CS2 highlighted how the current email consent workflow was insufficient in circumstances where conversations captured covered highly sensitive topics or/and where access to technology was a limited factor. This prompted consideration of how and when a service, like FL, might manage consented data with vulnerable populations and the necessary design considerations required.

Informed by design learning in CS1/2, an *embargo period* was added where only participants from conversations could listen to the recording in the first 24-hours to give time to review their consent before the agreed-upon consent was used. In CS3, students created conversations with external participants who were unfamiliar with the digital consent procedure. Consequently, approximately half of all conversations created were unused in the data analysis stage because consent was not provided. Through conversations with students and analysis of paradata from digital prototype usage, it became clear that this was because they nor those interviewed realised that not updating their consent would impact the teaching practice or did not notice the consent email altogether. These factors combined with the previous challenges lead us to consider alternative models for consent. One model in particular was the possible use of in-application informed consent that is agreed upon prior to starting a conversation, combined with post-assent of the data, thus allowing for flexible, dynamic consent processes that suit a broader range of contexts while keeping ownership and control of the data with participants.

In summary, the digital consent workflow evolved through field use in CS1/2, raising issues of power dynamics (CS1) and confidentiality and data ownership (CS2). This led to the introduction of an embargo period in CS3 with our design findings highlighting a need for alternative models of consent that occur at point-of-capture and includes flexibility of when consent can be changed.

4.4.3. Capture

Capturing participant's experiences in their natural environment and as audio media were core requirements of each case study to mirror existing practices. Prior to the course starting in CS1, an Android mobile prototype was designed and developed with the aim of simplifying the capture of structured audio conversations. Audio media was chosen to capture the nuances of experience that written material do not, while being reported as a more comfortable and less invasive experience than video recording [175]. The prototype contained four screens as illustrated in Figure 4.2): (a) the *project screen* that presented a list of buttons containing the names of existing projects to help users differentiate between multiple projects. For example, CS1 appeared as *"interaction design methods"*; (b) the *participants screen* where metadata (i.e., name, email address, and photo) could be added for each participant who was taking part in the conversation; (c) the *capture screen* that presented a swipeable horizontal list of 'cards' containing one image and an associated *textual topic* that appears below the images; and (d) the interface would then change to display 'cancel' and 'save' buttons and the duration of the recording. When the save button was pressed the user would be asked to 'finish' or 'record again' and if 'record again' was pressed the list of topics as cards would be shown. Tapping a card would then take them to the record screen.

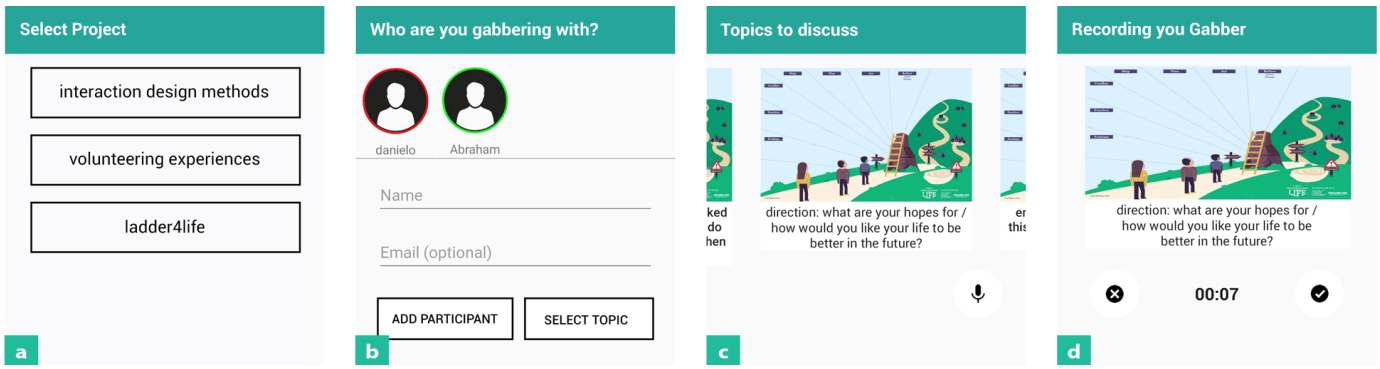


Figure 4.2 Four stages of the capture mobile prototype: (a) choosing the project to participate in; (b) adding participants as being active in the conversation; (c) using pre-defined topics to structure the conversation; (d) recording the conversation.

Topics were designed to structure discussions similar to interview questions but differed as they contained images and short open-ended text to spark themed discussions. Once a topic was pressed, an audio recorder button appeared below the card, which when pressed began recording an audio conversation in response to that specific topic. Key to this prototype was recording a single audio conversation in response to each topic.

The content of conversations recorded during CS1 were informal and topic focused with frequent use of humour to diffuse tension amongst the groups. For example, Sami had provided feedback on student's blog posts that week in audio-video format, and when discussing the topic *"Feedback on your first blog posts"* participants joked about the structure of feedback they received:

> *"I like how he always starts with a good thing and then (all laugh) everything said is constructive and a good thing. He points out really important stuff."* (CS1, student)

Across this deployment, several key design issues emerged. Firstly, it was common across groups that one student took a 'speaker' role that involved reading out each topic and prompting responses from others. Secondly, recording individual's discussions for each topic interrupted the conversations flow, which not only frustrated students, but also produced question-answer responses rather than free-flowing conversations as desired. This also made the subsequent analysis stage more difficult. Thirdly, despite topics being designed to produce short and focused conversations (e.g., *"The workload"*), students often had tangential or in-depth discussions, resulting in long audio recordings (mean=6m20s, SD=2m41s, min=2m4s, max=14m19s) that made it challenging for Sami to engage with each week. Finally, the use of images alongside textual topics was reported by students as distracting from starting their conversation as they were left wondering about the meaning of the image, e.g., *"Why's Sami chosen this?!"*. Moreover, in the *participant screen* it was optional to take a photo of the participant being interviewed, which few participants used because it was unclear how they would be represented or associated with the audio conversation from within the capture mobile prototype.

Due to the limited time between CS1/2 and the focus on developing the analysis interface, the recording screen of the prototype was initially unchanged, i.e., one recording was created for each topic. However, due to the sensitivity of the context and at the request of Ray, the photo option from the *participant screen* was removed. Despite the challenges of using images in CS1, CS2 retained images in topics as their existing interview practices with service-users involved imagery to structure conversations around themes. Topics were configured to mirror these existing practices, resulting in interview style textual topics, such as *"What sort of things do you think get you side-tracked when you have plans?"*. Consequently, the content of conversations recorded was often formal and required Ray explaining concepts to participants or reframing the questions being asked to invoke meaningful responses to topics, which interrupted the conversation flow. For example, on the topic of *"conflict"* Ray set the scene before asking the topic:

> *"When you're trying to stay out of prison, move forward in life where you want to meet someone, settle down, stay off drugs and eventually run your own burger van ... how do you deal with conflict with what other people want?"*

Consequently, long audio conversations were created that made the subsequent analysis stage more time consuming. Despite the formal interview-style approach, content captured across all conversations gave an emotional account of the lived experiences and challenges each participant faced with complex needs. Moreover, capturing participants voice in audio format enabled the capture of dramatic change of moods that would be otherwise difficult to express in textual form. For example, on the topic of *"emotions"* one participant was happy to discuss how they felt about their current drug use, but became aggressive in response to the interviewer probing how they *"felt when others ask you to buy heroin"*, with the participant responding that:

> *"Know what I want to do? I just want to head-butt them and tell them to fuck off. Do you know how hard it is to get off that drug mate?"*

Responding to findings in CS1/2, the *capture screen* in the prototype was iteratively designed to capture a single audio recording rather than multiple separate conversations for each individual topic. Additional metadata regarding what topic was chosen and when in the audio was stored for use when presenting conversations to participants. This involved presenting only textual topics that changed colour to indicate that they were previously discussed, and a single audio recording was saved rather than one for each topic discussed as illustrated in Figure 4.3.

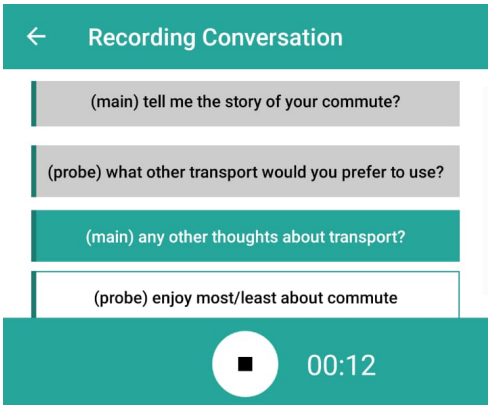


Figure 4.3 In the second iteration of the recording screen topics were textual and appeared as buttons where their pressed state indicated that topics were: covered (grey), active (green) and uncovered (white).

During CS3, the capture prototype was used outside of the classroom by students to record conversations with friends or peers to practice interviewing technique. The content of conversations captured were qualitatively rich and focused on the topics annotated through the capture prototype. Similar to CS1 and despite the formal interview-style questions as topics, the conversations recorded were informal and qualitatively rich, highlighting that the prototype was unobtrusive to the natural flow of conversations.

In summary, the capturing prototype evolved from creating short, individual recordings for each topic alongside the use of images (CS1), to recording a single conversation and tagging it with topics as the conversation changed (CS2/3), with text becoming the focus of topics (CS2). Across this work, the design of topics was critical in determining the conversation style, formality, recording length and quality of conversation, which ultimately impacts the analysis stage.

4.4.4. Analysis

The aim of the analysis stage and our design focus varied across case studies: CS1 aimed to design a lightweight interface to view conversations and learn from how these were engaged with, while CS2/3 was the design of new interfaces to make highlighting insights across conversations possible and to make this stage inclusive to all participants. During CS1, it was the lecturer's role to perform analysis of the entire weekly dataset to understand student's perceptions of the taught material and format and respond. In response, a single-page website was designed and developed

to make the weekly (consented) recordings available, which were listed by topic alongside the names of participants and when the conversation occurred.

As Sami was an expert of qualitative research, observations of how analysis was approached on these audio conversations were used to understand how a prototype could be designed to accommodate these practices. Sami listened to each audio in-turn while making paper-based notes of the challenges or suggestions students made and the associated timestamp where this discussion took place. Some recordings were longer than anticipated, resulting in Sami skipping parts in recordings in search of more relevant content to what had previously been heard in other recordings. This light touch approach often overlooked issues raised by some students due to the limited free time available to engage with content. Sami had expressed interest in working with the audio directly but noted that the workload attached to loading this content into a qualitative data analysis software (QDAS) required extensive time and felt it unnecessary.

One aim of CS2 was to involve service-users and staff in the data analysis workflow stage where they were currently excluded due to it being undertaken by one individual. The design of the analysis stage was primarily driven by desires from participants to support a collaborative discussion directly on the audio media. This enabled the analysis task to be distributed to participants who were not engaged in the data capture stage, but were local experts with a rich contextual understanding of the domain and content discussed. This expertise could then be used to inform the selection of rich insights more quickly. Informed by design learning in CS1 and the workflow aim to reuse captured audio, a prototype was developed to facilitate revisiting each recording and adding a textual response to a specific region of audio, termed an *annotation*. This design drew from existing qualitative research coding practices and analysis software and introduced a feature whereby participants could apply codes alongside their textual comment as illustrated in Figure 4.4.

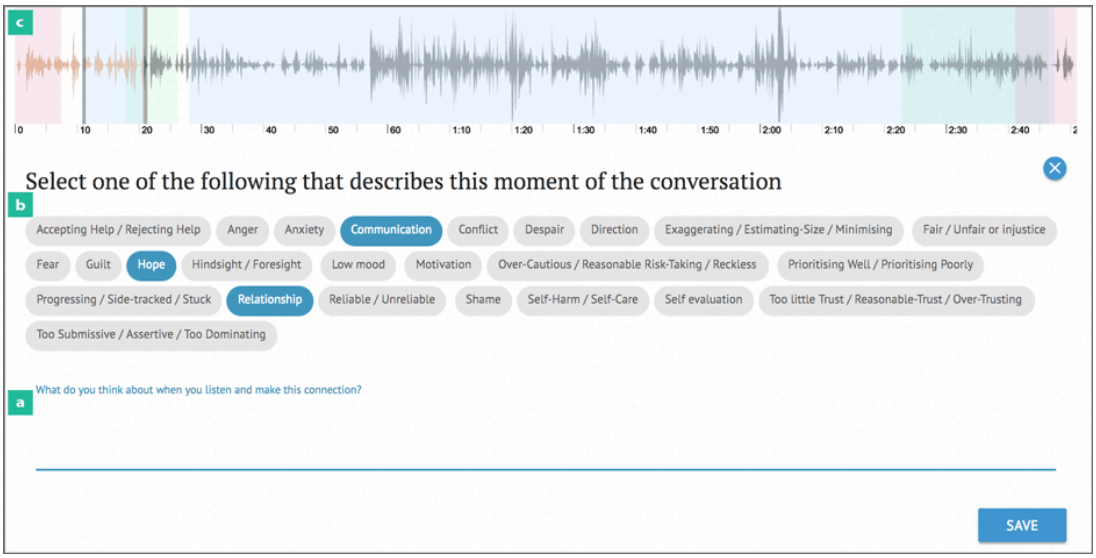


Figure 4.4 An optional text entry field (a) and codebook (b) are presented when creating an annotation. Annotation appear colour-coded and overlaid onto the audio where they can be resized to respond to specific time in the recording (c).

Participants could then view the annotation once that point of time in the audio recording was reached. Audio recordings were presented individually by topic similar to the capture stage to focus data on each topic of interest. Participants could navigate between audio recordings and topic through a navigation sidebar as illustrated in Figure 4.5. The decision to annotate the audio media directly was motivated by a desire to reuse audio in the subsequent qualitative workflow stages. This is in line with existing academic qualitative research practices and was similar to how Ray prepared interview content for training delivery.

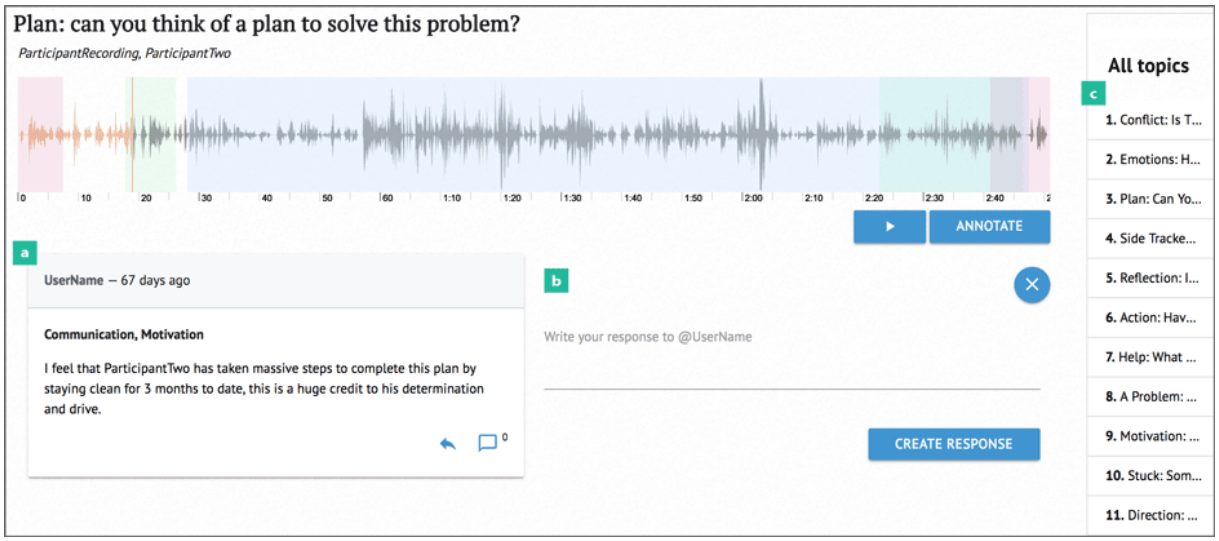


Figure 4.5 An anonymised representation of viewing a recording and annotations in CS2. Each annotation is shown as the audio progresses (a) with the option to respond to the annotation (b). Participants could navigate to a different by topic (c).

As participants could perform analysis at any time, capturing paradata was introduced to understand how the prototype was used alongside observational research and post-deployment interviews. Each action on the analysis prototype was recorded in a database with the corresponding interaction type (what was done, e.g., creating an annotation), timestamp (when), user details (by whom), and metadata related to the action (what second of the audio was pressed). This paradata provided insights into how the prototype was used and helped structure interviews with service-staff and users to understand *why* annotations were created.

Through CS2, two design insights emerged from engagement with the analysis prototype. Firstly, staff felt hesitant to engage with the analysis stage because they knew their name would be associated with annotations, and therefore what they wrote might be seen by other staff members and they did not wish to *"upset other workers"* by being seen to challenge or criticize their working practices. Consequently, annotations often lacked substance and instead primarily reiterated content from the audio conversation to reaffirm and support what participants had said (e.g., *"I was surprised to hear you feel intimidated by staff."*) or explicitly reference content between discussion topics to further contextualise their response (e.g., *"you mentioned [sister] in your direction discussion"*). Moreover, analysis of paradata concerning annotation behaviours highlighted that most staff (besides Ray) created many responses that they did not save as outlined in Table 4.2. While this could be attributed to lack of familiarity with the analysis

prototype, observations of its use and conversations with staff reaffirmed that this was due to associating their name with content.

Participant	*Saved*	*Unsaved*	*Codes*
Ray	77	29	211
Staff 1	13	18	53
Staff 2	13	23	17
Staff 3	5	4	8
Service User	2	0	5

Table 4.2 Annotation's Saved and Unsaved by each participant and the total quantity of codes applied.

Despite the hesitancy and thoughtfulness of creating annotations, staff felt confident creating annotations for conversations with clients of other staff and described this as a *"familiar"* process. All staff members interviewed described that engaging in the workflow had been useful to access new insights: *"like being nosy and privileged to listen to another client that you don't even know"* and provided new knowledge that could be *"used in the field"*. Confidence with the existing prototype can be seen through analysis of paradata: staff spent a considerable time using the analysis interface to listen and engage with content, spending four hours and 52-minutes listening to conversations on average (SD=3h39m, min=36m, max=10h35m) and spending three minutes on average to create an annotation (SD=1m17s, min=2m, max=4m43s).

During the creation of an annotation, participants could resize an annotation region to respond directly to that specific section of audio. 106 of the 110 annotations created were resized from the default 10 second length to an average of 53 seconds across participants, which highlights both a desire to respond to specific content of the audio and the utility of this interface for participants. Codes applied with annotations were described as being more useful compared with the textual comment feature due to the anonymity issue described above.

Secondly, the power of voice through audio was highlighted by both staff and service-users as enabling *"genuine"* connection with the individual as it allowed for emotional tone that would be lost in textual form. This was particularly important for one staff member who made explicit reference to how a service-user had changed since sharing their experiences several months previously: *"I can hear the aggression in Walter's voice. Compared to now and how relaxed and confident he is"*. After listening to his conversation, Walter said that he had been made to *"realize his own words"* with staff attributing this reflective process as a *"big part of his recovery"*. This highlighted the potential value that can be gained through exposing and using voice at each stage of the workflow, particularly for individuals who lack confidence in writing, and a potential therapeutic value when there are teams working together to support service-users.

Building on the challenges raised around the reluctance to share opinion through comments in CS2, the analysis prototype was redesigned to anonymise participants names through the use of pseudonym icons. A goal of CS3 was to include students in data analysis where they were asked to provide peer feedback on interviewing technique. The annotations created by students were informal compared to CS2, perhaps due to participants knowing one another and the

contained classroom setting. For example, one textual response read *"10 points for Gryffindor!"* coded as *"rapport"* and *"flow"* in response to the interviewer doing a good job. Conversely, anonymization of names from the analysis prototype resulted in more critical comments being created by students, for example, *"directly leading ... surely?"*, while remaining informative and helpful *"Good job on picking up on what the interviewee said and giving them opportunity to talk about their experiences"*. Notably, only two occurrences of students changing an annotation's length from the predefined ten seconds to 30 and 25 seconds occurred. Through conversations, students were aware of this feature but felt it unnecessary as the lengths of the recordings were short (in contrast to CS2) and they wanted to quickly complete the analysis stage and saw the default length as *"good enough"*. Similar to CS2, students described a preference over coding data than writing textual responses, in part because they knew it would be more informative for the lecturer to structure feedback, but also because of the *"difficulty"* in determining what to write as feedback to other students. This highlighted the importance of necessary guidance in this stage to ensure participants understand *why* they were creating responses and how it would impact the subsequent workflow stages.

In summary, the analysis stage evolved from understanding existing practices of listening to conversations (CS1), developing a prototype for informal community discussions through annotating the captured recordings directly (CS2), to augmenting this prototype with pseudonymity to conceal participants identities to inform more critical discussions (CS3).

4.4.5. Curation

Selecting and using insights from annotated data was central across the three case studies, but how this material was selected, curated, and used varied significantly. In CS1, Sami's expertise of qualitative data analysis resulted in general themes being created each week in a word document to serve as discussion points at the start of the class, which included telling quotes that were added to slides to remind Sami what feedback to provide, for example, *"'just relax and go with it' – don't worry too much about writing style at the moment"*. However, the use of quotes was rare, which could be attributed to the light touch analysis undertaken, time limitations, or the increase to Sami's workload. Design learning in CS1 was primarily in the capture stage of the qualitative workflow, however, the practice of making personalised notes to guide and structure the delivery of the disseminated insights revealed the need for such note-taking features within digital prototypes.

Following the analysis stage in CS2, a Wizard of Oz (WoZ) design session was conducted with Ray to understand how the analysed snippets of audio could be accessed and curated when planning the delivery of a training session where the recordings would be reused. A cardboard timeline and post-it notes were provided to create an area for note-taking and reflection for structuring and using the audio material in a training session as illustrated in Figure 4.6.

In this session, I acted as a 'search engine' by retrieving and playing conversations through the analyse prototype in response to questions from Ray, for example, a question asked was to retrieve analysed data relating to specific codes: *"can we see, urgh, the annotations people make*

Figure 4.6 A training session timeline being planned through listening to recorded segments of interviews.

around hope?". Database queries were prepared to enable quick retrieval of audio recordings and matching conversations were selected or navigated to depending on what was asked. Ray then read the textual comments and codes applied before listening to the segment of audio and determined if the snippet of conversation was suitable for use in training. Ray often requested to begin playing the recording at the time before the selected audio clip to better understand its context and to determine when to 'cut' the audio for a production ready recording. Ray used post-it notes to document timestamps of relevant audio snippets for potential use on the cardboard timeline, and as the session progressed (and more content was listened to) these began to be grouped by theme. Overall, five recordings were chosen from three unique conversations that covered 4/11 topics, and were 2m41s on average (SD=1m13s, min:1m43s, max:4m5s). The selected recordings lasted 12-minutes in total, and 17 annotations were made on the curated content.

Two design challenges were observed as a result of this session: (i) the conflicting role of our collaborator who was deeply involved in the capture and analysis stages when curating content to structure training delivery; and (ii) ethical challenges of reusing audio media. Firstly, Ray was the most prolific participant during the analysis stage – listening to 10h35m compared with 2-hours on average for other participants, and applying 211 codes compared with participants combined 83. This meant that Ray was familiar with all content therefore the questions asked of the analysed dataset were primarily driven by a desire to listen to content associated with the same codes that he was familiar with. Moreover, Ray's in-depth engagement with all content during analysis and responsibility to deliver training sessions was seen to introduce personal bias when selecting content in favour of recordings that he had listened to and commented on. For example, passing over the more frequently used codes (e.g., *"motivation"* or *"conflict"*) and overlooking the most popular staff-generated annotations and codes in favour of his own insights and experiences to make judgement on where the key training issues lay, and hence which

annotations were suitable for reuse. One example of this was when revisiting a conversation that only he had engaged with but considered it important to curate:

> *"I don't know whether anyone mentioned **hope** in Lisa's (pseudonym) recordings. Maybe only me? ... can you refresh my mind and just play that one?"*

This highlighted the need for guidance within data curation to ensure that fair, unbiased representations of data are curated. Despite this, it was important for Ray to select a diverse range of content that created a balance of voices during training delivery, and in particular females who are less likely to experience complex needs.

The second challenge concerned the ethics and consent of reusing voice for training delivery. As noted above, one participant in CS2 recorded an interview that was excluded from analysis. However, Ray was able to listen to it as he was present for the interview and recalled that what was discussed would be meaningful for his discussion in a training setting. This raised a discussion around how consent by vulnerable participants might be handled in such prototypes, but in this case, we did not play the recordings as desired. Instead, Ray suggested using a previous audio interview that he had recorded to supplement the material curated in this session. This WoZ session lasted 90-minutes, resulting in eight minutes of recording from analysed content and four from outside sources, which highlighted both the labour required to curate voice and the flexibility necessary to reuse external media sources.

Responding to the note taking practices and design challenges of personal bias and time constraints, a new web-based prototype was designed and developed for use in CS3. This digital prototype as outlined in Figure 4.7 presented all the coded annotations of audio conversations from the analysis stage in one interface as an *audio playlist*, drawing from the familiarity of commercial interfaces for listening and curating music, but differing in several ways. Firstly, annotated snippets from the analysis stage were presented in chronological order and played automatically in-turn, with a short delay between recordings. Secondly, participants could choose to filter the analysed snippets that they want to listen to by *Topics* or *Tags* (codes) to areas of interest, thereby reducing the time necessary to engage with content. Thirdly, participants could also add textual notes to each snippet they added to their playlist to document why it was chosen.

The aim of CS3 was for students to provide critical peer feedback on interviewing technique in the analysis stage, and the lecturer, Tony, to listen and synthesise shared challenges across the class. This was then used to provide an additional layer of feedback during the following class. Consequently, Tony was *not* involved in data analysis to reduce bias when curating the analysed dataset. How content was chosen through the curation prototype was primarily through filtering by tags. Initially, Tony listened to all 37 analysed snippets in-turn to get an understanding of the data, then filtered the dataset by tags applied by students and listened to the recordings again. This enabled Tony to quickly hear the similarity between snippets and select content that would equally evidence the positive and negative aspects of interviewing. Unlike the CS2, snippets were primarily ten seconds (i.e., default annotation length), which enabled this first pass of data to be a quick way to understand which recordings were worth revisiting.

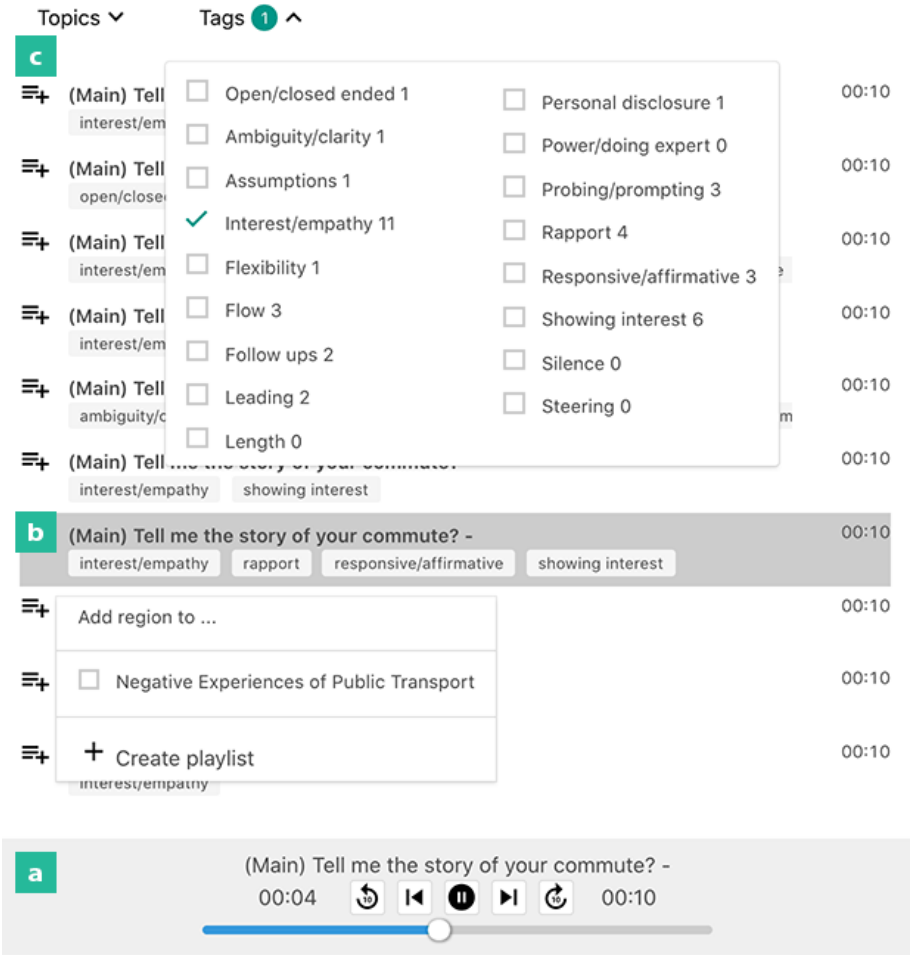


Figure 4.7 Participants could listen and create *audio playlists* from analysed snippets of captured conversations. Audio recordings could be (a) listened to; (b) adding to a playlist; and (c) filtered based on *topics* discussed (during data capture) and codes used during analysis.

Tony added snippets to a playlist that he thought might be useful, then revisited the playlist after listening to the filtered content. From there, content was removed that was deemed not relevant for the reuse session. The note feature was used by Tony for each chosen audio recording that were intended to be used in the session delivery to contextualise the recording to make revisiting easier (e.g., *"Lovely use of affirmation!"*) and why that particular recording was chosen (e.g., *"ASK: What are gremlins?"*). Similar to CS2, it was critical for Tony to select content from a range of participants as to not single out any individual, and to also provide equal learning opportunities and feedback amongst the class. 12 snippets were chosen, totalling 2 minutes 31 seconds (mean=13s, SD=6s, min=10s, max=30s) from four participants, which was significantly shorter than CS2 and the overall curation stage took less than 30 minutes including the time to become familiar with the interface.

While this highlighted the success of the prototype, it was not without challenges. Notably, Tony wanted to listen to the part of the audio recording before and after the annotated snippet to better understand the context, which involved multiple steps through the current prototype. Moreover, Tony desired a way to filter by specific speakers and also to view participant's textual responses to the audio snippet as a way to understand *why* participants had chosen to respond.

In summary, the curation stage highlighted a note-taking activity for documenting *why* media was chosen for reuse (CS1), the potential biases and desires for representation through curation (CS2/3), and additional constraints surrounded dynamic consent when reusing media (CS2). CS3 examined these challenges in practice through the design and deployment of a digital prototype, Figure 4.7, that surfaced additional design learning necessary to contextualise the analysed snippets presented in the prototype.

4.4.6. Reuse

Reusing the curated snippets of conversation to structure meaningful discussion amongst participants around a shared experience was critical during CS2/3, i.e., to discuss complex needs and augment interview training. While CS1 did reuse quotes from audio snippets as noted above, our research in this stage examined how the curated audio recordings were reused and how these practices might inform the curation prototype's design. During CS2, the curated material was used to deliver a training session within the partner organisation to support staff listening and reflecting on their client's experiences, lasting 93 minutes. This was structured using the five curated audio recordings that were played through Ray's smartphone in a predefined order. Before playing a recording, Ray provided context to outline the recordings importance:

> *"Just to introduce the first clip, it's from a client of ours called Walter ... he had been away from the city, to the countryside in Durham, done some physical work and got paid, he is sleeping better, feeling his self-esteem is better, and he's become more hopeful as he's been out of the city and away from trouble ... I will just play it."*

After playing the recording, an open-ended question was asked to the group on what participants heard in relation to their existing personal and work experiences. This resulted in participants sharing detailed, personal experiences relating to the recording's content. For example, one participant reflected on gaining employment after fighting addition:

> *"I can remember the first time I got back into work after a few years with addiction and stuff, and the buzz and glow I had was intense ... I think you can hear that in Walter's voice as well."*

This openness to share personal experiences in response to audio recordings could be attributed to participants having experienced similar challenges as discussed in the recordings. Across the session and similar to the analysis stage, participants would make explicit reference to content when forming their discussions, making reference to the characteristics of voice that Ray attributed to a rich reflective discussion during the session.

In CS3, the goal of the curation session was to utilise curated audio recordings as examples of the practices of conducting interviews to structure a class-based reflective discussion. This session lasted 25-minutes and was delivered in the same format as CS2: snippets of conversation were played in turn, with the lecturer (Tony) prompting the class into a group discussion after playing each recording. Tony displayed the playlist prototype to the class with all 'notes' being

visible to the students. Each recording was played multiple times by Tony prior to invoking a discussion with students. We observed that the prototype simplified how content was delivered, enabling Tony to jump between content and was more seamless than CS2's training delivery session. Similar to CS2, conversations produced through using the playlist prototype were focused on the specific recording presented, with students relating and discussing their own experiences with issues raised by Tony. While the prototype was reported as being effective for structuring and delivering the session by Tony, the students requested access to the playlist afterwards as they desired to view the notes and general interpretation of the content. Tony noted that it would have been useful to have multiple playlists around specific themes, that could be used to add a substructure to the session, which was not possible through the current prototype.

In summary, the reuse of analysed audio recordings has shown flexibility in structuring and delivering a diverse range of sessions in both teaching and training contexts (CS2/3). The prototype designed and developed in response to CS2 and deployed in CS3 has shown to simplify the delivery of audio recordings with the notes feature enabling (CS3).

4.5. Discussion

Findings across three distinct case studies highlighted the utility and usefulness of digital tools to support inclusive participation across the qualitative workflow with a range stakeholders and the value of preserving and reusing voice as a resource to facilitate discussion. Informed by observations across all stages of the qualitative workflow in each case study, the following subsections reflect on the challenges of configuring who and how participants engage with each qualitative stage, and how consent needs to be reimagined when utilising digital tools across the qualitative workflow.

4.5.1. Configuring Participation

Individual stakeholders – teachers in CS1/3 and staff in CS2 – took ownership over the configuration of the digital prototypes and directed participation from other stakeholders during each stage, i.e., students, employees, and service-users. The scope of each case study highlighted that participation during each qualitative workflow stage is independent of the previous and therefore can be as inclusive and participatory depending on the goals and needs of the context. For example, we saw that CS2 limited the capture stage to one individual due to the sensitivity of their service-users while CS3 facilitated co-design of topics and enabled ownership of the stage to students. Moreover, during CS1/2 topics were created by one person who led the engagement, which influenced the formality and duration of recordings captured. The digital prototypes developed were adopted to suit the needs of the context without introducing additional context-specific design requirements and facilitated varying degrees of participation, from light touch coding (CS2/3), in-depth curation activities (CS3), to distributing the data capture amongst community members (CS1/3). The qualitative workflow is complex when taken as a whole and is not linear: data captured may occur while other data is analysed. Designing for each stage of

the workflow reduces the complexity for stakeholders to engage, while allowing participation on their own terms as either in-depth or light touch, such as the analysis activities of coding data compared to writing in-depth textual responses.

4.5.2. Consent Beyond Data Capture

The three case studies suggested that different models of consent would be more appropriate for different stakeholders and that they desired ownership and control over who and how others can engage and use their data. In particular, each case study presents unique constraints for how consent could be realised, with email consent limiting reuse of media in CS1/3 and the partner organisation in CS2 removing data on behalf of a vulnerable participant that had previously been created and where consented was provided. These challenges demonstrated a need for flexible and dynamic models of consent that give control to participants while allowing for traditional gatekeeping assent mechanisms. While email was explored as a means to provide dynamic consent, this was not suitable for participants in CS2 who had limited access to technology and in CS1/CS3 this was not used to its full potential. This highlights a need for in-person consent through digital tools similar to existing informed consent practices alongside dynamic models where participants can assent their data easily.

During CS2, audio recordings were curated for use outside of the developed prototype, i.e., as a training resource. This raised ethical concerns on data sharing where participants may be identified and where their previous consent may differ from how they currently wish for their data to be used. Audio data is not easily anonymised and doing so (e.g., transcription) would retract from the richness and nuance voice that media offers, which was reported as a strength across our case studies. Communicating clear guidelines at point-of-capture for how data may be more widely shared upon dissemination and adopting dynamic models alongside this which respond to the changing needs of stakeholders regarding data reuse could increase transparency of decisions both for participants and how stakeholders and organisations use their data. While legislation is now in place to accommodate higher degrees of transparency around data use, e.g., the General Data Protection Regulation (GDPR) [85], how this is designed for into the research workflow and embedded within digital tools remained an area for exploration.

4.6. Summary

This chapter explored how digital technologies can enhance each stage of the qualitative workflow through the iterative design, development, and deployment of digital prototypes across three distinct case studies, i.e., **RO1**. These case studies engaged stakeholders who were interested in or actively engaging in qualitative practices and provided experiences of qualitative research from both academics (CS1/3) and civil society (CS2). The findings presented a chronological account of the challenges and insights gained through action-oriented research to iterative design digital prototypes that enhance each stage of the qualitative workflow. Through this, we have shown the value of preserving voice and utilising it in its original form as a resource for reuse

and that a diverse range of stakeholder's desire to actively contribute to a qualitative workflow through technology. Reflections across these case studies highlight the challenges of configuring participation across the qualitative workflow and desires from participants for more pragmatic and dynamic models of consent.

The following chapter synthesises the challenges identified across the research literature concerning how *academic, civil society, and citizen* practitioners configure and engage with qualitative practices, and design learning from this chapter. Through this, a *qualitative workflow* is defined to structure flexible and inclusive modes of participation in qualitative practices through technology, and thus facilitate broader adoption across contexts. This workflow provides a design space where the research aims of this thesis are explored.

Chapter 5. Defining A Qualitative Research Workflow

5.1. Introduction

The previous chapter documented the iterative design research undertaken across three distinct case studies to explore how digital technology can facilitate inclusive participation in each qualitative workflow stage. Design learning across these case studies informed the iterative development of independent prototypes to explore each workflow stage in practice. This subsequently informed the development **Gabber**, which aims to create inclusive participation across the complete qualitative workflow through technology.

This chapter reflects on the literature examined in chapter 2 and summarises the distinct and shared research practices at the intersection of these stakeholder groups. Through this, a conceptualisation of a *qualitative research* ***workflow*** is presented that creates a novel design space for exploring the procedural activities and data required to structure inclusive participation across the proposed workflow. This begins through summarising the research practices undertaken by each qualitative practitioner to surface the distinct activities of each and how digital tools supplement these. Following this, a cross-cutting qualitative research workflow is posited that draws on the distinct yet overlapping research workflows of these practitioners, which are characterised as six stages: *Preparation, Consent, Capture, Analysis, Curation, and Reuse*. Through conceptualising this qualitative research workflow, design challenges and opportunities for how participation can be structured to enable engagement and inclusion across each workflow stage is described and contrasted with existing research.

5.2. Qualitative Practices of Practitioners

The literature review provided a broad account of existing qualitative research practices for each stakeholder group of interest to this thesis across a range of emerging research areas through which opportunities for how digital tools can augment these were presented. Building on this, the following subsections summarise the procedures undertaken by each stakeholder group of interest to this thesis – *academics, civil society organisations, and citizens* – during their qualitative research practices, including: the intended purpose, who benefits, sources of generating data, stakeholders involved, and the typical outcome. Across each summary, how digital tools are used is described to reiterate existing stakeholder practices and opportunities for research. While the underlying aims and intended outcomes vary across practitioners, the increasing popularity of participatory and action research methods results in each stakeholder group contributing to the practices of others with varying degrees of participation. For example, citizens are increasingly contributing to consultations led by civil society organisations or engaging in co-research with academic practitioners. As such, there can be overlap between the following categorisation of practitioners, but for simplicity of narrative the following subsections summarise conventional research practices of each stakeholder group.

5.2.1. Academics

The methodologies, analytical frameworks and approaches adopted by academics undertaking qualitative practices are vast as outlined in the literature review, yet there are shared practices across these research activities as illustrated in Figure 5.1. Academic's primary aim is to develop new knowledge that provides an enhanced understanding of a phenomena of interest, often disseminated and shared through publication that serves an academic community. This typically begins by identifying a research problem to explore, such as through an in-depth literature review that is grounded in prior research knowledge. At this point, academics often already know the types of data that should be collected, desired sample size to ensure validity of their findings, and the data analysis methods to use. This forms a research plan that is designed to ensure the research is rigorous and that the output is trustworthy, which is then submitted to an ethics board where it is reviewed to ensure there is no potential harm brought to research subjects [37]. As such, there are layers of institutionalised processes designed into academic's research practices to facilitate accountability and rigour, which is sometimes not the case for the subsequent practitioners.

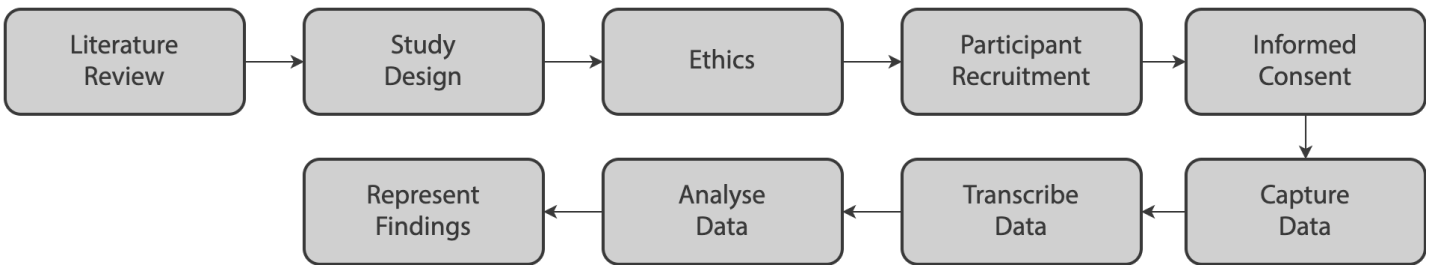


Figure 5.1 An academic's qualitative workflow that extends Paulus et al. [206]'s research process.

Once ethics has been approved, the research study participants can be recruited and times arranged to apply the data capture method. Prior to capturing data, participants are provided printouts summarising the study and their role within it, and an informed consent form that they must sign for data to be captured and used for research. Importantly, participants infrequently are provided with the raw recording and if they wish for their data to be retracted they must contact the researcher directly. Data is then captured, often as an audio or video recording through mobile smartphones or a Dictaphone. In this way, research subjects are being researched 'on' and their contribution is limited to data capture through sharing their experiences. While this is not the case for participatory and action research methodologies, these are not the standard approach across academic research fields.

Captured data is then transcribed and collated for data analysis where the analytical procedures often involve making notes, memos, annotating, and coding chunks of data. This is often the most time-consuming stage and the most collaborative if undertaken as a team: other academics undertake analysis in parallel, then regroup to discuss and create a codebook, then iteratively apply and refine it. The final activities of data analysis typically intersect with the writing stage, often resulting in a written publication to be submitted to peer-reviewed journal or conference where it principally serves an academic community. Alternative additional forms of dissemination of findings through technology are increasingly being adopted, such as through social media [194]. Increasingly, funding bodies require that academics make available the captured and analysed data as part of publication processes so that others can access and use it or to interrogate the analytical procedure [44]. As such, it is critical across the workflow that all decisions made are documented to supplement the data shared. In practice this is left to academic's discretion and is manual and time-consuming that limits uptake.

Commercial digital tools were historically developed to facilitate academic's qualitative research practices, chiefly for data analysis [209]. Despite advances in these digital tools, technology use can be ad-hoc when undertaking data capture and analysis as there is no standard procedure for how this should be structured, such as using mobile smartphones to record interviews, or word processors to view and annotate transcripts. Media data captured is often transcribed verbatim by researchers or outsourced to save time but at a substantial cost often unavailable to other practitioners [172]. Analysis directly on the media is possible, but infrequent in practice due to the associated complexities in existing QDAS [279]. This use of multiple, disconnected technologies within and across workflow stages adds administrate efforts when collating captured data in preparation for data analysis. Overall, the use of digital tools to facilitate existing academic practices is limited to data capture and analysis, with opportunities for digital tools to encompass multiple workflow stages as data often flows between stages.

5.2.2. Civil Society Organisations

Civil society organisations, such as charities, are increasingly adopting qualitative practices to understand opinion from their community members or service-users, with the aim of incorporating these perspectives into the refinement of service delivery. Within the United Kingdom

(UK) where the research in this thesis is conducted, civil society organisations are increasingly supplanting services previously provided by the public sector (e.g., local government) where their goal is often to collect evidence that can be used to answer questions that the organisation has and to shape a narrative around a problem they are experiencing, such as to gauge community opinion on town planning decisions [96, 100, 146]. In this way, these qualitative practices often take the form of applied research through *consulting external stakeholders*, i.e., citizens or service-users. This positions power with decision-makers who research *for* external stakeholders that are the likely beneficiaries of this research workflow as illustrated in Figure 5.2. These practitioners are increasingly adopting participatory methods to work in partnership *with* research participants in the earlier research stages, such as idea generation and capture, but less often in data analysis and dissemination [111, 160]. Ethical and research design procedures are often *not* designed into these qualitative research practices, which raises questions of rigour and credibility of findings from external stakeholders, such as funding bodies [146]. This is increasingly important as such external stakeholders now require evidencing the analytical decisions to receive funding support [145]. Informed consent is increasingly becoming critical to these practitioners due to recent privacy legislation (namely GDPR [85]), but like academics is often paper-based that adds administrate complexities for how consent is captured and how it can be later changed [145].

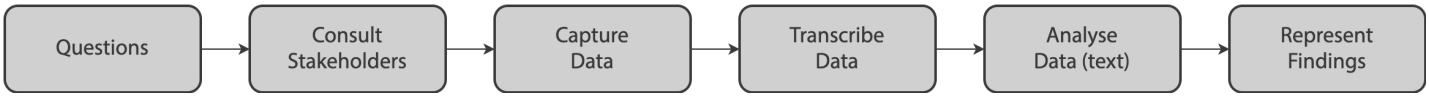


Figure 5.2 Civil Society Organisation's qualitative practices often involve external stakeholders (e.g., citizens or service-users) in data capture, but less often in the subsequent stages.

Qualitative data collection methods are increasingly being used beyond in-person forms and open-ended surveys, ranging from semi-structured interviews, focus groups, to workshops [27, 52, 121]. When engagements are civic focused more deliberative methods are also used, such as juries and town-halls [95, 96, 106]. Across these methods, qualitative data often takes the form of audio media due to the increasing simplicity of capturing it. Due to the quantity of data and limited time available to these practitioners, data analysis is often light touch, with the aim of surfacing consensus in responses to their initial data collection questions. The analytical practices in some ways mirror academics: often *deductively* coding transcripts through spreadsheets or word processors to collate experiences. The aim of this analysis stage is often to answer known questions rather than generate new knowledge that academics strive for. Likewise, the research outcome is often a written publication for internal use that evidences participants experiences using poignant quotes to contextualize the problem or solutions being put forth that could inform decision-making. Consequently, external stakeholders that contributed to these research practices often do not see or understand how their contributions informed decision-making and whether or not their experiences were analysed or engaged with [60, 146, 224]. This has led to calls for increased accountability of these consultations, presenting opportunities to explore ways to automatically document decisions made across these qualitative practices that can be represented when data is used. This challenge is explored further in chapter 6.

Digital tools are often used across the research workflow as communication channels between decision-makers and external stakeholders [54, 78, 121], and for data capture and analysis [79, 145]. Existing commercial platforms are often reappropriated ad-hoc rather than using bespoke platforms like qualitative data analysis software, such as through using spreadsheets to read transcripts and code data or social media platforms to build community [167]. Civil society organisations adopting participatory practices often use a broader range of technologies that could be attributed to desires to include their stakeholders in other research stages and therefore exploring new ways to achieve this, or as a technique to overcome data capture and analysis limitations when capturing large quantities of qualitative data [172, 224]. Similar to academics, stakeholder participation in the *data analysis* and *representation of findings* is less common, but when it does happen it is often through technology where analysis occurs directly with the media recordings to lower barriers to entry [21, 174]. However, prior research highlights that creating actionable outcomes from media datasets is challenging for decision-makers because their internal processes are tightly coupled with existing modes of delivery, i.e., written reports [78, 146, 217]. This presents an opportunity to explore new ways that media datasets could supplement existing practices to create more inclusive practices for external stakeholders.

5.2.3. Citizens

How individuals participate civically and raise awareness of issues within their local communities has been revolutionised through civic technology [115]. Examples include the use of social media to coordinate community volunteering efforts [60], creating community radio productions for civic participation [228], to citizen journalist informing local communities of ongoing hyper-local issues [70]. These diverse practices share the aspirations of raising awareness or creating change that positively impacts the local community. Participatory methods and multimedia are often adopted and used to encourage community participation while lowering barriers to participation through the use of existing media-oriented platforms [281]. Action-oriented approaches are often applied to iteratively develop incremental solutions to real problems experienced by citizens. This often involves working in partnership with academics and civil society organisations where citizens can draw from the expertise of both: research methodologies from academics to facilitate the procedural engagement activities, and political, social or financial influence of civil society organisations to enact change. In these configurations, citizens often have the power to define the research agenda and the associated decisions, where external stakeholders work *with* them to achieve their often mutually beneficial goals. These qualitative practices are summarised in a citizen's workflow in Figure 5.3.

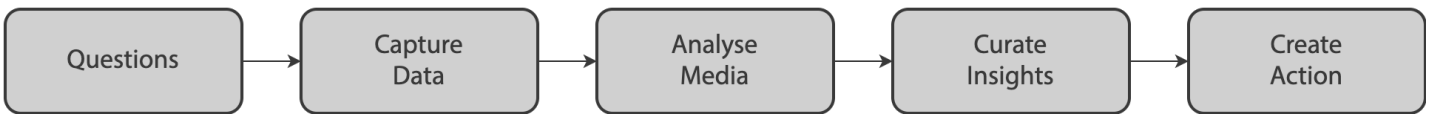


Figure 5.3 Citizen's qualitative workflow often aims to create action that positively impacts participants involved and their community. Media is typically used to lower barriers to participation to foster inclusion.

Citizen's practices often begin in response to a known problem experienced by community members that they want to capture evidence for to inform change. Although partnerships with academics are common, citizen's practices are less structured and so formal research plans, ethics, or informed consent procedures are often not incorporated in practice [145]. This typically begins through informal conversations (as opposed to academic style interviews) with community members of interest, which are typically captured on smartphones in media format or written up informally following the meeting. Data analysis often aims to identify salient sources that can be used to evidence claims to support their cause. In practice, academics often scaffold the data analysis and curation stages while brokering relationships and data exchange between citizens, the public sector, and civil society, i.e., digital civics research [201]. As such, there can be a dependency on external stakeholders to proceed with each research stage that can compound existing challenges of data management, access, and sharing because citizens may not have privileged access or control over this data.

Insights gained through data analysis are then curated into a summarised output to raise awareness of the problem explored within and outside of the community. Citizen-led projects often disseminate insights in ways that are meaningful to community stakeholders, such as through radio, podcasts, or live broadcasts on social media [228]. These qualitative practices are overall ad-hoc, informal and semi-structured, with limited procedures in place to ensure rigour that the data produced is representative or credible of the questions it aims to examine. Consequently, creating actionable outcomes is difficult to achieve as the output of these practices are often in a format that is at odds with existing practices of decision-makers who are unable to meaningfully transform and use this media to inform action [79, 145, 146, 218].

Citizens use a diverse range of digital tools when undertaking qualitative practices, ranging from curating social media content to raise awareness of hyper-local issues [192] to using bespoke participatory video platforms to document hyper-local issues to community stakeholders [21]. Citizens often also participate as stakeholders in the qualitative workflows of both academics and civil society organisations during which the selection of digital tools is guided by the experienced qualitative practitioners. This can result in the use of *participatory platforms* where working with media directly has been seen to help lower barriers to entry for citizens in data analysis and curation, in part due to citizen's increased familiarity and use of media practices [115].

5.3. Workflow Stages

Prior research primarily frames qualitative research as an iterative *process* consisting of a range of activities most often relevant to or from the perspective of academics [32, 209]. The previous section illustrates the distinct motivations, aims, and outcomes of three distinct qualitative stakeholder groups, and how they intersect in various ways, including: how digital tools are used and where participation of research participants is often limited to idea generation and data capture. This thesis contends that abstracting this from an iterative qualitative *process* to an iterative qualitative *workflow* composed of six stages creates a novel *design space* where design research can be explored to augment and enhance the qualitative workflow as examined in this

thesis. Here the dimensions of the design space involve each workflow stage that aspire to give value to creating inclusive and 'thick' forms of participation in qualitative practices [281]. The proposed workflow represents one way that the design space of *digital qualitative practices* could be conceptualised that is examined throughout this thesis.

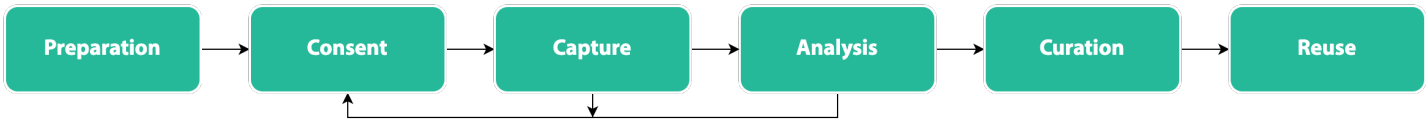


Figure 5.4 The six stages of the proposed qualitative research workflow. The consent, capture, and analysis stages form an iterative process as data can be contributed continuously.

The *preparation* stage defines the requirements of the overall research project and determines how the subsequent consent, capture and analysis stages should be configured. The *consent* stage ensures ownership and control are provided to stakeholders who contribute data through dynamic models of consent. The *capture* stage adds a structured procedure to standardise how data could be annotated at point-of-capture to contextualise the recording with what was discussed. The *analysis* stage represents the original captured media alongside these annotations and provides lightweight modes of coding captured data. As such, the consent, capture, and analysis stage form a cyclical process where stakeholders can contribute to each as the project evolves as illustrated in Figure 5.4. The *curation* stage aims to represent a narrative from the analysed corpus and is intended to supplement existing publishing and action-oriented practices. Finally, the *reuse* stage exists to complement the diverse ways that practitioners can meaningfully (re)use curated content through contextualising this data in relation to decisions made on it at each prior workflow stage.

Through framing this as a workflow, each stage is required to produce data that informs how interactions occur in the subsequent stage, thereby creating a dependency between stages similar to how media production [21] or data science workflows are undertaken [195]. In this way, the expected outcomes are defined for each workflow stage that creates opportunities for how digital tools can be designed to augment existing qualitative practices, thereby creating consistency across qualitative research practices that could increase rigour and accountability. Each stage explicitly defines the expected data outcomes that adds structure and consistency to the research workflow for participants to contribute consistently across stakeholder groups, which creates opportunities for more inclusive participation across qualitative practices. Through grounding each workflow stage in the existing qualitative practices of all three stakeholder groups, the proposed workflow is both an inclusive space for participation while drawing from the best practices across stakeholders to ensure the outcome of the process is actionable and meaningful for all involved. This is particularly important as these practitioners are increasingly engaging in participatory practices between stakeholder groups. For example, citizens contributing to academic's ongoing projects [126, 215], academic's facilitating citizen-led research initiatives [95, 163], or citizens being more actively involved in community engagements led by public institutions and civil society organisations [224, 270].

The following subsections defines each qualitative workflow stage, how it draws from the qualitative practices currently undertaken by each practitioner and draws out the shared challenges associated with existing practices. Each workflow stage defines research activities and recommends how data could be structured to facilitate engagement in the subsequent stage. In doing so, research opportunities are identified that aim to enhance these practices and create opportunities for inclusive participation for all stakeholders involved while aiming to create a consistent data output layer that can enhance the rigour and credibility of qualitative practices.

5.3.1. Preparation

Prior to starting a qualitative research project, each stakeholder group engages in varying forms of ideation with the aim of reaching consensus on how each of the subsequent stages will be configured. For academics this is often driven by existing gaps in literature, while for civil society organisations and citizens these are often grounded in problems experienced. Across these practices, the research aims are often determined by a subset of stakeholders, typically through in-person meetings. Participatory methods are increasingly being adopted to overcome these challenges by including external stakeholders in setting the agenda, but this is not yet standard practice [95, 98]. Moreover, when these methods are adopted it is often as part of larger research initiatives that are driven be an existing agenda, and therefore the types of questions to explore have pre-determined scope.

The activities undertaken in this stage by practitioners are typically in-person with limited use of digital tools to structure participation. Prior research highlights how citizens feel ownership towards projects when they engage in the preparation stage, which motivated participation in subsequent stages [269], and so designing ways to facilitate ownership and decision-making amongst all stakeholders is critical to the success and longevity of such research projects. One approach that has had success in a different context is *community commissioning* whereby community members contribute through a digital platform by proposing, discussing, and coming to agreement on project ideas that the platform transforms into a place-based mobile application [102]. Such a technique could be applied within this workflow stage to produce the minimal requirements necessary to proceed with each workflow stage. For example, to structure the capture stage through applying emerging methods such as the question formulation technique (QFT) that is designed to *"help all individuals learn how to ask better questions"* through a guided three-step process of divergent, convergent, and reflective thinking [235]. An example within a community-led citizen science project is described in [216].

Academic's existing preparation practices are guided by institutionalised processes that enable accountability, such as having the proposed research plan and methods reviewed by an ethical review board [199] or pre-registering their intended research questions and activities [49]. Existing research led by or involving citizens in the subsequent workflow stages has previously identified ethical issues when participants take on more active roles in research, such as through citizen social science where observational data of unsuspecting subjects was captured [126]. Reflecting on existing ethical procedures of academics, Brown et al. [36] argue that these are

principally designed for legal reasons that can delay research and often does not account for the benefits or desires of participants to be named in research outcomes and posit ethics as a situated practice that should be *"grounded in every practice and judgements"* [36]. Given the practical orientation of civil society organisations and citizen's qualitative practices, ethical procedures should be embedded within the workflow directly to scaffold adherence, for example through a community commissioning process as outlined above to raise awareness for how participation is understood and intended to be conducted by stakeholders involved.

The use of digital tools can compound ethical and privacy challenges as the data they generate requires reimagining consent and participant anonymity [68]. Prior work posits that participation benefits research participants and that anonymisation is not always appropriate or desired by participants [36]. As such and given the intended inclusive configuration of this workflow, providing control and ownership to participants over how they are represented alongside contributed data throughout each workflow stage is critical to explore.

The *data output* from this stage must define key criteria of each subsequent workflow stage that can be used to structure participation. While these are expanded upon below, they are summarised as follows: *(consent)* where data will be stored, who has access, and how it will be used; *(capture)* the activities to structure data capture, such as an interview schedule; *(analysis)* how captured data will be analysed, such as codes in a codebook; *(curate)* how analysed data can be summarised for presentation, such as through visualisations; and *(reuse)* intended output of the project and how this links to existing initiatives.

5.3.2. Consent

Informed consent typically occurs before data is captured where participants must agree to understanding the implications of participating in research activities and acknowledge how their contributed data will be used, who will have access, and how it will be stored [199]. The use of informed consent by academics is an institutionalised paper-based procedure that is required prior to capturing data, whereas for civil society organisations and citizen-led projects this is often an informality that is taken verbally [145]. This paper-based procedure requires manual association of each consent form with the relevant captured recordings and other documents, which requires additional time from practitioners and creates opportunity for human error, such as associating recordings and consent with the incorrect participants. When consent is taken by practitioners, it often occurs *once before the data capture stage*, and so if data is to be reused in a way that varies from the agreed use, then reconsent must be sought. This introduces additional time and communication barriers that are compounded by the existing consent practices [149].

Despite the increased appropriation of digital tools to capture data by practitioners, they often do not incorporate consent procedures and are typically supplemented with paper-based consent forms, e.g., [79, 117, 147, 175]. This could be attributed to these digital tools often not being designed to specifically support qualitative practices. Recent qualitative research calls for rethinking how consent is handled and managed within digital spaces created through technology [68]. These challenges could be automated and overcome through recent forms of

consent, such as dynamic consent models [149], which are especially important at a time where legislation requires explicit consent for how personal data is collected, stored, and reused, such as through the European Union's General Data Protection Regulation (GDPR) [85] and California's Consumer Privacy Act (CCPA) [40]. By designing this stage to draw from the ethical and privacy practices of academics all practitioners can benefit. However, this must be a quick informational procedure for participants similar to existing practices to ensure it is understood and used.

The aim of consent in this workflow stage is to empower participants to have continued autonomy, ownership, and control over the data they contributed, including how it is accessed and used by others. As such, and inline with emerging decentralised models of data access (e.g., [272]) and legislation [40, 85], consent mechanisms should be separate from the original source data so that at any point from data capture participants can easily modify and update their consent. In this way, the types of data from this workflow stage are contingent on how consent procedures are designed into the workflow. As such, data output could be the *option* that each participant provided and when they last engaged with data or updated their consent, thereby providing granular access and control over data to its owners while enabling practitioners to use only data that has been consented.

5.3.3. Capture

Qualitative data is typically captured by practitioners to understand the behaviours, perceptions, attitudes, or opinions of individuals or groups [34]. This typically involves capturing audio or video recordings, yielding large, unstructured media datasets. During participatory processes, stakeholders involved in the research process are typically invited to contribute to data capture as equals [94], in part because they often have direct access to, and first-hand knowledge of the population being engaged that can lead to informal yet qualitatively rich conversations [26]. This is in contrast to the unequal power dynamics that exist between academics and research subjects when undertaking data capture that requires additional time and effort from the researcher to build rapport [164]. As such, designing the capture stage as a conversational rather than formal procedure where all stakeholders involved have control over the direction of conversation could increase the inclusivity of participation for stakeholders while providing further opportunity to draw from existing community members local knowledge and expertise.

Mobile applications are often (re)appropriated by practitioners during this stage to capture qualitative data, which adds privacy concerns for how data is transported and stored. This also introduces data management challenges concerning how data is retrieved and shared from within these applications. Importantly, a semi-structured format is often used to guide data capture, such as an interview schedule, which is typically paper-based and upon capture is not associated with the recording. As such, the challenges associated with working with large, unstructured media datasets provide opportunity to explore how such a pre-defined structure could be used within this and subsequent stages to add layers of structure and reference to the captured data.

Prior HCI literature highlights how civil society organisations and public institutions are overwhelmed with the increase use of participatory practices that result in large media datasets

that they struggle to analyse, i.e., the *"civic data deluge"* [172]. Reimagining how the capture stage can scaffold participation in the subsequent stages through restructuring data in a more meaningful and accessible way could help overcome these challenges. Prior media production literature uses pre-defined templates to structure the data capture process, for example, to provide a list of tags that should be covered in a video interview that can be selected at point-of-capture [42, 245]. While using such templates can structure data capture that is particularly relevant when multiple stakeholders engage in this stage, it implicitly adds potential barriers that could impact conversation dynamics depending on how the structure is presented to stakeholders. Nevertheless, coding data is a familiar practice for academics during data analysis and other practitioners to categorise resources and support informational retrieval, such as using hashtags on social media to filter and navigate content [177, 282].

Informed by existing media production research [21, 69, 245], data output from this stage should cover three areas: (i) a semi-structure procedure to be followed to structure what *topics* were discussed during data capture; (ii) the *raw media recording*; (iii) *annotations* of when the topics occurred during the recording. In doing so, existing data management challenges can be reduced, while enabling external stakeholders to revisit their content in a context that is more meaningful than the raw recording, such as when updating consent. Moreover, capturing and using this metadata could create opportunities for how the raw recording or derivatives of it (e.g., transcripts) could be presented and designed into activities as a proxy to contextualise what was discussed during specific points of data capture in the subsequent stages.

5.3.4. Analysis

Qualitative data analysis is an iterative process that aims to identify, describe, and explain patterns of meaning, relationships, or experiences from across the captured data [34]. While there are many analytical methodologies available to structure data analysis, the choice of these is often confined to academic practices, with other practitioners drawing on more thematic approaches to analysis. Across these methods there are shared techniques that structure analysis: *coding* where practitioners assign codes or phrases to regions of content and a short textual *memo* to explain its selection, which is typically used for self-reflective purposes [34, 44].

Academics often transcribe captured data to become more familiar with its contents as the first step of analysis [16], then each transcript is read, coded, and discussed between the research team. Coding and analysis typically take place through a word processor or on printouts of the transcripts [176]. In contrast, civil society organisations and citizens analytical procedures are often light touch that aim to summarise content. These typically involve listening to captured media and making notes rather than coding on transcripts, in part because these practitioners often lack the time or financial resources available to transcribe data [79]. When transcription is undertaken their analysis practices mirror the coding and memoing practices of academics. As the total duration of captured qualitative data increases, working with media datasets becomes difficult due to time constraints, resulting in outsourcing transcription or both transcription and data analysis [172]. Resources are often limited for civil society organisations and citizens, and

thus transcription is not always possible that can lead to large portions of the data not being engaged with altogether [79].

One approach to overcome these challenges is to involve more participants in data analysis. Prior research highlights how external stakeholders, such as citizens and research participants, are less involved in data analysis and dissemination stages [171, 225], and a need for increased *"data literacy"* to increase participation [27]. Participatory media case studies demonstrate how prioritising interactions with the original media can increase participation in data analysis [21, 175]. Likewise, citizen's practices are often contingent on working with media in varying forms, e.g., video blogs [190]. Central to citizen's analysis practices is tagging of content in a way that is similar to how academics code data [115]. As such, there is opportunity to design digital tools that offer lightweight modes of participation that prioritise analysis on the original media. In doing so, the analysis stage could also act as a boundary object during participatory practices that is meaningful to all stakeholders, while reducing existing transcription cost constraints. While this could be possible through existing qualitative data analysis software, these are infrequently used in practice and augmenting these for exploratory research purposes is not possible [209].

Data output from this stage should involve *annotations* of the *start* and *end* location where coding and memoing took place, when, and by whom. For example, the sentences in a paragraph, the timestamps in an audio recording, or a bounding box in an image. This creates design opportunities for how the annotated content can be represented in the subsequent stages. Creating connections between data analysis and the original media could be used to increase credibility of findings as the analysed media could be represented alongside the original recordings.

5.3.5. Curation

This stage involves curating analysed findings into a form that represents a *narrative* of practitioner's interpretations that can inform action, support decision-making or increase awareness of the topic. The curation stage often involves the final analysis stages that meld analysis and writing, e.g., the final two phases in thematic analysis: *Defining and naming themes* and *Producing the report* [33]. Creating a distinction between these enables new consideration for how analysed content can be engaged with, although acknowledging that the curation stage can be iterative and entwined with data analysis. For academics and civil society organisations, this often results in a written report as this is often a funding obligation [78, 174], while for citizens the curation output is typically summarisation of interpretations with snippets of analysed content, such as through blog posts, podcasts, or videos [115, 175, 192].

Similar to the data analysis stage, curation less often involves participants, which can lead to feeling unrepresented in the research output as decisions made on how contributed experiences were selected can be opaque [27, 60]. Johnson et al. [146] highlight how community organisations may exclude details of who participated in a consultation when evidencing and reporting to disguise demographics to ensure targets are met [146]. This work also argues for new ways to make who participated in community engagements visible to stakeholders that can be used to increase accountability during decision-making. There is opportunity to

explore alternative ways that disseminated findings can be represented that is meaningful to all stakeholders involved, but which could also supplement existing written outputs if desired.

Practitioners are increasingly required to disseminate their findings in formats that are accessible to the general public, often resulting in curated summarises, such as through podcasts or blogs. Mihailidis [189] argues that curation has the potential to be a core media literacy competency as it enables lightweight participation when synthesising ideas across a range of media datasets. For example, curating hyper-local tweets to document urban warfare [192] or the curatorship of community radio [228]. As such, using the analysed media could provide opportunities for stakeholders to individually or collaboratively create media outputs to represent narratives alongside their own interpretations of content. Using the original media content in its shorter analysed form could also help contextualise the interpretations while providing opportunity to notify and discuss the curated content with those who contributed or analysed the data. This could further increase the credibility of the workflow by enabling traceability from curated findings to the original data.

This stage should produce a narrative representing the practitioners' interpretation of analysed data. As such, the data output should consist of three parts: (i) a collection of *annotations* and associated artefacts from across analysed content in the previous stage; (ii) an interpretation and summary of this content in an appropriate format; and (iii) *metadata* from the previous workflow stages to contextualise the curated collection when sharing. This output could result in representations as blog posts, podcasts, or interactive visualisations that other stakeholders can explore, learn from, remix, and reuse for their own purposes.

5.3.6. Reuse

This stage aims to support opportunities where the curated output can be reused to evidence or supplement claims for a diverse range of purposes, such as academic publications to share new knowledge, raising awareness in communities for citizen practitioners, to supporting organisational change. Prior research on open data highlights how practitioners, including governments and funding agencies, are pushing for greater transparency and reproducibility in their research practices, calling for increased data sharing and archiving of captured and analysed data [44]. While there are notable ethical and legal challenges around how qualitative data can be shared [44, 56], the consent procedures underpinning this workflow ensures ownership is with those who create the data concerning how (and if) they are to be represented in the research output.

Curated data from the previous workflow stage provides an individual or group interpretation of the data. Prior research highlights how individuals who contribute their data can feel unrepresented in the research output as analytical decisions made on their contributions can be opaque [60, 175]. As such, this stage provides opportunity to explore interface design for how engagement by practitioners in each workflow stage could be represented so that other stakeholders could explore how their contributions created impact. In addition, increasing transparency of the decisions made throughout the workflow could help improve the perceived rigour, reliability, and accountability of the data being presented and reused, i.e., *"process transparency"* [256].

This stage aims to support the practical use of curated data to explore, complement, or address practitioner's needs. For example, representing community perspectives to raise awareness such as in the delivery of training as explored in e.g., [24, 268]. As such, the outputs of this stage are twofold: (i) a selection of curated interpretations to inform practical use; and (ii) an interface that summarises the previous workflow stages in relation to the curated data to contextualise it for external use.

5.4. Summary

This chapter synthesised the motivations and challenges experienced during the qualitative practices of *academics, civil society, and citizens* to surface the shared characteristics that define meaningful participation in each. Through this, a novel *qualitative research workflow* was conceptualised that defines the desired research activities and data output from each workflow stage that we posit can structure inclusive participation for *all* stakeholders involved in each and all workflow stages. This structure presents opportunities for how digital tools could facilitate engagement and defines what is required to ensure the output of each workflow stage is meaningful to practitioners while ensuring rigour and credibility of the workflow for external stakeholders to meaningfully reuse and action qualitative data.

The following two chapters present real-world deployments of the Gabber platform that provide insights into its adoption, use, and the challenges experienced across the end-to-end qualitative workflow by civil society and citizen practitioners. In particular, a globally distributed community engagement by an global non-governmental organization (NGO) in chapter 6, and a co-research project in chapter 7.

Chapter 6. TalkFutures: Gabber in a Global Community Engagement

6.1. Introduction

Community engagements are qualitative processes that draw from participants local knowledge to inform decision-making processes that impact their everyday lives. Participants are often excluded from data analysis and dissemination due to skill, resource, and time barriers, which can become compounded in geographically distributed community engagements as coordinating participation requires significant support. Chapter 3 introduced Gabber that was designed to support inclusive participation in each stage of the qualitative workflow for all stakeholders involved but had not yet been deployed across a complete qualitative workflow. Consequently, and in contrast to prior case studies in this thesis (i.e., chapter 4), this chapter explores how *practitioners* use and configure Gabber across the *end-to-end* qualitative workflow in practice.

This chapter presents a six-month collaboration with the International Federation of Red Cross and Red Crescent Societies (IFRC) where the author led a digital community engagement, **TalkFutures**, that aimed to actively involve the organisation's globally distributed members in the data capture, analysis, and summarisation of qualitative data as part of an ongoing engagement. This begins by summarising existing challenges with traditional, digital, and geographically distributed community engagements that motivated three design goals that underpinned the research in this chapter. To accommodate the anticipated scope and geographically configuration of TalkFutures, Gabber was reconfigured and adapted prior to deployment, which is then described. In addition to technical changes to the platform, distinct roles were designed to structure participation for each workflow stage as limited support could be provided to participants. Following this, the design and findings from two phases of research are reported in-turn: (i) a real-world, field deployment of the Gabber workflow through the TalkFutures digital campaign; and (ii) post-deployment interviews with participants to understand their perceptions from participation. Finally, findings from across the field deployment and interviews are discussed in relation to the three design goals and suggestions for future work presented.

This chapter contributes design insights concerning the opportunities and challenges that arise through supporting *distributed* qualitative practices of a civil society organisation and its members, i.e., **RO2**. This extends Mahyar et al. [172]'s call for *"hybrid"* approaches to scale out the data analysis stage by facilitating participation across the complete qualitative workflow. These findings highlight how practitioner's desired increased transparency in who and how their contributions were engaged with, further motivating a need to explore how paradata generated through digital tools might be used to represent participation.

Related Publication and Acknowledgements

- The research presented in this chapter expands on a DIS'20 publication, Rainey et al. [224], to be consistent with the overall narrative of this thesis. The study design, field deployment, data analysis, and writing were undertaken by the thesis author unless specified otherwise.
- Acknowledgements go to *Juan Carlos Alvarez de la Vega* (Carlos) for designing resources for the TalkFutures campaign (e.g., videos, posters) as part of his role in the IFRC, *Dr Dan Richardson* for supporting the software development of the TalkFutures mobile applications, and *Sara Armouch* for translating all support material and Gabber content into Arabic and French to facilitate this global engagement. Additional thanks to Carlos and Sara for providing support through WhatsApp to Spanish and Arabic participants respectively. Finally, thanks to Carlos for conducting research interviews with participants in Spanish, translating those to English, and assisting with a first pass of data analysis.

6.2. Motivations

Prior public policy highlights that communities who will be impacted by the consequences of decisions made by governing institutions (e.g., local government, NGOs, etc) should be included in giving their voices to collective decision-making processes [100]. Consequently, community engagements have emerged as the successor to public consultations that aim to more actively involve local stakeholders in decision-making. HCI research has explored the role of technology in community engagements across a range of policy areas, including issues surrounding neighbourhood planning [63, 98, 175] and the development of smart cities [111, 162, 185]. The research methods adopted by decision-makers are primarily qualitative and mirror a qualitative workflow in how data is captured, analysed, and reused. During such engagements, participants more often offer their experiences as data through in-person methods such as public workshops [54] than being involved in the data analysis or dissemination stages [111, 160, 175]. This is despite participants having the most knowledge of the context surrounding the captured data and its contents, and thus are arguably best positioned to meaningfully engage with it [100, 258]. Like public consultations, community engagements that use traditional engagement methods where physical attendance is required limit participation due to the proximity to community members. As such, only a small portion of the community impacted attend, and attendees can unevenly represent those affected by the final outcome [54, 100, 133]. This increasingly creates tensions between decision-makers and communities, which can result in engagement outcomes being unsuitable for participants [60, 74, 175].

To enhance existing community engagement strategies, researchers have explored the development of digital tools that aim to simplify how decision-makers collect insights from their community, such as through the use of situated physical devices [79, 110, 146, 258] or community voting technologies [153, 269]. While these result in broader participation, the captured data often goes unused as decision-makers lack the skills to effectively analyse this data [79], particularly as the quantity of data increases [172]. Mahyar et al. [172] highlight how qualitative data analysis is often outsourced by public officials to overcome this *"data deluge"* and argue for an increased need for scalable qualitative methods and digital tools to overcome these challenges. While technologies have been designed to encourage involvement across all stages of a qualitative process, they require significant assistance by researchers to support data analysis [21, 146, 175]. This is particularly unsuitable for geographically distributed community engagements – as presented in this chapter – as providing real-time assistance is unfeasible. Despite these challenges with geographical participation, prior work has shown promise for supporting remote participation and capturing opinion through technology in city-wide and global community engagements [111, 121, 160, 162]. However, similar to local engagements, have so far failed to support participation in the data analysis and curation stages.

As such, civil society organisations could benefit from utilising participatory strategies to create more inclusive opportunities for participation in community engagements that actively involve their community members in all stages. Building on these challenges and informed by

the literature review and workflow chapters, three design goals (DG) were established to explore inclusive participation in community engagements through technology:

- **(DG1) Alternative Modes of Participation:** Support participants engaging in the *capture, analysis, and curation* stages through structured activities [21, 172].
- **(DG2) Reduce Barriers to Participation:** Create opportunities for active participation by lowering technical, geographic and temporal barriers [52, 60, 121].
- **(DG3) Improve Representation:** Design a digital space where participants feel valued for contributing their voice and can observe it impact on process [27, 160, 237].

6.3. Study Design

This chapter aimed to explore these challenges through a collaboration with a global civil society organisation as part of an ongoing *globally distributed* community engagement where Gabber could be configured and deployed to gain insights into the challenges and opportunities through real-world use. Through this, we anticipated practical insights for the partner organisation and its members, and design learning for how distributed community engagements could be configured to enable active participation in all research stages. The following subsections outline the research approach undertaken throughout this chapter and describes the context and associated motivations of the collaborating organisation.

6.3.1. Approach

To investigate the challenges associated with configuring and running a distributed community engagement, the author sought out an organisation that had experienced the challenges outlined above, and who wanted to explore alternative, digital methods of actively involving their members in community engagements. Consistent with the overarching research approach taken throughout this thesis and as outlined in the research approach section, was the application of an *action research* approach through an in-depth case study in one context, i.e., an *instrumental case study* [254]. The aim of this approach was to generate *practical knowledge* for the collaborating organisation to inform an ongoing community engagement, and *research insights* as presented in this chapter to understand how the Gabber platform was appropriated and used across the research workflow through a real-world field deployment [249]. This case study provided a unique opportunity to explore the challenges and opportunities faced by civil society practitioners when adopting and deploying the end-to-end qualitative research workflow through Gabber, and for citizens practitioners (the organisation's members) when contributing to each research workflow stage. In contrast to prior research presented in this thesis, this chapter explores the end-to-end qualitative process from the perspective of both a civil society organisation (an NGO) and its members in a *geographically distributed* engagement. Consequently, the research presented encompasses *two phases* that describe: (i) a real-world deployment of the qualitative workflow through Gabber in an NGO to understand real-world use; and (ii) post-deployment

interviews with participants who took part in phase one to understand their perceptions of how their data would be used and enact change in the organisation.

6.3.2. Context

The International Federation of Red Cross and Red Crescent Societies (IFRC) is the central governing body for the Red Cross and Red Crescent Movement, the largest humanitarian network in the world, comprising of 192 National Societies (NS) that jointly mobilise over 12 million active volunteers each year [136]. Due to the IFRC's federated structure, each NS operates as an independent organisation with its own governance and structure, typically comprising many layers of management between senior leadership and volunteers.

In 2017, the IFRC's *innovation team* began a three-year series of future forecasting activities with the aim of producing a collective plan of action to respond to the anticipated humanitarian needs of the future, termed *Strategy 2030* [134]. The innovation team had previously used workshops with different national societies to understand how local members would respond to hypothetical future events that impact humanitarian aid, such as global pandemics. This approach helped foster discussion, but as with traditional workshop approaches, attendance was limited by time, proximity, and the venue's size and cost, leading to a smaller portion of the affected community attending than desired.

In a prior research collaboration, the innovation team co-led a digital community engagement named *WhatFutures*, where WhatsApp was used to structure remote participation from their members with the aim of capturing ideas in media format in response to challenges set by the IFRC [160]. Findings from this work illustrated the potential of distributed participants collaborating and independently capturing rich qualitative data for a collective goal, but through its design, participants were excluded from the data analysis and dissemination stages. WhatFutures produced large media datasets that the innovation team could not analyse due to limited internal capacity and time constraints, and so were keen to explore alternative, ideally participatory approaches that involve their distributed members in data analysis and dissemination with the aim of producing a podcast from captured media.

Gabber was subsequently demoed to the innovation team who were interested to use it as part of their ongoing strategy development process because in contrast to WhatFutures the platform enables members to contribute to data analysis and dissemination of ideas, which had been raised as a tension point through prior conversations between members of the innovation team. In particular, the innovation team had experienced similar challenges to prior community engagements that are summarised as three design priorities that expand upon the aforementioned design goals but contextualised within the challenges experienced by the IFRC:

- **Modes of Participation:** The IFRC had previously used novel digital approaches to explore the future challenges faced by NS's but had struggled to increase participation beyond data capture without significant assistance from researchers [21, 160]. A priority was thus to increase participation in the analysis and reporting stages, whilst drawing from members' local knowledge to contextualise and enhance the output [100, 258].

- **Barriers to Participation:** The IFRC previously used in-person methods (workshops) to engage NS members, which required significant resources and coordination, and took participants away from daily programme delivery. A key priority identified through our collaboration was to increase opportunities for all members to participate through lowering existing technical, geographical, and organisational barriers [45, 100].
- **Improving Representation:** Key to Strategy 2030 was the inclusion of local views from members across all layers of the IFRC, and the sharing of these between branches to promote knowledge exchange. However, sharing insights between branches and reaching all members through a digital engagement has not been possible due to the organisation's federated structure, traditional hierarchy, and independent power of branches [160]. Priority was therefore also given to promote inclusive representation of members' opinions through sharing in-depth, qualitative insights from all layers of the IFRC.

Between August 2018 to January 2019 the author was embedded within the IFRC's headquarters in Geneva, Switzerland, collaborating directly with the innovation team to design, lead, and deploy a digital campaign, termed *TalkFutures*, that aimed to address these design priorities. TalkFutures aimed to actively involve the IFRC's distributed members in the production, analysis, and summarisation of qualitative data to surface local insights that could inform strategy development. The following section outlines how Gabber was adapted into TalkFutures in response to the innovation team's needs and informed by the design goals outlined above.

6.4. Designing TalkFutures

The collaboration with the innovation team aimed to design a digital campaign where distributed members could become actively involved in the data capture, analysis and summarisation of audio interviews through a Gabber deployment. However, Gabber's design was informed by three co-located deployments (i.e., chapter 4), whereas the geographical, global distribution of participation by IFRC members surfaced several new design challenges, such as the expectation that limited support could be provided to participants due to time zone conflicts. Consequently, the **TalkFutures** digital campaign was designed to extend the *capture*, *analysis*, *curation* stages of the Gabber workflow in two ways.

Firstly, the Gabber platform was configured as a distinct deployment in line with the IFRC branding to create a familiar experience for participants. This involved technical changes to facilitate filtering of analysed data in ways that were meaningful to this specific context due to the potential large-scale scope of the deployment. For example, recording additional metadata during the data capture stage to enhance filtering of conversations, such as demographics and national society.

Secondly, unique roles and associated responsibilities were introduced in each qualitative research stage to structure independent, distributed participation, that were meaningful to participants who were not necessarily familiar with the associated terms or practices of qualitative research. Moreover, having a unique brand (TalkFutures) facilitated promotion of the deployment

across the IFRC while utilising prior awareness from its member with prior digital engagements led by the innovation team, i.e., WhatFutures [160].

The following subsections describe how each Gabber workflow stage was adapted for TalkFutures, and how roles were introduced to facilitate distinct modes of participation around each to ensure distributed members could participate with minimal support. Following this, each research phase is described, including the associated study design and findings.

6.4.1. Adapting Gabber

At the beginning of our collaboration, the IFRC's innovation team noted that the current Gabber platform contained several other public projects (e.g., from prior deployments in this thesis and use by other researchers) that they thought potential participants would view and may limit participation in a digital engagement. As such, the innovation team wanted a way to more easily brand the platform in line with their current image. Consequently, the Gabber platform's source code was run as a separate instance that was made possible due to its flexible architectural design that accommodates multiple, concurrent deployments with limited setup required (section 3.3). IFRC members have a shared trust in the organisation's brand, which informed the decision to white-label the forked platform to mirror the IFRC's branding, including hosting the web application on a subdomain of the strategy website[1] and deploying separate mobile applications for data capture[2]. Due to the multilingual aim of TalkFutures, all content in the platform was translated into the organisation's four core languages: Arabic, English, French and Spanish. In addition, technical changes were required on the mobile and web applications to capture demographics and reduce the steps needed for members to engage with conversations.

The following subsections outline how each workflow stage in the Gabber platform was reconfigured and adapted to accommodate the TalkFutures deployment. No technical changes were made to the *consent* stage of Gabber, and so is not described in the subsequent sections. Informed consent continued to be recorded at a group-level, with participants receiving follow-up emails where their data was embargoed for 24-hours where they could change the consent type if they desired.

6.4.1.1. Preparation

To structure the data capture stage, a *project description* and *discussion topics* were iteratively created with IFRC's head of innovation as outlined in Appendix B.1. The final description included a summary of the strategy process, what the innovation correspondent role was, how contributed data would be used, and a one-sentence instruction of the capture process as follows:

> *Strategy 2030 (https://ifrc.org/s2030) revolves around understanding how the Red Cross and Red Crescent should adapt to global challenges and seize emerging opportunities over the next 10 years.*

[1] This was originally hosted on https://talk.future-rcrc.com and later moved to https://tf.gabber.audio for posterity.
[2] The **TalkFutures** mobile applications are available on Android and iOS.

> *The Innovation Correspondent will interview leaders, staff, volunteers and/or external experts to capture their visions on how the organization can be ready for future challenges. Your interviews will be transformed into podcasts and other communications and research products.*
>
> *All it takes is 3 steps: (1) add your participant(s); (2) provide consent; (3) choose a topic to start interviewing.*

Five topics were created that aimed to explore existing challenges and potential solutions utilised by local IFRC members to inform broader discussions with the global community and by extension inform the strategy development process as follows:

1. What trends in your country will most affect people in the next 10 years?
2. How will these trends impact the IFRC?
3. What practical steps should your branch take in response to these trends?
4. Given these changes, what would be your vision of the IFRC in 2030?
5. Ask your own question

Once the description and topics were finalised and translated into the four core languages, a project was manually created by the thesis author to populate the multilingual project, as no interface design existed for multilingual project creation as outlined in chapter 3.

6.4.1.2. Capture

The innovation team led the configuration of the Gabber platform as highlighted above and was framed as a participatory process through which we facilitated the design of appropriate topics for use in Gabber. This "top-down" approach by the organisation was necessary due to the scale of the organisation and limited time frame that was possible to run a deployment. Likewise, the innovation team were particularly interested in recording the demographics and role of participants that took part in TalkFutures for internal reporting, to gauge the reach of this digital approach, and to provide an opportunity to reach out to specific national societies to thank them for engaging. Consequently, two changes were made where demographic data – i.e., *age range (<21, 21-30, 31-40, 41+), gender (Female, Male, Specified, Not said), National Society* – and the participants role in the organisation – i.e., *Volunteer, Intern, Staff, Leadership and External* – were recorded as illustrated in Figure 6.1 that captured this data: (i) upon registration in the mobile or web application; and (ii) in the *add participant screen* when recording a conversation in the mobile application to capture the same data.

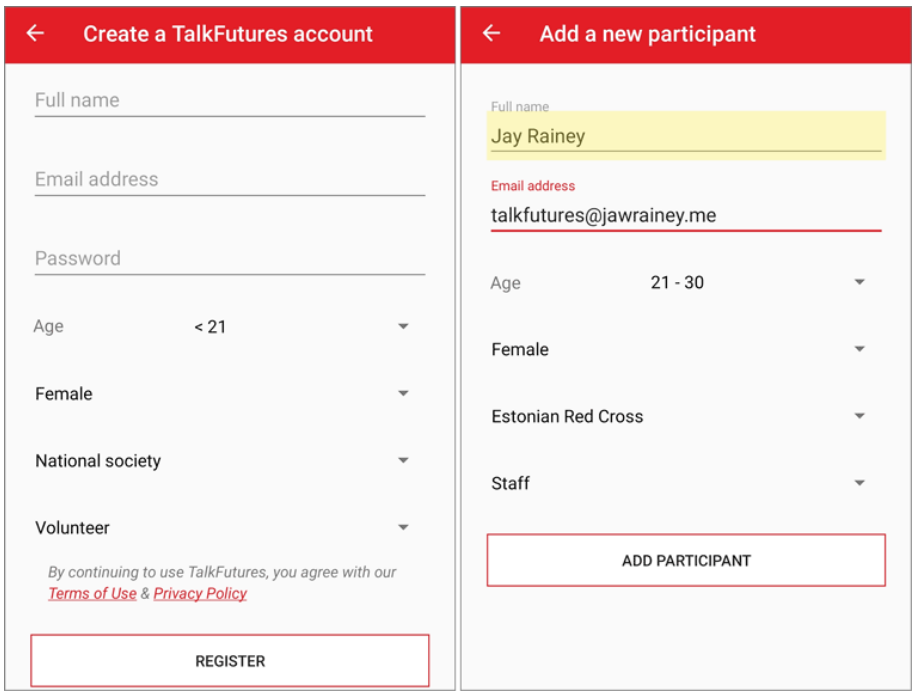


Figure 6.1 The *register* and *add participant* screens recorded demographic and organisation data.

6.4.1.3. Analysis

As there was only one project on the TalkFutures website that contained all the conversations, it was hidden, and the navigation menu changed to direct participants to the listed conversations. The conversation component was updated to include the additional demographic data recorded on data capture and the language spoken in the conversation. The associated filters were also updated to enable filtering by language, national society, role, gender, and age (Figure 6.2)

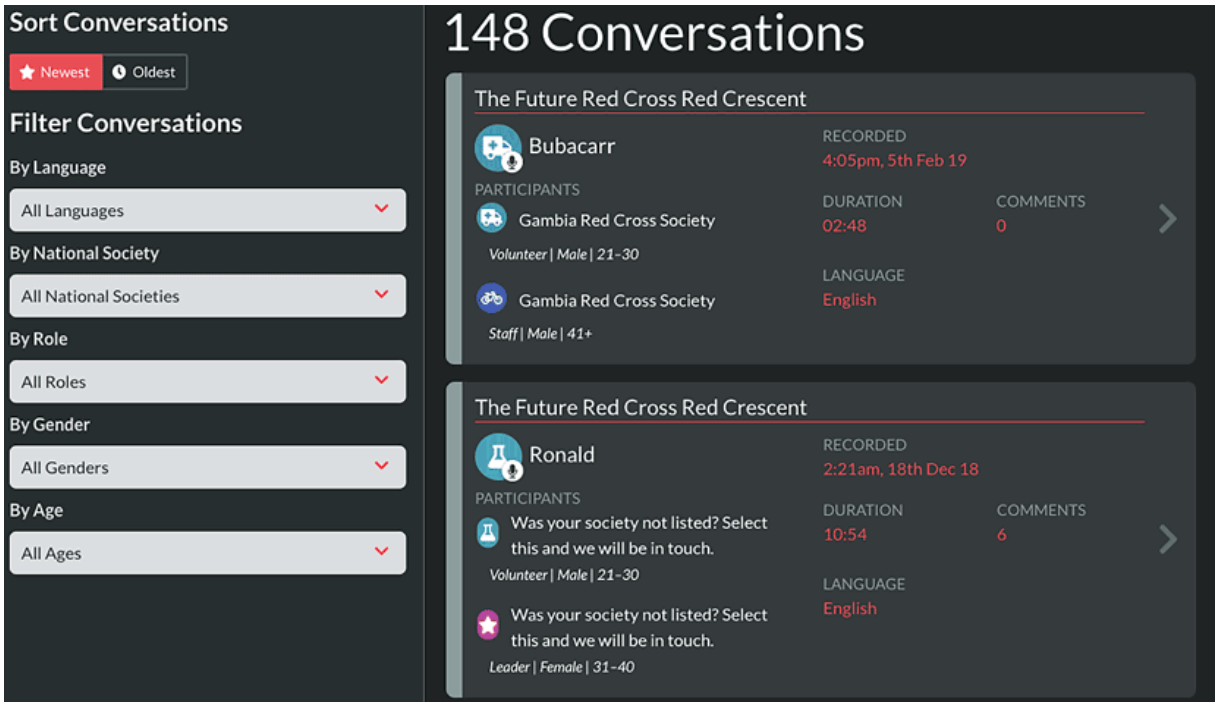


Figure 6.2 Conversations could be filtered by language and demographics on the web application.

The innovation team chose not to create a *codebook* to structure data analysis as they desired free-form discussions of the conversations between participants and did not intend to use the playlist interface for curation in the qualitative workflow as detailed below. The annotation interaction remained unchanged when analysing a conversation, however, the project title and description, and participants demographics were displayed in the metadata column to remind participants who and from where the conversation was created (Figure 6.3).

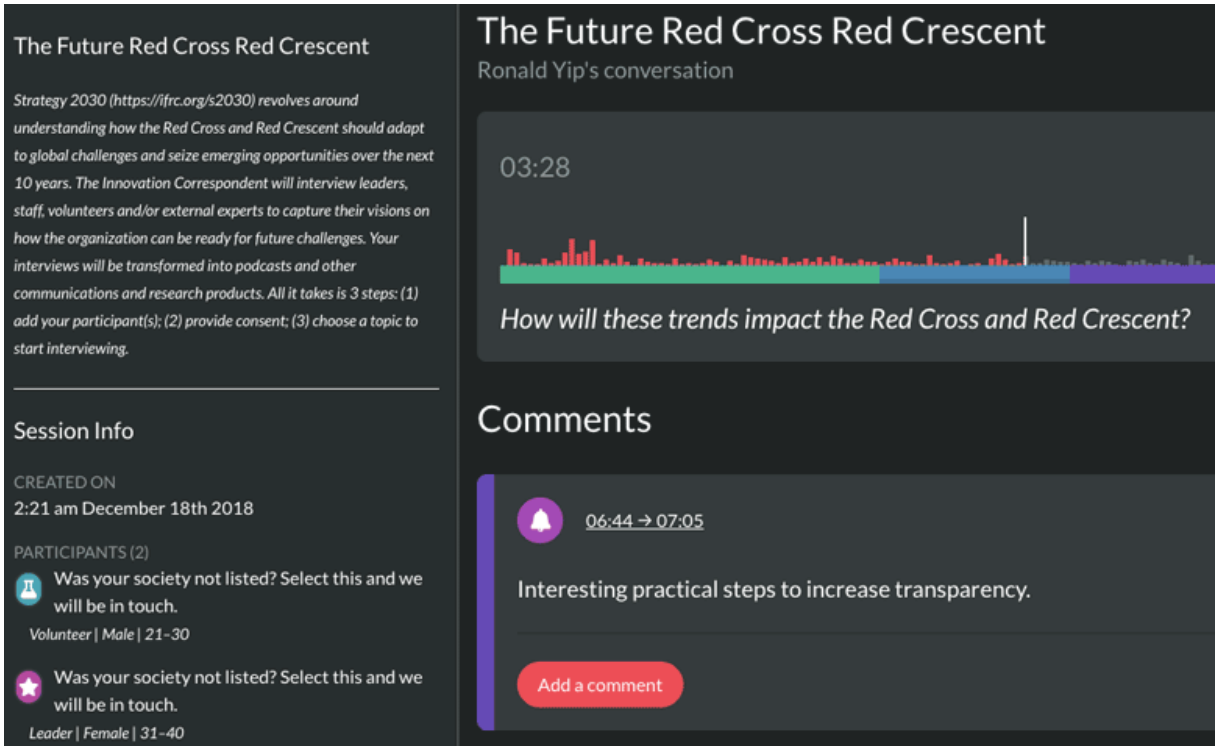


Figure 6.3 The project's metadata and participant's demographics were shown during data analysis.

6.4.1.4. Curation

The IFRC's innovation team wanted to capture the voices of its members in hopes of disseminating and distributing outcomes through communication material on social media and their website, such as through posters, audio snippets, and blog posts. The innovation team requested to not use the playlist curation interface as it would require additional time from participants to familiarise themselves with it. Instead, the curation stage was designed to utilise participants existing communication and design skills whereby participants would summarise contributions from the capture and analysis stages that would be promoted by the innovation team through social media channels as a form of dissemination and reuse. In this way, the practices of curating analysed conversations (through comments) encompassed both the *curation* and *reuse* stages of the qualitative research workflow.

6.4.2. Configuring Workflow Stages with Roles

Prior research has shown that roles help participants builds identity and a sense of responsibility when engaging in an activity and can be a valuable approach for scoping contributions through

defining responsibilities to achieve from participating [144, 160, 244]. Roles help increase engagement by enabling flexible participation as participants can choose roles suitable to their interests, skills, and learning [160, 244]. In contrast, prior deployments of the Gabber workflow (i.e., chapter 4 and those led by other researchers [24, 268]) were designed to include participants in all stages of the workflow when possible and were typically led by a researcher who supported or informally trained participants in using the associated capture and analysis technologies. As such, there was no distinction in how participants contribute to workflow stages by design to encourage flexible participation for how and when participants could pursue each role. In contrast, participants of TalkFutures would be globally distributed, spanning multiple time zones, and therefore any communication would be limited and synchronous. This restricted what support and training could be provided, which was compounded by supporting four languages across the deployment and therefore introduced time constraints associated with translating any supporting materials.

Responding to the challenges of configuring participation and prior research success with utilising roles in distributed engagements, TalkFuture's design extends the *capture*, *analysis*, and *curation* stages of the Gabber workflow through the design of unique roles and engagement activities to guide independent and inclusive participation in each workflow stage. Each stage was separated to allow flexible participation and to reduce the time required to engage with each role to increase their accessible for participants. Moreover, on completion of each role a member would receive a certificate or letter of reference for participating to incentivise participation and contribute to each member's professional development, which had been applied previously by the innovation team [160]. In this way, the completion of roles was enforced through responsibilities and associated incentives (certificates), but how each role was completed in practice was left open to support flexibility of participation. An overview of each role as was presented to participants during recruitment is illustrated in Figure 6.4 that includes their responsibilities and intended outcome. The motivation, aim, design rationale, and responsibilities of each role is described in the following subsections.

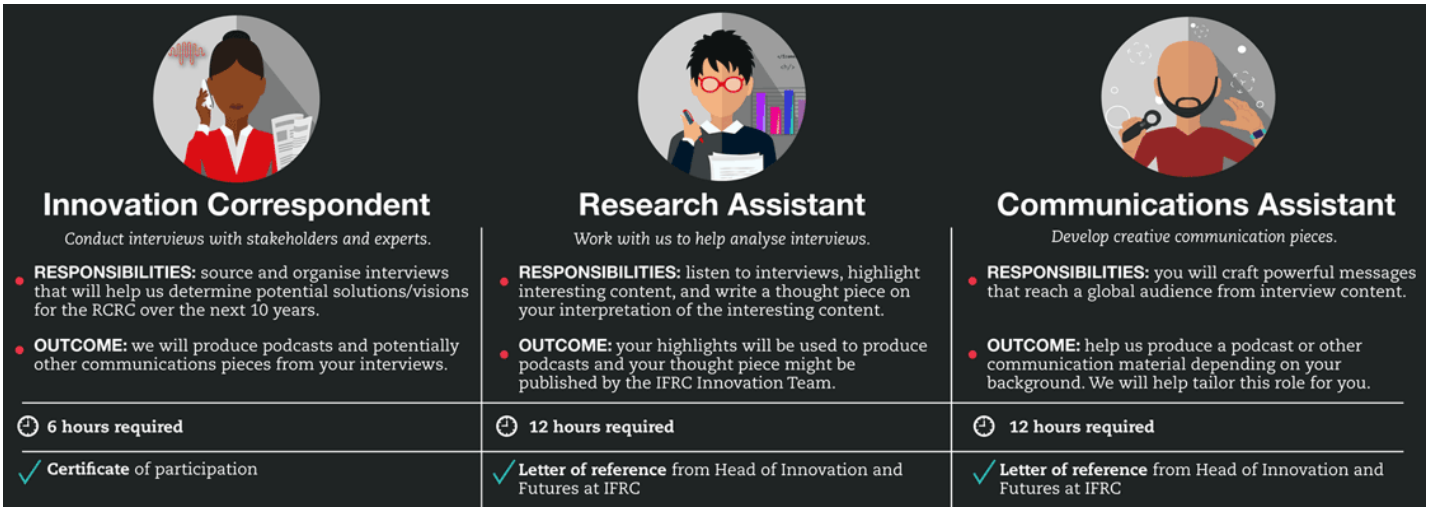


Figure 6.4 The three roles, responsibilities, outcomes and incentives for taking part in TalkFutures.

6.4.2.1. Capture: Innovation Correspondent

The innovation team had previously used workshops with different national societies to understand local members perspectives in relation to strategy development. As with traditional workshop approaches, attendance was limited by time, proximity and the venue's size and cost, leading to a smaller portion of the affected community attending than desired [27, 74, 237]. As such, key to the data capture stage was increasing opportunities for all distributed members to participate while empowering them to capture the perspectives of other members that may not attend traditional engagements.

The *Innovation Correspondent's* role was designed to support distributed participants sourcing and conducting interviews with IFRC members or external experts to capture their local knowledge using the TalkFutures mobile application. This stage was framed as an interviewing activity rather than informal conversations in contrast to prior deployments at the request of the innovation team to simplify the promotion of TalkFutures. Participants were given ownership and control over who and how they decided to select interviewees. Recorded interviews were then automatically uploaded to the TalkFutures web application for others to view and analyse. Participants received a *certificate of participation* upon recording at least three interviews.

6.4.2.2. Analysis: Research Assistant

The IFRC's existing analysis practices involve specialised research units that commission data capture from local branches that is sent to a centralised location for analysis, with infrequent input from participants. As IFRC branches are independent, communication between them can be limited despite potential overlap in similar internal or outreach activities. Moreover, the innovation team had previously struggled to analyse the growing amounts of qualitative data they produced through prior community engagements, paralleling similar experiences of governing institutions that utilise traditional methods of community engagement [172].

In response, the *Research Assistant* role supports participants engaging in qualitative data analysis of perspectives from outside their national society to aid knowledge exchange between otherwise siloed communities, whilst drawing from members' local knowledge to contextualise and enhance the output [100, 258]. This role was responsible for listening, analysing and commenting on captured interviews to identify insights from across national societies pertaining to strategy development, and writing a blog post on the IFRC's strategy website to synthesis their analysis and share findings with the community [134]. Participants would receive a letter of recommendation from the IFRC's head of innovation upon completion of a blog post. To measure completion of activities and ensure quality of blog posts, participants were asked to create at least three comments across different interviews.

6.4.2.3. Curation: Communications Assistant

Traditional methods of community engagement are effective for sourcing opinions in-person [54, 172], but generally do not involve participants in data analysis, curation, or dissemination

[111, 160, 175]. This can result in participants feeling that their voice is underrepresented in the final output of community engagements [60, 175], in part because outputs are typically dense, written reports that require significant time to engage with. Moreover, local participants have the most knowledge of the data context and its contents through their lived experiences contributing to the IFRC and are therefore best positioned to contribute to the data curation stage [100, 258].

The *Communications Assistant* role responds to these challenges and was responsible with producing a design output that summarises material contributed from the other two stages – i.e., *interviews, blog posts, and comments* – that the innovation team could reuse to promote insights across the global network to represent participants views and create further discussion. This role aimed to make participants who contributed to prior stages feel valued and represented in the artefacts output from TalkFutures. In contrast to traditional consultations, this stage uses content in formats that are meaningful and accessible to participants to encourage engagement. Participants were given creative control in what digital tools that they use to produce summaries, and similar to the research assistant role, would receive a letter of recommendation for producing one communication piece.

6.5. Phase One: Field Deployment

Following the sociotechnical design of TalkFutures that reconfigured the Gabber platform to accommodate how the IFRC wanted its members to engage in a qualitative workflow, a *digital campaign* was designed to recruit and support IFRC members participating in a four-week deployment of TalkFutures as part of an ongoing community engagement, i.e., Strategy 2030. This provided insight into how qualitative practices were adopted by a civil society organisation (IFRC), what was required to facilitate participation in each workflow stage in a *globally* distributed community engagement, and how TalkFutures was used to enable members to actively participate in each stage of the qualitative workflow. As such, the following subsections detail: (i) how the deployment was configured, including how participants were recruited and supported across the duration of TalkFutures; and (ii) a summary of findings for each qualitative workflow stage through its associated role.

6.5.1. Study Design

The TalkFutures deployment was designed as a *digital campaign* lasting four weeks between November 12^{th} and December 14^{th}, 2018. In line with prior research on digital engagements, fixed deadlines were associated with roles to structure the campaign to ensure deliverables from roles would be achieved by fixed dates [160]. As such, the following sections describes the recruitment strategy used to raise awareness of the TalkFutures event amongst the IFRC's federated network, the associated challenges, and an overview of participants that registered interest. Following this, the support and training that was designed into the campaign to enable participants to independently pursue roles with minimal guidance from researchers is outlined.

6.5.1.1. Recruitment Strategy

Between September 2nd and mid-October, recruitment was undertaken by the author using a range of email and social media campaigns where participants could register interest to participate in the upcoming TalkFutures engagement through a Google Form that captured their demographics (name, age, gender), email address, and national society. National societies that had previously shown interest to take part in digital engagements led by the innovation team were contacted directly requesting that they advertise the campaign across their network in Kenya, Mexico, Australia, and Tunisia, as well as the IFRC's regional office in the Americas that has direct contact with all national societies in that region. Each National Society relays information independently, making it difficult to determine if recruitment material was forwarded to IFRC members or how many participants were reached through digital recruitment strategies. It was therefore important to use multiple modes of communication as a recruitment strategy. As such, an internal mailing list from the IFRC's innovation team was used, which contained 5,000 participants who had previously registered interest to participate in any future digital initiatives. Moreover, an independent volunteering Facebook group with roughly 32,000 members was also used to promote TalkFutures[1]. Posters and videos were intermittently released during the recruitment campaign to promote the upcoming TalkFutures engagement using the aforementioned communication channels[2]. Figure 6.5 illustrated how the *innovation correspondent* role was promoted through a poster and that recruitment occurred in multiple languages. All recruitment was undertaken directly by the author from within the IFRC's innovation team where an existing relationship between IFRC members existed.

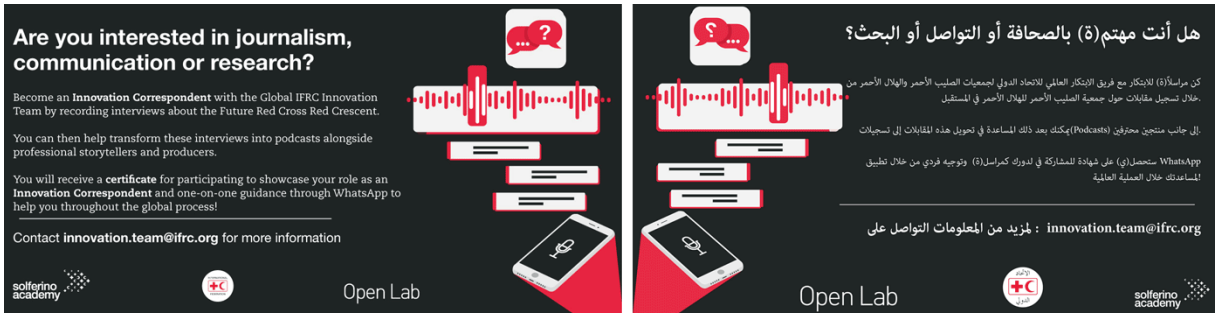


Figure 6.5 A poster used to encourage interest in the *innovation correspondent* role during recruitment.

In prior engagements by the IFRC, participants frequently registered interest and did not engage further, leading to high dropout. With the skills required to pursue roles in TalkFutures additional dropout was anticipated, and so a recruitment strategy was designed that involved direct communication with participants using their mobile telephone number. Following registration of interest, each participant was emailed to outline the roles, responsibilities, and deployment timeline, requesting a response with their desired role(s) and their personal mobile telephone number. Each participant was then contacted through WhatsApp for a debriefing of the TalkFutures

[1] https://www.facebook.com/groups/VolunteersIFRC

[2] Two videos were produced and released on the IFRC's official YouTube channel to promote TalkFutures: https://www.youtube.com/watch?v=mIbTK3wOwD4 and https://www.youtube.com/watch?v=XTCTzBb4Ih4

deployment and written informed consent taken for their participation in research. Participants' mobile numbers were also used to create a communication channel between members with the same roles to foster discussions and coordinate support and training through WhatsApp as outlined in subsequent sections.

6.5.1.2. Participants

In total, 467 participants from 81 National Societies registered interest through the recruitment strategy: 338 English, 79 Spanish, 27 French, 23 Arabic. Following the recruitment strategy where each participant was emailed with next steps, 77 participants from 42 national societies (countries) pursued a varying range of roles by language as illustrated in Table 6.1. Notably, participation by Arabic and French speakers was considerably less than English and Spanish. The relative levels of recruitment compared with the IFRC's scale may be attributed to the perceived skills required for each role, or the IFRC's federated and independent communication structure between national societies that is known to impede the promotion of timed events. This was evidenced once the TalkFutures deployment began as additional members contacted the innovation team requesting to take part up to six-months after the digital engagement began.

	English	*Spanish*	*Arabic*	*French*
Innovation Correspondent	10	8	8	8
Research Assistant	10	11	2	5
Communications Assistant	9	4	0	2
Total	29	23	10	15

Table 6.1 Participation by Role and Language in TalkFutures.

6.5.1.3. Support and Training

Prior research highlights how researchers often require supporting participants to facilitate engagement in collocated qualitative practices, e.g., [21, 146, 175, 268]. Due to the distributed configuration of TalkFutures and the innovation correspondent and research assistant roles depending on new technology that was unfamiliar to participants, we opted to design support material that could be used by participants at any time. WhatsApp was chosen to create a communication channel between participants due to enabling group conversations where support could be provided at a group level, and prior research had shown its effectiveness for coordinating geographically distributed engagements within the IFRC due to its ubiquity of use amongst volunteers [160]. Moreover, WhatsApp has been used to create more inclusive forms of organisational communication [12] and to structure participation in data collection activities in citizen social science research projects [126].

Following the recruitment campaign and one week prior to the deployment, 19 WhatsApp groups were created composing 77 participants in total: two groups per role with four participants in each on average. This resulted in seven English, five Spanish, three Arabic, and four French

groups. These WhatsApp groups were used to provide support and training to participants in their preferred language, to foster a community around each role, and to support informal conversations between members, which is atypical across national societies. For example, participants described how their personal commitments and time constraints would often impact their completion of responsibilities associated with their roles through WhatsApp. To facilitate group engagement, one native speaker from the innovation team (henceforth *group lead*) was added to the Spanish, Arabic, and French groups and was responsible with initiating discussions and providing training material to participants. Training material in the form of videos and posters were prepared by the author and translated prior to creating WhatsApp groups that demonstrated how to use the digital platform to achieve the responsibilities of the innovative correspondent (data capture) and research assistant (data analysis) roles as illustrated in Figure 6.6.

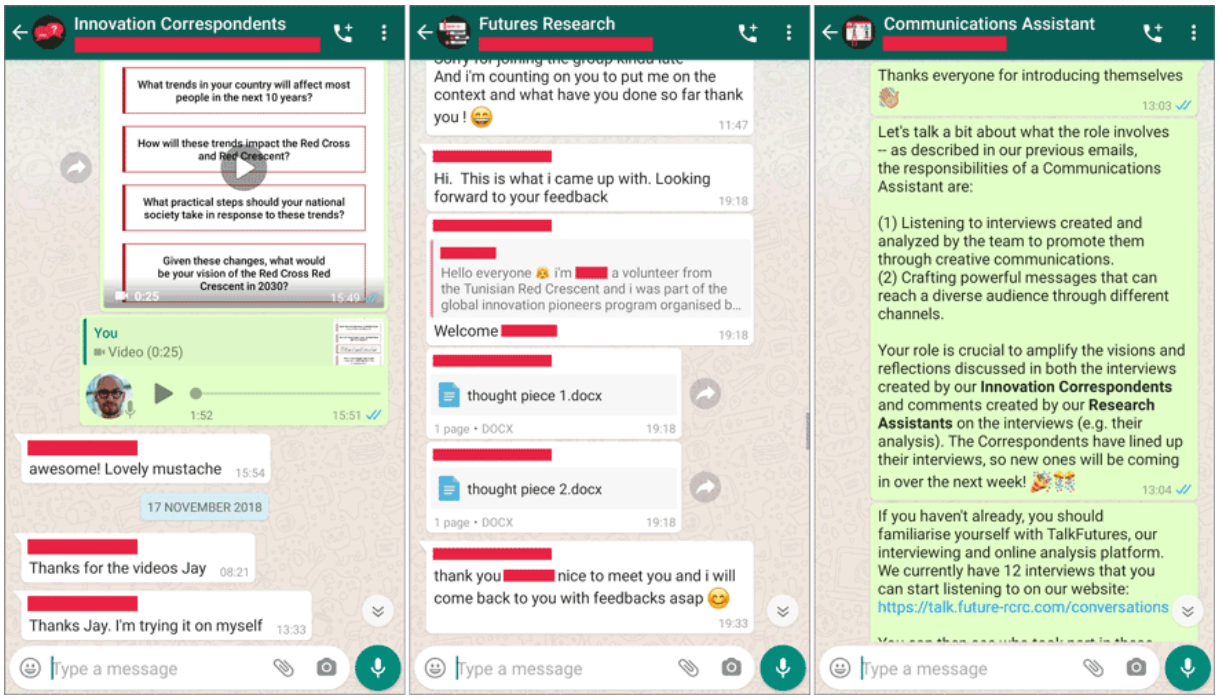


Figure 6.6 Short training videos were provided to demonstrate the capture process, and participants provided peer-support through reviewing each other's work.

Prior to TalkFutures commencing, innovation correspondent groups were asked to record a test interview to familiarise themselves with the process, and to share it with their group to receive peer feedback (Figure 6.6). The researcher in each group used the recordings to discuss best practices, e.g., placement of the mobile device to control for audio quality. Group leads sent messages to research assistant groups containing hyperlinks of the uploaded conversations on the TalkFutures website to simplify data access, engagement and discussion within groups. Moreover, one-on-one review of research assistant's blog posts were provided by group leads, and by other participants in each group before publication to support feedback and high-quality writing at the request of the innovation team lead.

6.5.2. *Findings*

The following sections present engagement statistics concerning the uptake and participation of each role during the four-week, global deployment of TalkFutures across the IFRC. These findings evidence the breadth and depth of engagement with each qualitative workflow stage (i.e., *capture, analysis, and curation*), and describe the usage of the Gabber platform for data capture and analysis through the associated innovation correspondent and research assistant roles.

6.5.2.1. *Innovation Correspondents*

This role involved using the TalkFutures mobile application to capture the experiences of local IFRC members using discussion topics created by the innovation team concerning the future of the organisation. In total, 108 interviews were recorded from 26 national societies (countries), of which 13 were uploaded by participants to test the process as per the design of our support and training process and are therefore excluded from the remaining analysis. These 95 interviews were recorded by 37 innovation correspondents, totalling 11 hours and 38 minutes, with an average length of 7 minutes 33 seconds per interview (SD=05m:31s, min: 00m:32s, max: 25m:00s). An overview of data contributed by language is illustrated in Table 6.2.

	English	*Spanish*	*Arabic*	*French*
# Interviews	31	38	22	4
Total Length	04:25:48	02:50:17	03:56:43	00:25:32
Avg Length	00:08:34	00:04:29	00:10:46	00:06:23
# Interviewers	14	13	7	3

Table 6.2 Participation as innovation correspondents by language. Total and average length are hh:mm:ss.

While Arabic speakers recorded fewer conversations overall, these were considerably longer on average. Low engagement by French speakers could be attributed to the limitations of the recruitment strategy within French speaking nations. This had notable impact on participation in the subsequent roles because they were dependent on data being contributed to this stage.

Of the 37 innovation correspondents, 23 were males and 14 females, and were collectively from 26 unique countries. 20 out of 37 (54%) completed the responsibilities associated with the role to receive a certificate of participation as illustrate in Appendix B.2. In line with prior digital engagements by the innovation team (e.g., [160]), 75% of participants were primarily young adults where the IFRC define young adults as less than 30 years old [137]. Participants had mixed roles within the IFRC: 57% were volunteers, with the remaining evenly spread across interns, staff, leaders and external experts. This is in contrast to prior digital engagements led by the innovation team where participation was primarily by volunteers.

There was a small portion of participants that were prolific at capturing interviews that went beyond the three interviews required to receive the certificate of participation. For example, one participant recorded 16 of the 22 Arabic interviews (75%), and another recorded 10 of all 38 Spanish interviews (26%). These *"hyper-engaged"* patterns of participation mirror prior digital

engagement research that describes how these forms of participation keep the engagement active but could lead to skewed narratives if other voices are not shared [139, 140, 160].

Of the 95 interviews, 69 (72%) participants used the *participants screen* to add the participant and record demographics about the individual prior to recording a conversation. This was currently optional within the mobile application to facilitate adding participants as required. However, while this usage indicates understanding of the process, the current design is limited because participants who were not added (and therefore their email not recorded) did not have the opportunity to modify their consent dynamically following the interview. All recordings were consented for public use, with the exception of one where the creator (and only participant in the conversation) contacted the innovation team directly requested that it be removed from the website due to the content discussed.

Of the 69 participants interviewed, 18 identified as volunteers while 51 were in varying positions within the IFRC: 6 were interns, 23 staff, 13 leader, and 9 external experts. This highlights that interviewees were more often senior members in positions of power in the IFRC than the interviewers, providing control and power to the interviewee in contrast to existing work practices. There were 19 unique countries among these interviewees, ranging from larger national societies – e.g., Colombian (15) – to much smaller branches – e.g., Saint Lucia (1) – illustrating a breadth of participation from across the organisation.

Discussion topics are presented to the user through the mobile application in the *recording conversation* screen to structure audio capture. Of the five available for this project, innovation correspondents covered 3.8 on average, which often excluded the *"Ask your own question"* topic. Covering all key topics illustrates that the synchronous support and training enabled participants to independently and correctly use the mobile application to capture recordings. 15 out of 95 of captured interviews covered the same topic more than once. The remaining five were used by two participants using the *"Ask your own question"* topic more than once indicating that those participants wanted to ask the interviewee questions outside of the topics set by the IFRC.

In summary, innovation correspondents independently organised and *captured* audio interviews using the TalkFutures platform that covered 80% of topics on average that were prepared by the innovation team. Participants often selected interviewees who were in positions of relative power who would typically contribute to traditional community engagements, thereby giving control to interviewers to choose interviewees. However, this was at the cost of reinforcing existing dynamics of participation as such interviewees are likely to contribute to other community engagements. Moreover, 95 interviews lasting seven minutes on average were recorded with a range of internal and external stakeholders highlighting a breadth of engagement with this role.

6.5.2.2. Research Assistants

This role was responsible with using the TalkFutures' web application to listen to interviews recorded by innovation correspondents, commenting on at least three interviews as the analysis process, and writing a blog post to curate and share insights gained from the data analysed. There were 28 participants registered as research assistants, with nine completing all criteria

for the role (32%). In total, 67 comments were created (35 in English and 32 in Spanish) with an average length of 47 words (SD=38, min: 4, max: 141). An example of a typical comment and response threads are highlighted in Figure 6.7. Participants that completed this role were from eight national societies and were primarily volunteers (seven volunteers, two staff) with a mixed age range: five were younger than 30, two between 31–40, and two were 41+. Five of the nine participants (55%) who completed the research assistant role also completed the innovation correspondent role. Participants attributed pursing both roles due to being familiar with data captured therefore making the analysis easier. For example, both Arabic speakers that wrote blog posts did *not* create comments because they felt familiar with the data they captured and chose to write about the insights gained from this data. The limited engagement by French speakers could be attributed to either limitations in the recruitment strategy used or the limited data created by innovation correspondents by French speakers.

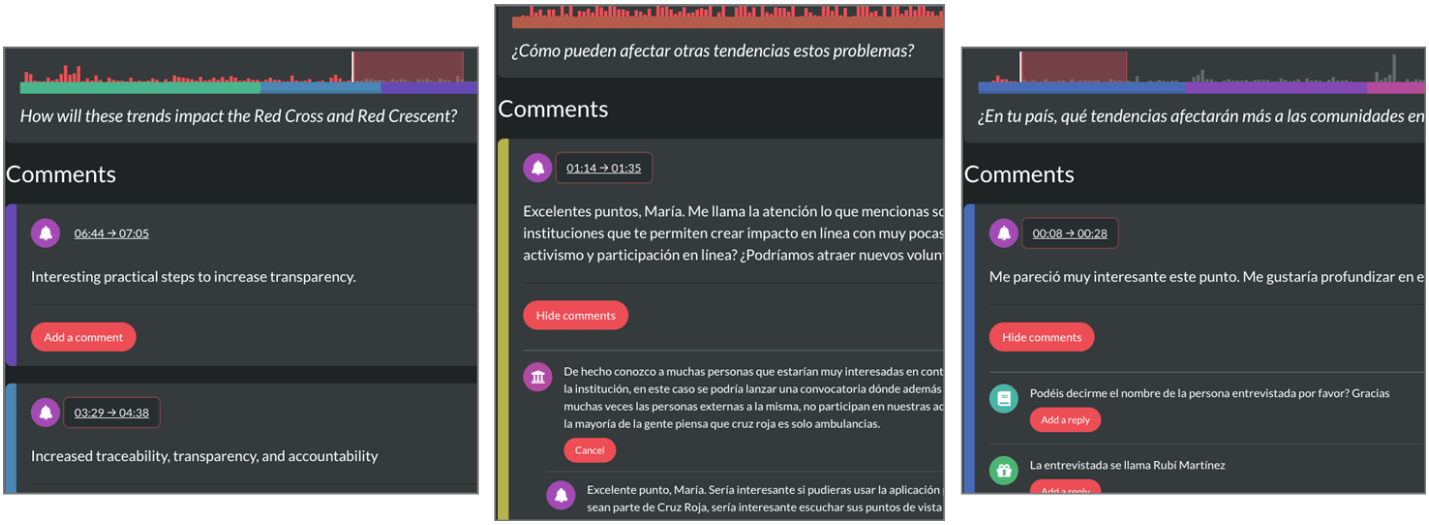
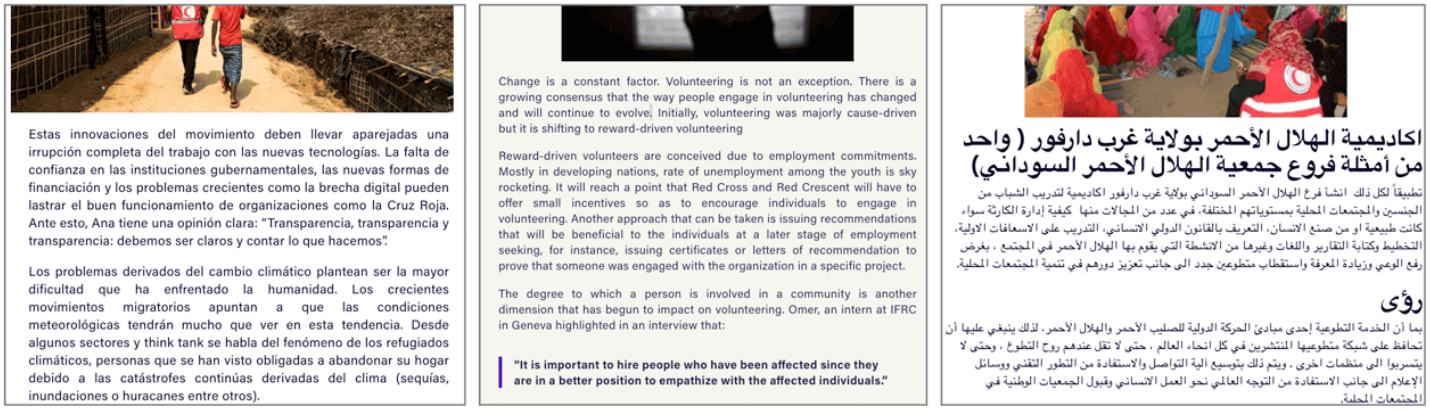


Figure 6.7 How an interview was presented on the Gabber platform and participant's responses.

Distinct from the analysis stage designed in the Gabber platform, this role involved disseminating insights into written reports from the analysed conversations. Blog posts created by research assistants were published on the IFRC strategy website alongside articles written by established humanitarian leaders and were promoted externally through social media by the innovation team, e.g., Figure 6.8. In total, nine blog posts were written by participants (five in English, two Spanish, and two Arabic) with an average length of 816 words (SD=287, min: 468, max: 1227). The content of blog posts varied from imagining the future of episodic volunteering and recruitment to technology's potential role in the organisation. Across these blog posts, participants often drew from interviews spanning multiple national societies to evidence the impact of their discussion while drawing from their personal experiences within the IFRC to contrast and reflect on the interview discussions. Verbatim quotes from interviewees were often used to structure blog posts, with each participant attributing the interviewer (e.g., *"Rubi, a volunteer from the Spanish Red Cross"*) while some participants extended attribution through adding hyperlinks to the interview source for others to listen.



Estas innovaciones del movimiento deben llevar aparejadas una irrupción completa del trabajo con las nuevas tecnologías. La falta de confianza en las instituciones gubernamentales, las nuevas formas de financiación y los problemas crecientes como la brecha digital pueden lastrar el buen funcionamiento de organizaciones como la Cruz Roja. Ante esto, Ana tiene una opinión clara: "Transparencia, transparencia y transparencia: debemos ser claros y contar lo que hacemos".

Los problemas derivados del cambio climático plantean ser la mayor dificultad que ha enfrentado la humanidad. Los crecientes movimientos migratorios apuntan a que las condiciones meteorológicas tendrán mucho que ver en esta tendencia. Desde algunos sectores y think tank se habla del fenómeno de los refugiados climáticos, personas que se han visto obligadas a abandonar su hogar debido a las catástrofes continúas derivadas del clima (sequías, inundaciones o huracanes entre otros).

Change is a constant factor. Volunteering is not an exception. There is a growing consensus that the way people engage in volunteering has changed and will continue to evolve. Initially, volunteering was majorly cause-driven but it is shifting to reward-driven volunteering

Reward-driven volunteers are conceived due to employment commitments. Mostly in developing nations, rate of unemployment among the youth is sky rocketing. It will reach a point that Red Cross and Red Crescent will have to offer small incentives so as to encourage individuals to engage in volunteering. Another approach that can be taken is issuing recommendations that will be beneficial to the individuals at a later stage of employment seeking, for instance, issuing certificates or letters of recommendation to prove that someone was engaged with the organization in a specific project.

The degree to which a person is involved in a community is another dimension that has begun to impact on volunteering. Omer, an intern at IFRC in Geneva highlighted in an interview that:

"It is important to hire people who have been affected since they are in a better position to empathize with the affected individuals."

اكاديمية الهلال الأحمر بولاية غرب دارفور (واحد من أمثلة فروع جمعية الهلال الأحمر السوداني)

تطبيقاً لكل ذلك انشأ فرع الهلال الأحمر السوداني بولاية غرب دارفور اكاديمية لتدريب الشباب من الجنسين والمجتمعات المحلية بمستوياتهم المختلفة، في عدد من المجالات منها كيفية إدارة الكارثة سواء كانت طبيعية او من صنع الانسان، التعريف بالقانون الدولي الانساني، التدريب على الاسعافات الاولية، التخطيط وكتابة التقارير واللغات وغيرها من الانشطة التي يقوم بها الهلال الأحمر في المجتمع ، بغرض رفع الوعي وزيادة المعرفة واستقطاب متطوعين جدد الى جانب تعزيز دورهم في تنمية المجتمعات المحلية.

رؤى

بما أن الخدمة التطوعية إحدى مبادئ الحركة الدولية للصليب الأحمر والهلال الأحمر، لذلك ينبغي عليها أن تحافظ على شبكة متطوعيها المنتشرين في كل انحاء العالم ، حتى لا تقل عندهم روح التطوع ، وحتى لا يتسربوا الى منظمات اخرى . ويتم ذلك بتوسيع الية التواصل والاستفادة من التطور التقني ووسائل الإعلام الى جانب الاستفادة من التوجه العالمي نحو العمل الانساني وقبول الجمعيات الوطنية في المجتمعات المحلية.

Figure 6.8 Snippets of three research assistants blog posts illustrating depth of engagement with this role.

In summary, research assistants analysed data contributed by innovation correspondents through creating 63 textual comments and writing nine *blog posts* to disseminate and represent their findings. Individual feedback was provided to participants on their blog posts before publishing as a quality control measure, which was possible due to the small number of participants. 55% of participants that completed this role also undertook the data capture role, which participants described as enabling deeper understanding of the strategy context and data contributed by others that streamlined contributing to this role. This role enabled independent data analysis and dissemination with limited formal training, highlighting the inherent capacity of citizen practitioners to contribute to these qualitative stages as part of larger initiatives when barriers for data handling and management are reduced.

6.5.2.3. Communications Assistants

Participants of this role were responsible with designing and creating an artefact (e.g., a *poster*) from data contributed from the previous two roles that would be used to represent and promote the ideas and solutions created by TalkFutures participants to the broader IFRC community. This involved reading research assistants *blog posts and comments* and listening to contributed audio interviews to gain an understanding of what was contributed before producing a design.

15 participants pursued this role with one participant, Andrea, a volunteer from Spain aged between 31–40, completing the associated responsibilities to receive a letter of recommendation. Andrea was a professional in the field of communications and described their existing skill set as the main reason for pursuing the role. In total, two posters were produced and a PowerPoint presentation containing ten slides that each presented multiple images from the IFRC with quotes overlaid from interviews to illustrate the ideas from both innovation correspondent's interviews and research assistant's blog posts as illustrated in Figure 6.9.

The other participants that pursued this role, but did not complete it, described insufficient time as the key factor for not engaging, which was compounded with having to wait one month before data from the other two roles was on the TalkFutures platform to begin disseminating. Importantly, all participants that registered for this role had not undertaken any of the prior two roles and therefore would have required additional time to familiarise themselves with the context

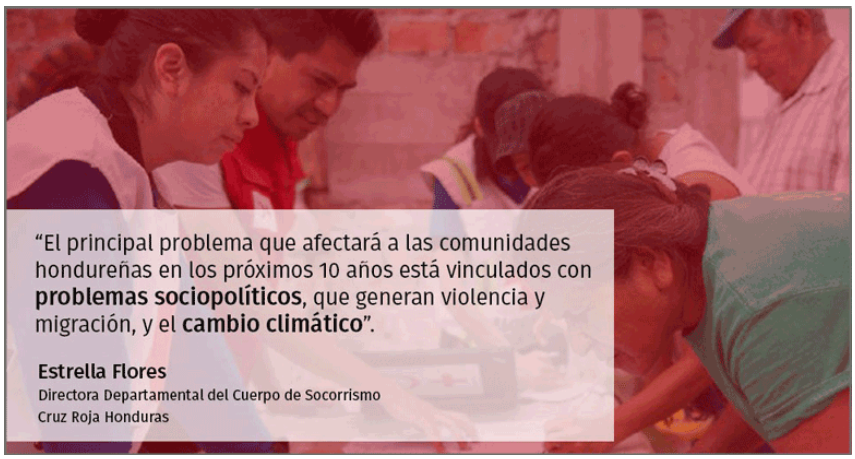


Figure 6.9 A promotional poster created by a communications assistant that quotes a participant interviewed. Translation: *"The main problem that affects indigenous communities in the next 10 years is related to **socio-political problems**, which generate violence and migration, and **climate change**."*

of the data. Limited engagement with this role could be attributed to it requiring pre-existing technical skills to complete the responsibilities, or that communications assistants had to wait several weeks to participate due to the role's dependency on data produced from other roles.

In contrast to the playlist interface designed through Gabber to facilitate the curation stage, the innovation team desired media artefacts in a format that was familiar to IFRC, i.e., *posters*. As such, this role was designed to *curate* insights and ideas from data contributed through the previous two roles and to produce a media output. However, this role faced temporal, skill, and knowledge barriers that limited participation that we posit limited recruitment, participation, and overall engagement with this role despite such media practices being a common way for the organisation to represent qualitative data. Our findings highlight that the process to produce these artefacts and the delay in having data due to the time taken through the previous two roles further restricted participation. Despite this, one participant completed and went beyond the associated responsibilities of this role to produce multiple posters from across contributed data.

6.5.3. Summary

Following the TalkFutures deployment the innovation team thematically analysed interview data and blog posts created to confirm findings from parallel and prior workshops, which informed the final recommendations in the strategy report. Their initial aim of producing podcasts to represent experiences and voices from across the network was not possible at the time due to the small team size and focus on writing the strategy report [135]. As our findings demonstrate, TalkFutures engaged a broad demographic of the organisation, but as with prior geographically distributed engagements, the potential scale of participation was impeded by recruitment strategies. As such, TalkFutures was a *research success* for me as it provided insights into how practitioners use Gabber across the qualitative workflow (i.e., **RO2**), and was perceived as a success by participants through providing a platform to network and develop skills applicable to their daily work lives as outlines in the subsequent section.

6.6. Phase Two: Post-Deployment Interviews

The real-world field deployment, adoption, and usage of the end-to-end qualitative workflow through TalkFutures provided insights into how qualitative practices are used by both civil society (IFRC) and citizen (IFRC members) practitioners and the challenges experienced with designing distributed participation for each role as outlined above. While this provided insight into uptake and technology usage for each qualitative stage, one research aim of this thesis was to understand the experiences and challenges for participants to engage with the qualitative workflow (i.e., **RO2**). Consequently, three weeks following TalkFutures, semi-structured interviews were conducted with a subset of active participants to understand their motivations and values from participating, and the perceived impact of data they contributed. The following sections outline the study design and findings of a thematic analysis of these interviews.

6.6.1. Study Design

In line with the overall approach of this thesis, semi-structured interviews were conducted with participants following the TalkFutures deployment. This provided an opportunity to the understand motivations and values from participating, and to reflect on specific aspects of each qualitative research workflow stage through discussion of participation with each role. Interviews were chosen specifically with participants that had completed roles to more meaningfully reflect on their qualitative practices, i.e., system usage, engagement with roles, etc. The following subsections provides an overview of who was interviewed, the data collection procedure and protocol followed, and how the qualitative data captured were analysed.

6.6.1.1. Participants

24 participants completed all responsibilities across roles and were invited for one-on-one interviews following the TalkFutures deployment. Participants that completed roles were contacted as the research aim of these interviews was to understand the motivations, values, and their perceived impact on the strategy process from engaging in a distributed qualitative workflow through technology (i.e., TalkFutures), therefore participants that did not complete roles were not invited for interview. Ten participants agreed to be interviewed, with the remaining 16 instead sharing their experiences informally through WhatsApp messages. In total, six interviews were conducted as four participants dropped out due to personal circumstances or time zone issues that made scheduling interviews challenging. All participants interviewed were innovation correspondents (data capture stage) and three also pursed the research assistant role (data analysis stage) as outlined alongside their demographics and role in the IFRC in Table 6.3.

6.6.1.2. Data Collection

Six semi-structured interviews were conducted in two languages (three in English and three in Spanish) that lasted 29 minutes on average (SD=9m, min=16m, max=36m). All interviews were audio recorded and conducted remotely through WhatsApp's audio call feature due to

ID	*Organisation Role*	*TalkFutures Role*	*Country*	*Age*	*Gender*
P1	Volunteer	IC	Finland	21-30	Female
P2	Volunteer	IC, RA	Brazil	21-30	Male
P3	Volunteer	IC, RA	Hong Kong	21-30	Male
P4	Volunteer	IC, RA	Spain	31-40	Female
P5	Manager	IC	Colombia	21-30	Male
P6	Volunteer	IC	Colombia	< 21	Male

Table 6.3 Participant's demographics, role in IFRC, and roles in TalkFutures; Innovation correspondents (IC) and Research Assistants (RA).

the distributed nature of the deployment and use of WhatsApp throughout. Interviews were conducted across a two-week period one-month following the TalkFutures deployment (late January 2018) due to an overlap with the Christmas period. Interviews in Spanish were conducted by Carlos, a member of the innovation team, who subsequently transcribed and translated each interview. Each participant was sent an information sheet one week before conducting the interview, which provided an overview of the background and research objectives. Participants were invited to write any questions over WhatsApp where clarification would be provided directly before or/and after the interview. Prior to conducting the interview, participants were briefed on the study using the information sheet and asked to read and verbally confirm agreement to their consent. A consent form was provided to participants requesting that they sign and return this after the interview, but due to the remote process verbal consent was also taken.

Interviews were semi-structured and began by discussing the participant's background and involvement with the IFRC. The following four categories were then covered: (1) why participants took part; (2) which roles they engaged with and value from contributing; (3) how they perceive their contributions are represented and would be used; (4) how the process could be improved. The interview protocol is outlined in Appendix B.3, and notably each category was tailored to the participant's role in the deployment. This required preparing before each interview by reviewing content participants had contributed to ensure questions could be tailored to invoke meaningful reflections and discussions from each participant. For example, open-ended questions were used in each category to guide the interview that started with a general question (e.g., *"Talk me through your process for preparing and recording an interview?"*) with optional questions depending on the roles and responsibilities that participant's pursued (e.g., *"How do you feel that your contributions (interviews or thought piece) will shape Strategy 2030?"*).

6.6.1.3. Data Analysis

All interviews were translated and transcribed into English and read by the author to become familiar with interviews recorded by Carlos and as the first step in data analysis [16]. These transcripts are available as a public dataset at [221]. In line with understanding experiences following other field deployments undertaken in this thesis (i.e., chapter 4), an inductive Thematic Analysis (TA) approach to data analysis was taken [33]. Whilst we were interested in understanding the challenges of using the associated Gabber workflow and technology for data capture and analysis,

an inductive analysis ensured that the findings were grounded in participant's experiences and in doing so provide insights into the design goals to better respond to what participants had experienced. Analysis was undertaken by the author of this thesis and Carlos who conducted the Spanish interviews and supported the TalkFutures deployment and was therefore familiar with the context and interview data. We each began by independently reviewing and assigning preliminary codes and summary notes to the transcripts of interviews that we each conducted. Following this, we met to agree on a codebook, before proceeding to recode the complete dataset. Next, coded data was clustered into initial themes, then discussed internally amongst the supervision and advisory team, and refined prior to revisiting the coded data to ensure relevant data were not overlooked. This iterative process resulted in defining three themes that illuminate the motivations and barriers from engaging in the qualitative data capture and analysis stages that applies directly to the Gabber workflow, which offers broader design implications for conducting distributed community engagements. Each theme is presented and discussed in detail in the following sections.

6.6.2. Findings

Three themes are presented from data analysis that provides insights into how qualitative practitioners adopted the Gabber platform and undertook qualitative practices across the TalkFutures deployment. The first theme, *representing and actioning contributions*, considers how valued and represented participants felt through contributing their voice to the engagement. The second theme, *navigating infrastructural barriers*, explores how TalkFutures enabled distributed participation through overcoming barriers of participation, leading to participants feeling empowered to contact, interview, and engage with organisation members in positions of relative power. The final theme, *impact on personal and professional development*, describes how participants adapted and developed their professional skills through engaging in qualitative practices.

6.6.2.1. Representing and Actioning Contributions

Feeling that your voice is being heard by decision-makers and that it represents your communities' concerns are key tensions for participants in community engagements [54, 60, 175]. Across these interviews, participants highlighted the importance of how TalkFutures included members across all stages of the community engagement (qualitative workflow) that they considered could enrich the process and lead to more meaningful outcomes:

> *"I loved the motive behind this initiative [TalkFutures], the idea that anyone could contribute to the construction of a global strategy. It wasn't merely listening to the voices of the decision-makers (IFRC) but [the voices of] any person. This enriches a lot the possibilities that the strategy offers."* (P6)

Prior work highlights the importance of building relationships to foster trust between stakeholders who are involved in community engagements, thereby encouraging more meaningful participation [52, 53]. Within TalkFutures, some participants expressed an inherent trust that data

they contributed would be heard and enacted by the IFRC and would therefore lead to change within the organisation. For example, P3 described how TalkFutures could lead to trustworthy *"solutions"* that they posit could impact branches across the organisation:

> *"I had trust that the interviews would be taken into consideration, and although each society has its own unique issues and let's say problems, I also had a trust that generally the same issues are everywhere, so that the solutions would be found using this [TalkFutures] process."* (P3)

However, the feeling that their contributions would create impact led to some innovation correspondents producing *"professionalised"* content because the data contributed could be engaged with and acted upon by IFRC representatives (i.e., the innovation team) as well as other participants. For example, P3 *re-recorded* interviews through Gabber to exclude laughter, which added additional time constraints to the capture stage for this participant as it required closing the application and completing the full consent process multiple times:

> *"Which is why at some point I laughed a little as I was so nervous as I was talking to my brother and because of that, we had to record it more than once."* (P1)

This highlighted the potential of misrepresenting experiences through the data capture stage if the focus was on quality of output, rather than the intended use of the Gabber platform, which was to capture the authentic experiences of participants. Likewise, having unique responsibilities for roles led to participants becoming task-driven, with high attention to detail in how they represent other participants' experiences. For example, when research assistants undertook data analysis, they often ensured that the original voices of interviewees were hyperlinked in written reports. P4 described this as to ensure that other IFRC members could more easily revisit and engage with the original content:

> *"The research process [for me] involved considering relevant work from the Red Cross, for example featuring different personalities some of them pioneers with the movement. I wanted to make sure that their views were captured meaningfully in the article. This is because they are the ones represented globally."* (P4)

Other participants interviewed were more sceptical of how their contributions would be used by the IFRC, and if they would impact the organisation at all. This led to a desire to know who, how, and from where other members were engaging with their content, highlighting a feeling of disconnection between what they contributed and how useful it was for other participants or stakeholders within the IFRC. In particular, P2 described this feeling if disconnect from contributing and noting that engagement metrics (paradata) were not visible through the Gabber platform:

> *"I saw that many, many interviews on the website were not commented [engaged with], I don't know if people will hear. It's like having a lot of data, but for you [IFRC] to not process that ... then the data is not useful."* (P2)

In summary, TalkFutures' design provided opportunity for IFRC members to contribute to an ongoing community engagement to represent their experiences and the experience of other members (DG3). Participants described tensions of trust and scepticism of how data they contributed will be actioned and impact the organization. This led to desires for increased transparency for who, how, and when other stakeholders engaged with contributed content as a mechanism to evidence engagement, which was a missing component of the Gabber platform.

6.6.2.2. Navigating Infrastructural Barriers

The IFRC's existing structure means that branches have independent power, which can create siloes of knowledge between branches while also limiting communication that could benefit individuals or the broader organisation. One underlying design goal (DG2) aimed to reduce barriers to participation, yet recruitment processes across the IFRC remained a key tension point amongst participants interviewed. For example, P3 had a unique perspective through volunteering for both the Canadian and Hong Kong branches and noted that they saw TalkFutures' recruitment material being advertised through only one branch:

> *"If they [IFRC] really want to hear more voices, then they will need to push more aggressively, and take a proactive approach to trickle the campaign down to the bottom. I was lucky to happen to stumble across the opportunity on the Canadian newsletter, but I don't recall hearing it from Hong Kong side."* (P3)

To overcome this recruitment barrier, P3 suggested that change at the highest level of the organisation is required, suggesting that *"aggressive"* promotion is needed for more voices across the organisation to be heard. While researchers must work within these constraints in such globally distributed community engagements, other participants recognised that the TalkFutures process reduced some existing barriers, such as creating opportunity for knowledge exchange and communication between branches that was previously not possible due to infrastructural barriers between branches:

> *"When we talk about communication we often relate to a vertical type. This process opened up the chance to communicate with any stratum of the IFRC, and collectively think of what can be done."* (P4)

Innovation correspondents were responsible for interviewing local stakeholders to explore potential solutions to challenges outlined by the IFRC. Participants describe how the process of interviewing senior staff provided a broader understanding of the complexity of the organisation's structure, which was previously difficult due to the power and communication barriers present. Consequently, participants described engaging with the data capture role as leading to a deeper sense of belonging between them and the organisation. For example, P4 interviewed several stakeholders, including senior members in different national societies and volunteers in their local branch, noting that this enabled P4 to gain new perspectives of the IFRC:

> *"These people were part of a group I belonged to. I realised that they were from different sectors, for instance I interviewed the director of Argentinian [branch], someone from the Ecuadorian [branch] ... I interviewed my coordinator in the Spanish [branch]. This opened my mind to get to know the different sides of the coin."* (P4)

Conversely, other participants had ideas for how digital engagements like TalkFutures could be done in tandem with offline engagements, with P2 suggesting that increased ownership and control could be associated with the innovation correspondent's role *"with tools to engage locally and physically with the people"* through hosting in-person workshops in local branches. The TalkFutures campaign implemented a *"hybrid"* approach to community engagements through configuring roles to involve both offline (innovation correspondent) and online (research assistant) participation [172]. This offered alternative forms of participation to those who may not be able to attend in-person workshops. P2 highlights that some participants may want more responsibility or a mixture of online and offline participation, suggesting that offline activities could supplement digital engagements and used as an opportunity to bring knowledge shared from other global innovation correspondents to discuss and disseminate it locally.

Innovation correspondents were not provided with any rules or restrictions on who they could interview and were encouraged to make use of their personal networks of colleagues, friends, and family to identify experts that they believed could share valuable insights from that local context. This resulted in some participants making use of experts within their local communities, while others reached out to more senior members of the IFRC branches in other countries. This gave control to participants on whose voices should be contributed and shifted power from decision-makers to participants who are typically 'subjects' in community engagements and the associated data analysis and curation stages. In practice, this led to participants often interviewing those in power, who are more likely to contribute to traditional engagements, thereby reinforcing existing issues of representation. Likewise, for some participants, sourcing opinion from outside of the IFRC was important and exemplified through wanting to share more critical perspectives from commercial domain experts. For example, P3 described interviewing such stakeholders as a means to diversify what other participants could learn and engage with:

> *"He is a young person who has created his own successful [start-up] company. I wanted to have their vision from outside the organisation, despite not being part of the IFRC. I tried to diversify the contributions that interviewees could bring."* (P3)

In summary, participants considered TalkFutures an inclusive workflow that created new opportunities for knowledge exchange and communication between distributed members of varying positions and power within the IFRC. Participants noted how such communication was not previously possible in other digital engagements led by the IFRC (DG2). However, increased offline engagements were desired to complement digital activities that could further strengthen and build trust within local communities, reflecting existing calls from researchers for such *"hybrid"* approaches [172].

6.6.2.3. Impact on Personal and Professional Development

Engaging with roles and the associated qualitative research stage required pre-existing skills or the drive to develop new skills, which added additional barriers that restricted the potential reach and participation with TalkFutures. Applying existing skills was described as a key motivation for participating – e.g., *"I wanted to use my professional skills in communications to engage with other volunteers"* (P4) – or to develop new skills to increase employability, such as P6 who described the personal impact from engaging in this process as:

> *"These activities allowed me to grow so much at the professional, ... strategic level ... understanding better how the IFRC works from an organisational level."* (P6)

Several participants described enhancing their existing soft skills that they considered would benefit their daily contribution to the IFRC. For example, P5 described building confidence and overcoming shyness through the process of interviewing others:

> *"I felt good as a correspondent as I gained interviewer skills. Before I was too shy to interview others. In fact, the first few interviews I did ... I didn't upload them because I was too shy to do it. I learned from these first few interviews, so I got better at interviewing."* (P5)

The innovation correspondent role provided opportunity to engage with a diverse range of stakeholders, with some participants using this role to build social capital through expanding their professional network by reaching out to stakeholders whom they may not communicate with otherwise:

> *"Through being an innovation correspondent, I could talk to other people with different backgrounds and interests, so this also expands my reach and connections and networking, so this was very interesting to me."* (P2)

For others, meeting new people was more important than building a professional network and the possibility to engage with international peers whose culture, nationality and diverse contexts provided an exciting opportunity for knowledge exchange:

> *"It has been extremely rewarding from a personal level because you end up meeting people vastly different, from different contexts; you would have never come across with them in your life otherwise."* (P5)

In summary, the design of roles in TalkFutures structured participation in each qualitative research stage (DG1) with the exception of the curation stage. Participants reflected that roles provided opportunities to develop and apply their personal (e.g., overcoming shyness) and technical skills (e.g., interviewing) that could contribute to their daily work life. However, the curation stage required technical skills that few participants had and therefore implicitly introduced barriers of participation through its design.

6.7. Discussion

Through a six-month collaboration with the IFRC as part of an ongoing community engagement, a sociotechnical process was designed, termed *TalkFutures*, that structured a two-stage research process: (i) a four-week, real-world deployment of TalkFutures in a *globally distributed community engagement* across the IFRC where participants contributed to each stage of the qualitative workflow through Gabber; and (ii) post-deployment interviews to understand the perceptions of participation, system usage and how data would be utilised by the IFRC. Our findings of platform usage, post-deployment interviews, and the design and configuration of TalkFutures provided practical insight into the tensions and opportunities of using technology to support the qualitative practices of a civil society organisation – the IFRC – and its distributed members who contributed to each qualitative workflow stage. In particular, the findings presented in this chapter highlighted how the design of roles that had responsibilities associated with each qualitative stage facilitated independent participation that drew from the inherent capacity of citizens to contribute to data capture and analysis, while surfacing existing recruitment and skills barriers that impeded participation.

The following sections situate the findings from both research phases in relation to the three design goals – *participation, barriers, and representation* – that unpinned the design and configuration of distributed participation in TalkFutures and expands upon the tensions and opportunities for designing digital tools to support participation in qualitative practices.

6.7.1. Alternative Modes of Participation

Prior research highlights that decision-makers primarily use technology in the initial stages of community engagements, i.e., data preparation [27, 52, 54], that facilitation is required to support participation [21, 175] and the impracticality of analysis of qualitative at scale [172]. These challenges parallel citizen social science (CSS) that aims to harness citizen participation in qualitative research on societal issues that affect participants [126, 215], but as yet research has not explored CSS in practice. Thus, this design goal builds on the opportunity that Gabber affords to engage in qualitative practices through exploring its application in a *geographically distributed* context that aimed to create alternative modes of participation in the capture, analysis, and reporting stages of a community engagement. Although Gabber was designed to facilitate participation across the qualitative workflow, it had not yet been used in distributed engagements or without the assistance of researchers physically present to assist participation. Consequently and informed by prior research [160], role-based activities were designed to support participation with these qualitative practices, which we posit facilitated independent and distributed engagement through *instrumentalization* of participation – a process whereby participants contribute to a project to realise their organisation's objectives without consideration for the scope of the problem [28].

Roles were previously used to engage distributed members in complex processes of capturing media during a community engagement, but excluded participants from data analysis or curation

[160]. This chapter extends this research through exploring how roles and the associated activities enabled distributed participation in the data analysis and curation of qualitative data. The presented findings highlight that drawing from participants' existing skills or the potential to develop new skills relevant to their work life motivated participation. While there were high levels of engagement and completion for innovation correspondents (data collection) and research assistants (data analysis), the communication assistant role (data curation) had limited uptake. This could be attributed to two possibilities: (i) the higher levels of technical skills required, such as graphic design; and (ii) that the configuration of TalkFutures created a dependency on data between roles, meaning that communication assistant's spent considerable time waiting to participate and then did not engage further (as evidenced through registration and dropout). Therefore, one risk to consider in future research when configuring roles around participation in a qualitative workflow is that having skill requirements could *amplify* the differences between skilled and non-skilled participants. As such, careful configuration must be taken when designing roles to ensure that roles consider both the types of skills required to complete each activity and the possible skills that participants could apply or obtain from taking part. This is particular important in community engagements where the notion of 'qualitative research' (and therefore the associated 'workflow') is unfamiliar and therefore framing participation through roles that are meaningful to stakeholders while contributing to data capture, analysis and curation is critical.

As noted in the designing TalkFutures section, curating playlists through Gabber was designed to leverage the raw, annotated audio recordings contributed during the data analysis stage. However, the playlist curation technology was not used in this case study as our collaborators, the IFRC's innovation team, requested designing the communication assistant role around media skills that were previously reported positively in prior engagements of their members, i.e., [160]. While we acknowledge that novelty of the playlist feature would have required additional training than the other two roles, we have seen that interviewing and data analysis were unfamiliar practices to citizens, but also that they quickly learned and applied new skills to succeed in these roles when given the opportunity. Thus, a key opportunity that arose from this research is the need to explore how the curation role is perceived and applied by citizens, which we examine in part in the subsequent chapter.

6.7.2. Reducing Barriers to Participation

This design goal aimed to create new opportunities for *active participation* in each qualitative workflow stage through reducing existing technical, geographical and time barriers identified in prior research [52, 60, 121, 172]. Our findings show how *geographically distributed* participants independently recorded one-on-one interviews with a broad range of stakeholders with limited support from a research team, and that these interviews were shared, listened to, and engaged with by other distributed members and IFRC stakeholders. Despite reducing some barriers, one finding that was surfaced through the innovation correspondent role was that participants selected and interviewed others who were in positions of relative power – i.e., more senior members of the organisation – because they wanted to represent organisational expertise that they saw

through seniority. Our framing and instruction of recruitment was open-ended, requiring that participants interview other stakeholders – either within or outside the IFRC – whose views they considered would benefit the community listening. Our findings highlight how interviewers more often selected individuals to interview who were in positions of relative power within the IFRC, which are stakeholders who are more likely to be invited to participate in traditional community engagement. Thus, while the data capture role empowered individuals to select and interview others, its openness reinforced existing barriers to participation. For future digital community engagements and qualitative workflows more broadly, this highlighted the importance of designing instruction and responsibilities that limit existing power imbalances and that they must be considered when designing roles.

In prior research, Mahyar et al. [172] highlight the challenges for decision-makers to perform qualitative analysis at scale and suggest *"hybrid approaches"* that combine offline and online engagement activities to overcome existing barriers to participation and inclusion in the data analysis and curation stages. The research presented in this chapter directly builds on this research through offline data collection of semi-structured interviews through Gabber and online data analysis, curation and dissemination of this dataset. Key to the configuration of this deployment was the design of asynchronous participation and distinct roles to structure the engagement. Our findings highlight that this type of a hybrid approach enabled flexible forms of participation with each qualitative research stage in ways that were meaningful to both the organisation and participants. As proposed by one participant in our post-deployment interviews, having the option of co-located, one-off events was desired as a way to meet and engage with other stakeholders in the data analysis process. Moreover, we argue that such events could be used to not only strengthened relationships between stakeholders (as evidenced in prior research [52, 54, 218]), but also used to collaboratively engage with the data analysis and curation stages as they require the most assistance even when technology is introduced to reduce barriers as demonstrated in this chapter. Such an event could be used to structure the initial engagement of participants with the associated analysis and curation roles through demonstrating how to participate with such activities through more hands-on and participatory practices.

6.7.3. Improving Representation

Prior research highlights that participants who contribute to community engagements can feel excluded from the final outcomes as the decisions made during data analysis and dissemination of data that they contributions can be opaque [60, 79, 160, 172]. This is an unfortunate consequence of requirements typically enforced by civil society organisations, government, and other stakeholders, like the IFRC, where producing summarised written documents (e.g., a strategy document) is the method of representing insights. In such instances, space is limited, and therefore including details of all contributions or documenting the data curation process undertaken is challenging. As such, this design goal aimed to create a digital space where participants could create, analyse, and curate qualitative data while observing how others were listening to see their voice represented in the ongoing outcomes to highlight the value it brought to others, e.g., that

their experiences were shared through blog posts. Our post-deployment findings highlight the value participants expressed from being able to access, view, and engage with perspectives from others that they described as providing new insight into the IFRC. Despite participants having trust that the IFRC would action data they contributed across roles (i.e., interviews, blog posts, posters), our findings highlight that some participants wanted increased transparency concerning how data that they contributed was engaged with and actioned by other members and the IFRC.

Data transparency in research has been shown to improve the validity of reported findings and is used to build trust between readers and the research community, although to date is primarily examined in the context of quantitative research [196]. In qualitative research, considerable importance is placed on capturing the authentic voice and experiences of participants, but ultimately researchers make decisions during the qualitative research process about which experiences to represent in their reports [193]. Our findings further surface desires from participants of qualitative workflows that transparency could help increase trust because the decisions made are less opaque. This desire for increased process transparency parallels findings from prior research on technology usage in community and civic engagements [52, 79, 175], and raises unique design challenges concerning which characteristics of data captured from a qualitative workflow is most meaningful to represent to participants to increase transparency as we explore throughout the next chapter in response to **RO3**.

One approach to explore that could help contextualise and ground the final document in community members contributions is data provenance [15], i.e., being able to trace contributions from the final output to the original source and its history. Prior research suggests *linked data* could be used to structure and potentially automate the transparency of NGO's financial practices and therefore promote accountability to donors [179]. However, in practice this requires advanced technical implementation and time to build ontologies that would likely change across community engagement contexts and therefore may not be suitable. Technologies like Gabber are increasingly being used to democratise participation and decision-making across all (qualitative) stages of community engagements, e.g., [21]. During each stage, *paradata* can be automatically recorded that describes the process of how people access, use, or engage with a digital system. In contrast to linked data, paradata is often already being recorded in digital platforms (by the platform creators) and has the potential to represent individual and aggregated interactions that could not only highlight data provenance, but also surface individual contributions and the impact they create as desired from participants in this chapter. For example, paradata could be used to show who in an organisation listened to an interview and contributed to a community engagement or which voices are included (or excluded) in reports that informed decision-making, thereby holding decision-makers accountable.

6.8. Limitations

The instrumental case study presented in this chapter was undertaken to provide an in-depth account of the qualitative workflow as adopted and used by one civil society organisation [254]. As this case study took place in a single organisational context (the IFRC) some of

the presented findings are not generalizable to other community engagement contexts, e.g., navigating infrastructural barriers. Moreover, a broader sample of participants in post-deployment interviews – such as those who registered interest but did not actively contribute – would have contributed additional insight into motivators for participation and challenges with creating inclusive design spaces to facilitate qualitative practices. However, this exploratory case study surfaced design challenges concerning the potential utility of paradata in qualitative practices through participants desires for increased data transparency, and the use of roles to structure participation in qualitative practices.

6.9. Summary

This chapter presented a collaboration with the IFRC as part of an ongoing community engagement where we designed *TalkFutures*, a sociotechnical process overlaid onto the Gabber workflow with the primary aim of encouraging active participation in all stages of a *distributed community engagement*. Through this, **RO2** was explored, i.e., to understand the challenges and opportunities that arise for practitioners through the real-world, end-to-end configuration and use of a digital qualitative workflow. Through the design, configuration, and real-world deployment of TalkFutures, findings concerning engagement with each qualitative workflow stage and post-deployment interviews highlight the potential that introducing roles and responsibilities has to support participants independently pursuing complex modes of participation in a qualitative workflow. Participants pursed roles with the aim of learning or enhancing existing skills, yet uptake with the data curation role was limited, in part due to the associated skills required to participate. It is therefore vital to design roles that create value for participants while being cautious that the design of roles could reinforce existing barriers to participation. Through reflecting and discussing the challenges and opportunities that arose through TalkFutures, there is a need to increase the transparency of how contributed data is engaged with and used as a technique to enable participants to feel more represented in outcomes. As such, the subsequent chapter examines the potential role of *paradata* to increase workflow transparency as a technique to enhance feelings of representation for participants involved in a qualitative workflow.

Chapter 7. Paradata: Gabber in a Co-Research Project

7.1. Introduction

The previous chapter explored the end-to-end qualitative research workflow from the perspective of a civil society organisation and a real-world deployment of Gabber as part of a geographically distributed community engagement. Findings from this research highlighted how participants desired increased transparency in who and how other stakeholders engaged with their contributed data to gain personal insight into how their data impacted the engagement. Prior work highlights that participants can feel ineffectual and unrepresented in the qualitative research process as output from analytical decisions made on their contributions can be opaque [60, 224]. Technologies like Gabber have the potential to automatically record *paradata* that describes how people access, use, or engage with a system or data that could enhance the understanding of the primary data to improve process transparency. Consequently, this chapter examines: (i) how *citizens* adopt the end-to-end Gabber workflow, including aspects that were not adopted in chapter 6, i.e., the playlist curation stage (**RO2**); and (ii) to investigate the types of paradata meaningful to practitioners who utilise Gabber to inform future design research (**RO3**). As such, this chapter contributes a conceptualisation of paradata to enhance qualitative research practices and offers design recommendations for digital tools to use paradata to improve process transparency and demystify decision-making processes for stakeholders involved.

This chapter presents a four-month collaboration with a community-led charity where nine stakeholders contributed and co-led an end-to-end qualitative co-research project using Gabber. This project, **Making Links**, aimed to capture, share, and reuse participants lived experiences to inform knowledge exchange and organisational training. This chapter begins by summarising the motivations underpinning the exploration of paradata in this chapter. Following this, literature concerning the role of transparency and the associated technology in qualitative research is described. The research approach taken and the context of this case study is then detailed. Two phases of research are then reported: (1) a field deployment of Gabber to explore the qualitative practices of *citizen practitioners* through observations of system use; and (2) post-deployment interviews with participants to reflect on how paradata could be meaningful to them. Finally, we discuss how findings across this chapter can inform interface designs to augment cooperative activities and enhance data sharing and consent mechanisms in qualitative practices.

Related Publication and Acknowledgements

- Research presented in this chapter extends a publication drafted for conference submission.
- Research reported in *phase one* forms part of a separate co-research investigation led by *Siobhan Macfarlane*, a researcher in Open Lab, where Gabber was used by a community as detailed in the study context section. My role primarily involved observational fieldwork, i.e., observing participant's qualitative practices in workshops. In contrast, research reported in *phase two* was a distinct research project initiated, led, and conducted as a follow-on investigation by me in partnership with Siobhan in this research context.

7.2. Motivations

Chapter 6 highlighted the capacity for citizen practitioners to independently and actively engage in all qualitative workflow stages through technology. Findings from that research surfaced desires from practitioners for increased transparency over who and how their contributions are engaged with to increase feelings of representation and to hold decision-makers accountable, mirroring results of prior research, e.g., [60, 79, 172]. Digital tools like Gabber can automatically capture *paradata* that could be used to surface the decisions made at each research stage. Here, paradata describes data about *processes*: how people interact, access, use, or engage with a process, system, document, or other data [58, 170]. Within commercial and academic contexts, paradata is primarily used to understand or improve a product, prototype or service, often through capturing paradata as 'engagement metrics' or 'system logs'. In contrast, limited research examines how paradata could be used to enhance or empower decision-making in qualitative practices. While existing qualitative data analysis software (QDAS) have the potential to record and visualise paradata, they are primarily designed to create outcomes from data analysis (e.g., themes), and collaboration is often a secondary feature. As such, recording paradata across the complete qualitative workflow through QDAS is impractical. Recent research calls for increased data sharing, replicability, and transparency of qualitative research practices while highlighting a need for *process transparency* [46, 89, 256, 273], but does not specify how such transparency could be achieved in practice. In response, this chapter aims to characterise how paradata could be meaningful to citizen practitioners (**RO3**) through observations of Gabber usage and reflective post-deployment interviews as part of a larger co-research project. In doing so, this chapter provides design insights for digital tools to leverage paradata to improve process transparency and demystify decision-making processes for both academic and citizen practitioners.

7.3. Related Literature

Building on these challenges and extending the literature review, this section examines existing tools, techniques, and practices adopted within and outside qualitative practices to enhance representation and process transparency in decision-making activities. As such, the following subsections discuss the role of transparency in qualitative research practices, existing techniques to enhance reliability, and the potential for technology to enhance it. Other research domains where metadata and paradata have been applied to enhance product development and to create collaborative interfaces that enhance decision-making processes are then described.

7.3.1. Transparency and Qualitative Research

While this diverse range of epistemological and ontological standpoints and analytical methods enables flexible approaches to qualitative research, it has also led to tension amongst the qualitative research community as it is difficult to ensure consistency and quality across the research workflow as there is no standardised practice [35]. Often, qualitative practitioners undertake decisions *"behind the scenes"* [263] that can lead to participants feeling that their

voices were not engaged with because such decisions made during the research workflow are opaque to them [60, 79, 172]. This leads to a lack of transparency as it can be difficult to determine how researchers arrived at particular findings or how they chose which findings to present in their research outputs. This can make it difficult to detect research bias [247] or to know when participant's experiences are misrepresented, either intentionally or otherwise [193]. This can in turn create mistrust between the various stakeholders who contribute data to processes, such as civic or community engagements, or consultations [60, 121]. These challenges have informed the creation of best practices to evaluate the rigour of qualitative inquiry through the systematisation of the research process [169, 247], which emphasises process transparency through documentation of steps and decisions made by the practitioner [127]. However, as this is a manual procedure that requires significant time and effort from the researcher, it is rarely a priority to adopt and therefore is infrequently used.

Transparency of qualitative practices can help to establish the *quality* of qualitative research [247] and frameworks have been developed in an attempt to standardise transparent practices. For example, Meyrick [186] developed a framework where transparency and systematicity are the two key principles to structure the evaluation of a research workflow. However, this work presents a high-level overview that the authors themselves state as being *"too general and not specific in setting levels of adequacy for each technique."* [186]. In response, Hiles and Čermák [127] propose an analysis method that strives towards transparency in both the data collection and analysis of qualitative data by forcing the researcher to consider the role of transparency prior to undertaking data capture and analysis. Similar to Meyrick [186]'s proposed framework, adequate details of what to record to increase transparency of each research stage is not provided. Building on these frameworks, Tuval-Mashiach [263] proposed a model of transparency developed around three reflective questions to consider when undertaking qualitative research: *what I did* (e.g., an audit trail), *how I did it* (e.g., paradata), and *why I did it* (e.g., reflexivity), and provides prompts to guide the researcher to consider how this model impacts their practices. This work also emphasises the importance of discussing decisions made *"behind the scenes"*, such as highlighting the participants that were not cited in findings or which themes emerged in the analysis but were not included in the report [263].

Transparency in qualitative research is often concerned with enhancing reliability of research findings. Prior research outlines how existing techniques and measures designed to improve reliability of qualitative research are primarily concerned with the data analysis stage and depend on methodological factors, e.g., inter-rater reliability (IRR), data source triangulation or member checking [184]. In contrast, paradata has the potential to: (1) be automatically captured that reduces researcher effort; (2) enhance decisions made in all research stages; (3) surface issues not identified through these techniques, e.g., show which analysed texts are excluded in reported results; (4) be independent of methodology. However, limited research explores the potential role of *technology* to capture *"what I did"*, *"how I did it"* or to prompt the researcher to explain *"why I did it"* alongside the relevant research material. Instead, technology's role when discussing transparency is often limited to use within Qualitative Data Analysis Software (QDAS) [279].

Technology has previously been used to increase transparency for specific aspects of the research process. For example, pre-registration of research studies to make the decisions researchers made when interpreting quantitative data more transparent to reduce p-hacking and bad science practices [49], and advocated for open data to increase efficiency, trustworthiness and reuse of data in scientific research [44, 82, 87, 204]. To date, such techniques are primarily tailored for quantitative research methods, yet technology is increasingly being used to support qualitative practices as outlined throughout this thesis. As such, there is potential to capture paradata of the decisions at each step within each research stage. These could then be made visible to the research community and research participants to increase trust and transparency of the process.

7.3.2. Utilising Metadata Beyond Research Workflows

Driven by the open data movement [44], researchers are making their data accessible through public repositories where metadata is used to drive the archiving, management, preservation, discoverability, and reuse of research data [4]. Creating quality and consistent metadata is costly in both time and money [66], although research has sought to utilise automation to reduce these challenges [7]. Metadata is typically immutable and curated to avoid ambiguity by using standardised data formats (e.g., [81]) or community defined taxonomies [44], depending on the research discipline. Much of this research has focused on the challenges of data management for *quantitative* disciplines and the design of appropriate solutions [4, 72, 196]. In part, because the flexibility in epistemological and methodological choices of qualitative research presents issues with what metadata the researcher should capture, meaning this process cannot be automated as there is no standardised data format across research methodologies [4]. Research shows that qualitative data is inextricably linked to the context where it is obtained and removing this information will impact data interpretation [44, 218, 258]. Some qualitative research data cannot be reused in secondary analysis, such as field notes, which brings into question if such data should be shared at all. However, the specifics of what metadata to include in an archive varies significantly across qualitative research due to the legal and ethical challenges associated with data sharing [256], and consequently becomes a curated rather than automated process for the researcher [91]. This raises design challenges concerning which metadata to prioritise and how best it could be automatically collected.

7.3.3. Paradata As a Digital By-product

Academics use a range digital tools across the qualitative research workflow, from performing literature review to undertaking qualitative data analysis [206, 279]. As detailed in the platform chapter (chapter 3), managing data across these tools is challenging as there is often no standardised way to export, view or use the meta(data) created through these. Commercial platforms for qualitative data analysis (e.g., Condens [51], Dovetail [77], QSR International [219], Quirkos [220]) have the potential to record and visualise paradata, but are primarily designed to create outcomes from data analysis (e.g., themes), and collaboration is often a secondary feature, which limits the potential for visualising aggregated paradata of cooperative activities, such as

co-analysis. Likewise, qualitative practitioners are increasingly adopting *participatory* digital tools to engage stakeholders in different stages of the qualitative workflow, e.g., [21, 79, 218]. Collecting paradata across digital tools has the potential to facilitate *process transparency* [256] and enable new collaborative activities within participatory projects. For example, consider a co-research project where two of four co-researchers listened to all interviews. Paradata could make visible the time spent listening and analysing interviews (writing notes and applying codes), and therefore if others could view the paradata they would know that two interviews were generally engaged with less. Likewise, the two co-researchers could take their paradata to the others and use that as an estimate of the effort required to participate.

One exception is online learning platforms, which have made extensive use of paradata to create tailored learning experiences and to support instructors having a better understanding of how their students are engaging with content, i.e., *learning analytics*. For example, Shi et al. [248] use paradata collected from students of massive online open platforms (i.e., *clickstreams*) to augment a video player with aggregated interaction data to enhance the viewing experience. This paradata was then overlaid onto the video's timeline to visualise aggregated watching history, enabling students to quickly see the areas of popular interest. Prinsloo and Slade [212] noted that collecting and representing paradata raises ethical challenges regarding consent, as while students are not identifiable through this data, they contributed it and as such advocate for increased transparency of how and when paradata is collected and used.

To explore these challenges, Sun et al. [255] interviewed multiple stakeholders of online learning platforms to understand their perspectives towards how learning analytics (paradata) were used, accessed, and analysed. This work highlighted the need to convey the origins (i.e., traceability) and quality of paradata within interfaces and showed how paradata could misrepresent student's performance. Moreover, this work highlighted how issues of consent were raised regarding who could access this paradata and how it might be used, with the owners of the data (students) requesting more involvement and control over its use [255]. These findings mirror prior survey methodology research on the need to inform users of which data is collected [41, 59, 158], which is critical given recent data protection legislation, e.g., [40, 85].

7.4. Study Design

There is a need to explore how digital tools can enhance the transparency of qualitative research practices. This chapter posits paradata as one potential way to enhance transparency, accountability, and trust for all stakeholders involved in the research workflow. To date, limit work has explicitly examined the role and utility of paradata in qualitative practices, in part, because the characteristics of paradata that are meaningful to practitioners remains underexplored. Consequently, rather than develop additional features onto the Gabber platform to record paradata – that *we [the academic research team] define* – and subject the research collaboration to potential delays, we sought to instead work with a community group that wanted to use Gabber across the end-to-end qualitative workflow. In doing so, our research aims of this chapter were twofold: (1) to reflect on the usage, utility, and challenges experienced with Gabber by *citizen practi-*

tioners across the research workflow (**RO2**); and (2) characterise paradata that is meaningful to stakeholders through post-deployment interviews (**RO3**). Through this, design implications are contributed that are relevant to professional researchers, practitioners, and research participants concerning how paradata can be used in digital tools to support transparency in qualitative research practices. The following subsections outline the context that this research is situated in, the action-oriented research approach taken, and the participants involved.

7.4.1. Context

Within the United Kingdom there has been an evolving shift from local government providing *"one size fits all"* models of social care provision to the delivery of personalised health and social care through the allocation of funding to individuals to self-manage and tailor the care that they receive, i.e., through legislation concerning *personal health budgets (PHB)* [73, 128]. The increased autonomy and control associated with becoming a personal budget holder requires overcoming complex administrative decisions that are often new to the individual and which are typically overcome through experience. For example, determining whether or not to employ a personal assistant, how and where to conduct interviews, managing a payroll, and general budgeting to adhere to auditing procedures. In response, civil society organisations have emerged to support individuals self-directing care to navigate the bureaucratic and complex procedures PHB's entail.

Action Hub is a community-led charity organisation based in North East England that provides information, advice, and support to disabled people and their families, including support for those who access personalised care funding. Action Hub members were keen to create informal peer-to-peer networks to share their experiences and knowledge on how they overcame the challenges associated with becoming a personal budget holder and self-directing their support. As such, from January 2019 a collaboration began to develop this idea further between Action Hub members, their staff, and another researcher based in Open Lab, Newcastle University. As part of an initial meeting, a range of participatory platforms were demoed as potential platforms that could be reappropriated by the stakeholders, including Gabber [225], OurStory [21], PosterVote [269], and WhatFutures [160]. It was critical to stakeholders that participants could lead and contribute throughout the engagement, and a voice-based system was seen as a means to increase accessibility and reduce some barriers to communication whilst amplifying the experiences of community members, which motivated their selection of the Gabber platform.

From June 2019 to September 2019, *Making Links* was set up as an action-oriented co-research project where Gabber was used *as-is* to capture, analyse, and disseminate the lived experiences of stakeholders pursing the varying roles associated with self-directing support, i.e., involving budget holders, personal assistants and family or informal carers. Building on insights gained from chapter 6 concerning the success of timed events and challenges of data dependency between workflow stages, five workshops (each lasting three-hours) were held in Action Hub across this period to structure each research stage where participants undertake *data preparation* (configuring projects), *consent and capture* (interviewing each other and learning the process),

analysis (engaging with interview data) and *curation* (creating playlists for reuse). This created a safe-space that added structure for participants to (optionally) attend where they could contribute to the research workflow, receive informal training on the associated Gabber technology, and put this training into practice to seed content into the platform, e.g., by sharing their experiences through interviewing each other during the data capture workshop. Each qualitative workflow stage was spaced over a multi-week period to provide time for participants to contribute outside of the workshop; the start of each workshop often involved activities from the previous session. An overview of how each stage was configured and the qualitative practices that ensued are outlined in the subsequent field deployment section.

7.4.2. Approach

The context and field deployment reported in this chapter are distinct from prior case studies outlined in this thesis in two ways. Firstly, Making Links was a co-research project setup and led by another researcher within the same lab as the author in this thesis. This provided a unique opportunity to observe how Gabber was adopted and configured with minimal support and input from myself. Consequently, my role within phase one (field deployment) reported in this chapter was ethnographic as a *participant observer* in each workshop through observing participants qualitative practices and platform usage. As such, while phase one was an *action research* project led by another researcher (see: acknowledgements secton) that aimed to create practical knowledge for our collaborators (Action Hub) to inform organisational training, the reported findings below are from my ethnographic role. Secondly, this co-research context provided opportunity to gain insight into the qualitative practices of citizen practitioners concerning the collaborative activities at each stage, i.e., commissioning topics from community members and undertaking co-analysis. Unlike academics who capture and analyse data from others, the co-researchers of this project were the creators, owners, and investigators of the research data that could provide insights into multiple perspectives, i.e., being both research participants and researchers.

In contrast to chapter 6, this chapter explores the perspective of how *citizens* configure and use Gabber across the complete workflow through a co-research project, but similarly, the research presented encompasses *two phases* describing: (1) a field deployment of Gabber to examine how the complete qualitative workflow was configured and used by citizens (**RO2**); and (2) post-deployment interviews with participants from phase one to understand their perceptions of how paradata could be used to enhance process transparency (**RO3**). As the participants involved across both research stages were the same, they are described in the subsequent section.

7.4.3. Participants

Across Making Links, nine participants – one researcher (P1), two Action Hub staff (P2-3), and six service-users – engaged with varying degrees of participation across each research stage as outlined in Table 7.1. The consent and reuse stages are not included in Table 7.1 as consent involved external stakeholders and the planned training activity to reuse curated content was

cancelled. Notably, A 'core group' of five participants (P1, P3, P6-8) were instrumental to the co-research project through contributing to almost all stages. Several participants had previously informally met through events held by Action Hub and had not previously participated together in a sustained research project in this way.

	Preparation	**Capture**	**Analysis**	**Curation**
ID	*Attended*	*Interviewer (Interviewee)*	*Comments (codes)*	*Attended*
P1	Y	5 (0)	107 (217)	Y
P2	Y	0 (0)	0 (0)	Y
P3	N	1 (1)	18 (74)	N
P4	N	0 (1)	77 (249)	N
P5	Y	0 (0)	0 (0)	N
P6	Y	2 (1)	175 (267)	N
P7	N	0 (1)	0 (0)	N
P8	Y	0 (1)	63 (101)	Y
P9	N	0 (1)	0 (0)	N
Total	5	8 (6)	364 (793)	3

Table 7.1 Participants contributions to each qualitative workflow stage in Making Links.

7.4.4. Data Collection

Data collection activities were distinct within each of the two research phases conducted in this chapter. Firstly, during the field deployment, data was captured in two ways: (i) through embedded, ethnographic participant observations of participant's qualitative practices during four of the five workshops; and (ii) summary statistics of Gabber usage across each stage of the qualitative workflow derived from metadata. Field notes were written up following each session to preserve insights, and a debriefing was held with P1 following each workshop, including the one where I did not attend to gather additional insights concerning the challenges experienced. Secondly, semi-structured interviews were conducted following the field deployment, with the associated data collection protocol and analysis method outlined in the phase two section below. The following subsections present findings from phase one of the research: participation observations and engagement statistics of Gabber usage across each stage of the qualitative workflow.

7.5. Phase One: Field Deployment

In contrast to the configuration and field deployment of Gabber outlined in chapter 6, Making Links used Gabber *as-is* and *collaboratively* configured each research stage. As such, the following subsections provides a chronological account from participant observations and Gabber usage across each qualitative workflow stage. Through this, the depth of engagement by citizen practitioners and their associated qualitative practices are highlighted (**RO2**).

7.5.1. Preparation

The initial data preparation workshop, attended by four participants (P1, P2, P6, P8), reintroduced Gabber as a refresher to reiterate the role of *projects* and *discussion topics* for structuring conversations. Projects are the overarching container where data is contributed to while topics structure the data capture stage. Following this, two design activities where undertaken where participants were asked to (i) individually write a response to pre-created postcards that were designed to structure reflection on their roles in relation to personal budgets; and (ii) sort, group, and prioritise their responses as a group. In doing so, participants shared their unique lived experiences in relation to their role within self-directed support, i.e., personal assistants, individuals self-directing support (employer), and family and carers employing personal assistants. From this, *six* project titles, descriptions, and associated discussion topics were proposed that aimed to capture the distinct areas of interest, which were entered into an online word document to be reviewed by other co-researchers not present in this workshop prior to the data capture workshop.

At the beginning of the second workshop, the five participants (P1, P3, P6, P7, P8) who attended discussed the comments on the online document, changing the phrasing of only a few topics before creating six *private* Gabber projects using the previously created metadata. Participants then invited all other co-researchers to contribute using Gabber's email invitation process. There were five topics per project on average (min=4, max=6), which are detailed in Appendix C.1. For example, one project was interested in capturing the perspectives of individuals managing and self-directing their support titled *"Views and Experiences of Self-Directing Support"* and had the following five topics:

1. What made you or your family consider self-directed support (SDS)?
2. What is your personal budget for?
3. What is the best thing about having a personal budget?
4. What 3 tips would you share with someone who is thinking about SDS for the first time?
5. What do you know about the SDS process that you wish you had known at the beginning?

In summary, participants collaboratively created content for and configured *multiple* private projects to capture experiences concerning the distinct yet overlapping roles associated with self-directed support. This highlighted the importance of offline discussion and commissioning to inform project creation that is meaningful to participants, while at the same time surfaced a limitation with Gabber's existing design. Namely, that it assumes one project is an isolated research project whereas in Making Links the intention was to capture multiple streams of distinct perspectives and experiences that required unique projects.

7.5.2. Consent

Consent occurs in Gabber at point-of-capture, following by a 24-hour embargo period to restrict access to the data to only its owners. Participants who contributed to the captured data can

modify their consent at any time through email or the Gabber website. All interviews were initially consented for use within Making Links. However, due to personal circumstances one participant changed their consent from *members* to *private*, thereby making their three conversations inaccessible to Making Links. This participant then emailed P1 (academic project lead) requesting confirmation that the data was not accessible to the project and outlined why they decided to retract their consent. The data analysis stage excluded these three recordings.

7.5.3. Capture

Across Making Links, participants took responsibility to capture interviews with peers from their personal networks that they believed could contribute valuable experiences. Recording of experiences took place between workshop two (*data preparation*) and four (*data analysis*). However, the third workshop, attended by four participants (P1, P3, P6, P8), was designed to familiarise participants with Gabber's data capture and analysis stages and participants that did not attend were provided written documentation that outlined how to use Gabber through email. During the workshop, **P6** provided a demonstration to others on how to use the Gabber mobile application for data capture as they had recorded interviews prior to this workshop and was therefore a local expert of Gabber. Following this, three participants recorded one-on-one interviews with one another to share their lived experiences and gain practical experience of using Gabber in preparation for using it outside of the workshop. This ensured that the data analysis stage would not be delayed due to the data dependency between workflow stages as outlined in chapter 6 findings.

In total, seven participants recorded 13 interviews, creating 3 hours 12 minutes of audio recordings (mean=14m45s, SD=08m15s, min=03m53s, max=29m23s). From these, P1, Making Links's academic co-lead, recorded five interviews (38%) in contrast to the other six participants that recorded one on average, which included three who recorded self-reflective interviews. Due to other commitments, co-researchers recommended potential stakeholders that P1 could interview on their behalf. In this way, P1 took on a role of a champion that ensured experiences for all projects were shared, resulting in at least one interview for each of the six Gabber projects. From the 13 interviews, 21 audio recordings were uploaded in total to the Gabber platform as three participants had used the *capture screen* to record a single recording for each topic rather than the intended single recording and multiple annotation process. These three conversations were from individuals recording themselves to share their experiences, which is in contrast to capturing conversations amongst peers. Despite this use, five discussion topics were covered on average across the 13 unique conversations indicating understanding and successful use of the annotation process in the Gabber mobile application.

7.5.4. Analysis

Within Gabber, commenting and coding audio conversations occurs on the website to support data analysis. Project administrators can add a *codebook* to a project that becomes available for all project members (co-researchers) to view and use when analysing conversations. Gabber

does not support collaboratively creating a codebook and instead takes place offline between project members to accommodate a diverse range of practices.

Following the data capture stage, a workshop was held with five participants who undertook close listening to the recorded audio to familiarise themselves with the data. Participants then created a codebook resulting in 15 codes that spanned key themes of significance for the community[1]. The analysis workshop initiated the first steps of co-researchers contributing to data analysis, which continued into the start of the final (curation) workshop. During each workshop, participants were provided with laptops where they could work individually or in groups to undertake analysis, which was left open to accommodate flexibility in how they wanted to approach the analysis stage. Similar to prior workshops, co-researchers who did not attend were invited to participate remotely. This section describes the process of creating a codebook and summarises the qualitative practices of citizens during data analysis through Gabber.

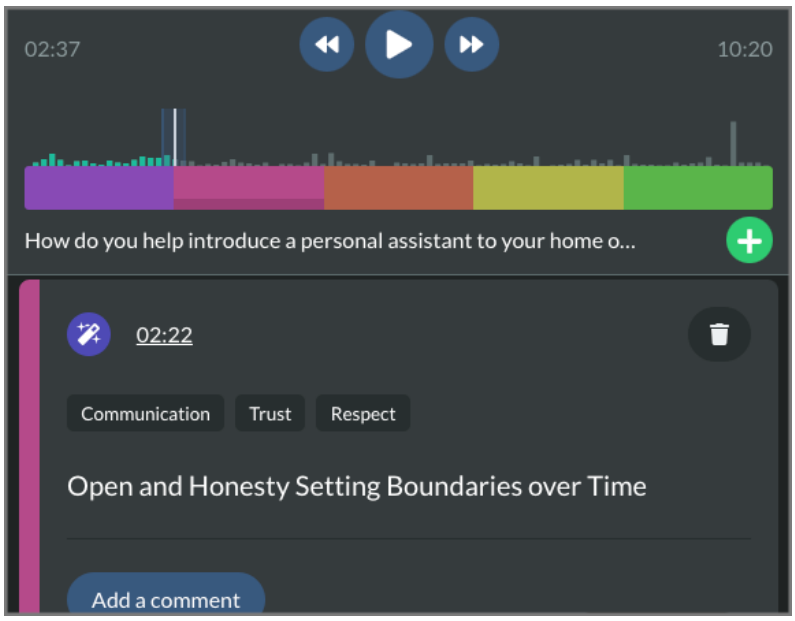


Figure 7.1 An example of how an interview was represented and analysed on the Gabber platform.

Within the Gabber platform, users can create textual comments, apply codes, or both to regions of the audio as the analytical process. Initially, participants split into two pairs (P1 & P3, P6 & P8) where they selected and played a recording to familiarise themselves with the data and analysis process. These pairs then went to separate rooms where they could listen to the recording aloud, discuss it, then code and annotated the data as a co-analysis process. This pair grouping was important as the process of typing textual entries for some participants was tiring due to their disability and through pairing with a partner this was mitigated. In this way, participants were performing a first pass of the data and considering the content in relation to potential codes. Comments created ranged from one-word codes (e.g., *'Honesty'*, *'Support'*) to short phrases (e.g., *'Training Advice Induction'*, *'lack of choice control = agency'*).

[1]Making Links's Codebook: *Recruitment, Paperwork, Wellbeing, Flexibility, Relationships, Networking, Trust, Advice, Choice, Planning, Training, Control, Needs, Communication, Respect.*

After listening to two recordings, participants regrouped to discuss the content that they had engaged with and proposed potential codes that formed the initial codebook. These were written into an online word document that was shared following the workshop for review from other co-researchers not present. The codes were then input into the Gabber platform following this discussion so participants could begin coding data with the preliminary codebook. Participants then split into the same pairs to begin coding data. Feedback was received on the codebook document that was affirmatory, and so the codebook in Gabber did not change.

Co-analysis occurred in the second data analysis workshop in the same pairs as noted above. In total, 68 comments (18%) were created comprising 175 codes (22%), indicating that this workshop provided an opportunity for some participants to engage in analysis who had not done so otherwise (i.e., P3), but highlights that data analysis was primarily undertaken outside of the workshop. An overview of participant's coding practices across this workflow stage are presented in Table 7.2, highlighting that although P1 contributed extensively to analysis, they did not disproportionately when compared with others, i.e., P6 or P8.

Participant(s)	*# Comments*	*# Codes*
P1 (P3)	107 (18)	217 (74)
P6	125	166
P4	77	249
P8 (P6)	63 (50)	130 (101)

Table 7.2 Total comments and codes created by each participant, with co-analysis contributions being denoted in brackets when participants were paired, e.g., P1 with (P3) creating 18 comments together.

Five participants created 374 comments across all interviews in total (mean=17.3, SD=17.5) where 793 codes were applied (mean=79.3, SD=32.2 per interview). From this, 57 comments contained no codes, and the remaining 307 comprised of 762 codes with 44 codes on average per conversation. All 15 codes from the codebook created by co-researchers were used across each conversation. The top three codes used were *"Relationships"* (96), *"Planning"* (89) and *"Recruitment"* (74), while the least used codes were *"Networking"* (21), *"Control"* (29), and *"Respect"* (30). 53% of comments did not include any textual responses, whereas all comments included codes that indicated a preference for coding of data over writing responses. This may be attributed to some participants feeling tired from writing comments due to their disability.

During comment creation, participants can resize where in the recording they want to respond that provides granular selection of content. All but two comments were resized from the default 10 seconds to 34 on average (SD=0m25s, min=0m4s, max=4m5s). This could be attributed to participant's desires to associate codes with related audio content or that the default length is unsuitable. In Gabber, users can create textual responses to comments to create further discussion around specific regions of audio recordings. In total, two responses were created by one participant, P4, to inform the commenter that they listened to their own conversation, e.g., *"I enjoyed listening over the recording and remembering some of the key points I mentioned."*.

In summary, this data analysis stage highlighted a desire to comment and code data specifically with the intended purpose of utilising the Gabber curation interface, i.e., to identify

interesting regions of conversations to structure reuse. This could also be because much of the discussions around the data analysis practices (i.e., why regions were created in specific places) occurred offline during the analysis workshop. Moreover, the practice of co-analysis revealed insights into the collaborative preferences to engage in data analysis highlighting a need to capture paradata outside of digital tools.

7.5.5. Curation

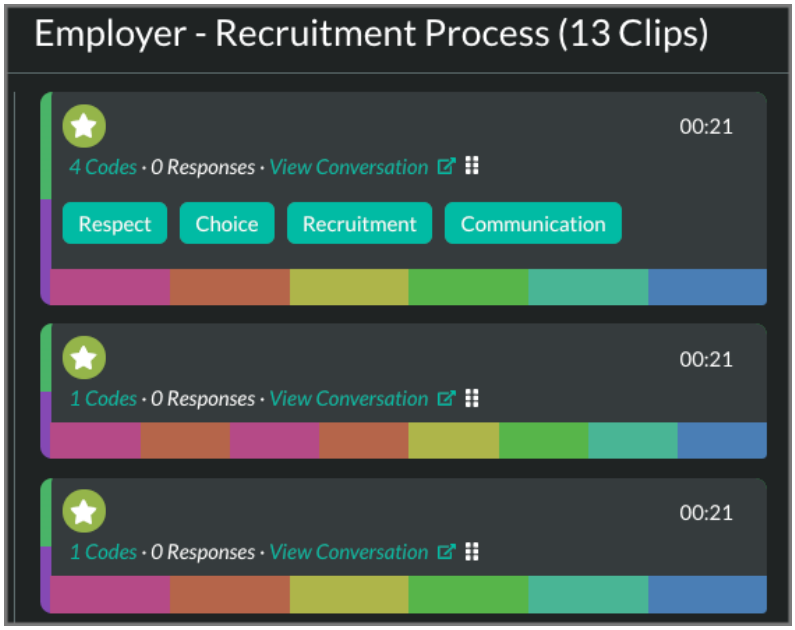


Figure 7.2 An example of a playlist created during the curation workshop and how it was represented.

The curation stage occurs in the Gabber platform through listening to all snippets of annotated audio conversations from the data analysis stage, and creating *audio playlists* by curating a selection of snippets around a specific theme. The curation workshop was attended by three participants (P1, P2, & P8) who had all previously engaged in the data analysis workshop and were therefore familiar with the dataset and had preconceptions for the types of playlists they would like to create. Curation was undertaken as a group, which involved discussing and planning potential playlists informed by the recordings they had listened to previously, and then filtering and listening to commented snippets using the playlist interface. In this way, participants did not have to listen to all content, but to find and listen to content that they were familiar with, which at the same time highlighted how familiarity with the dataset may have caused participants to overlook specific data. This curation process resulted in the creation of three playlists across a range of themes, i.e., *"The role of a PA"*, *"Employer: Recruitment Process"*, and *"Meeting an Employer"* that aimed to draw from experiences across projects. Figure 7.2 illustrated how a playlist appeared to participants on Gabber. Although the Gabber playlist interface was not designed to view multiple projects, participants instead viewed one project at a time, enabling curated snippets to be added to the same playlist and therefore to create playlists across projects.

Following this workshop, eight additional playlists were created by three participants: P1 created four, P6 created two (who did not attend the workshop), and P8 created one. In total, all 11

playlists lasted 35 minutes 38 seconds (mean=3m14s, SD=1m55s, min=0m44s, max=8m3s) that each contained nine commented audios on average (SD=4.7, min=2, max=19). Four interviews were used per playlist on average, which highlights how participants wanted to ensure that the experiences shared from across the captured interviews were represented in playlists.

7.5.6. Reuse

Making Links aimed to capture the diverse experiences of different stakeholders involved in managing personal health budgets, and to curate these experiences into a format that could be used to inform the delivery of training. In particular, four of the playlists were later selected to structure a series of training sessions aimed at individuals interested in becoming a personal assistant that did not participate in Making Links, thereby directly utilising and referencing the experiences shared. While P3, a staff member in Action Hub, wanted to use the playlist's as-is, Making Links co-researchers agreed to first request written consent from participants interviewed to use their recording for training. While participants had consented through Gabber for their experiences to be reused, the specific way in which it was reused outside of the platform is not specified and so co-researchers sought to provide an additional layer of consent and control to participants who shared their experiences. Consequently, 60% of the recordings were not consented for use in training prior to the first session, and the playlists were not used in the Gabber platform to deliver training and instead specific recordings that were consented were downloaded manually where P1 and P3 created an offline media playlist for internal reuse. In this way, only data with written consent was used, which in practice was curated further by P3 to accommodate the training session, therefore additional decisions on which data to use were made outside the scope of Making Links. P3 then delivered a pilot training session to personal assistants at Action Hub, thereby using the contributed experiences as a resource to enhance peer sharing within the delivery of training, which was also attended by P8 who wanted to see how the recordings would be used and engaged by others.

7.6. Phase Two: Post-Deployment Interviews

The previous section outlined the real-world configuration, adoption, and field deployment of the end-to-end Gabber workflow, which provided insights into the community-led configuration and use of Gabber and the citizen practitioners associated qualitative practices within each workflow stage (**RO2**). An additional aim of the research in this chapter was to understand the characteristics of paradata that were meaningful to participants that could inform design insights concerning transparency and trust of how qualitative data is represented through digital tools (**RO3**). The following sections outline the study design to explore this research aim and the findings from a thematic analysis of post-deployment interviews.

7.6.1. Study Design

One week following the data curation stage in the Making Links deployment, all participants involved were invited for one-on-one semi-structured interviews with the author to discuss their motivations and experiences contributing to the project, and to reflect on the types of paradata that were meaningful to them. As such, the following subsections detail the participants interviewed, and the data collection and analysis procedures.

7.6.1.1. Participants

ID	*Role*	*Research Stages*	*Prior Experience*
P1	Researcher	All	Expert
P2	Staff (CEO)	Preparation	Expert
P3	Staff	All	Novice
P4	Client	Capture, Analysis	None
P5	Client	Capture	None
P6	Client	All	Novice
P7	Client	All	None
P8	Client	All	None

Table 7.3 The role and stages participant's contributed to in Making Links, and their self-reported prior experience of qualitative research.

Eight of the nine participants took part in semi-structured interviews. P9 – who contributed to the project preparation and data capture stage, and did not participate in the data analysis, curation, or reuse stages – declined due to lack of time or personal circumstances. Table 7.3 presents an overview of the participants interviewed, their stakeholder role in Making Links, the research stages that they contributed to (further detailed in Table 7.1), and their self-reported prior experiences with qualitative research where we define an *expert* as having previously led qualitative research projects and a *novice* as having engaged in co-research activities. Notably, a core group of five participants (P1, P3, P6-8) contributed to all aspects of the co-research process despite some participants having limited prior exposure to qualitative research. Both P3 and P6 had conducted qualitative research in an academic environment, while P1 was the researcher responsible with leading Making Links. These distinct roles and research stages they contributed to were important for how the interview schedule was approached when discussing decisions made, representation in data, and transparency as outlined below.

7.6.1.2. Data Collection

Interviews took place one week after the data curation stage to ensure participants had recent experience engaging in research stages and because it was unclear when the data reuse stage would occur. All interviews were semi-structured and conducted in person, with the exception of P3 that was conducted over telephone. Interviews were split into two parts where: (i) participants reflected on the decisions that they made when contributing to each research stage and were

presented with Gabber interfaces to discuss how their contributions were represented, i.e., screens they used to analyse and curate data; and (ii) a scenario was used to structure a speculative discussion in relation to paradata usage concerning: *representation, trust, and transparency*.

For the second part of the interview, a speculative scenario was used to discuss these areas of interest for two reasons. Firstly, findings from chapter 6 highlight desires from citizen practitioners for new ways to understand who has engaged with their data (*transparency*), to see how they and others are represented across each stage of the research process (*representation*), and how they trust the data will be used. Secondly, prior work highlights that directly discussing the term 'paradata' explicitly could confuse participants as it is an unfamiliar term [59]. This motivated the choice of a scenario to reflect on the potential of paradata indirectly while limiting the potential to lead participants into discussing specific forms of paradata. The following subsections describe the protocol used, including what was shown to participants at each stage of the interview.

7.6.1.2.1. Reflections on Decision Making

Before the interview began, the rationale was described as aiming to understand participants experiences from contributing to Making Links and the decisions that they made that Gabber does not record, i.e., paradata. Each participant was then provided with an information sheet and consent form. The interview began by asking the participant to explain their motivation for engaging in Making Links to ease them into the interview process and were then asked to *"walk me through the stages you contributed to"* to explore the decisions that they made when contributing to Making Links. For example, P5 only contributed to the capture stage and was therefore asked why they interviewed the specific person that they did, where their interview took place, and why they did not engage in other research stages, etc. This enabled understanding of decisions that participants made (i.e., paradata) that was not captured through Gabber that participants deemed important to convey, while reflecting on the usage of Gabber and their qualitative practices. The interview schedule is outlined in Appendix C.2.

Following this, and to structure reflective discussions, a laptop was used to show the participant how data was represented and engaged with by other Making Links members in both the data analysis and curation stage on the Gabber website. For example, P5 was shown an interview that they took part in and P6-8 were shown interviews they had analysed. As P3's interview was conducted over the phone this was not possible, so instead the author prepared summary statistics to highlight how others engaged with their contributed data such as the total quantity of comments on their interviews. This enabled participants to understand the other workflow stages that they may not have contributed to and how data was engaged with, such as P3 who had only engaged in the data capture stage. Participants were then asked their thoughts concerning how this data was represented on the Gabber website, and *"Is there anything else you would have liked to know about how others engaged with your data"* to understand what was valuable for participants and what may be missing.

7.6.1.2.2. Speculative Scenario

The second half of the interview used a *speculative scenario* to discuss how the decisions participants made when contributing to Making Links could be viewed and benefit others. A scenario was used to structure and provoke discussions on the implications of the decisions that participants made. Participants were presented with a handout of the following scenario that was read out by the researcher verbatim to contextualise the proceeding discussion:

> *Sami, CEO of **Action Hub**, located in another area has come across content created through this co-research project. Sami has loved listening to the experiences shared and the innovative way technology has been used. Sami wants to lead a co-research project and would love to learn about what happened behind the scenes to help replicate your process: not just what data went in and what came out, but **why you made the choices you did**. Sami has contacted you with three questions that would help them get started.*

After introducing the scenario, a Gabber playlist was shown to participants to ground their responses in relation to the outcome of Making Links. Three questions were then asked to structure this second part of the interview around the themes of trust, representation and transparency as follows: (1) *"How can we trust that a playlist represents a community's experiences?"*; (2) *"How data you contributed and analysed might be misrepresented"*; (3) *"How the time and effort that went into the process is not present in the final output"*. When discussing each question, the participant was prompted to consider the decisions that they made during Making Links and how those could be used to represent their efforts.

7.6.1.3. Data Analysis

All interviews were audio recorded one-week following the completion of Making Links. Interviews lasted 47 minutes on average (SD=09m33s, min=35m51s, max=62m) and were transcribed verbatim using a transcription service and are available as a public dataset [223]. In line with analysis undertaken elsewhere in this thesis, an inductive thematic analysis (TA) approach was taken following Braun and Clarke [34]'s six-step methodology with an interest to understand the potential value, perceptions, and challenges of paradata. TA was chosen as it accommodates working with a diverse range of qualitative data sources as was collected in each case study – i.e., field notes, participant observations, and interviews – and facilitates flexible, iterative analysis. Data was initially coded and labelled with summary notes by three members of the research team including myself, which were then discussed between these three researchers. Following this, data was recoded, then clustered into initial themes based on codes and notes from across researchers. The initial themes were then discussed between those that coded data to refine themes prior to revisiting the coded data. The themes were then refined through an iterative process as the writing of the analysis progressed. This iterative, inductive process resulted in four themes that are presented in the following section.

7.6.2. Findings

The following findings document insights gained from the reflective, scenario-based interviews with participants following their participation in a digitally enhanced co-research project where Gabber was used across each stage of the qualitative workflow. Across these findings, how paradata was primarily framed as enabling *data provenance* [15] is highlighted for four distinct purposes: (1) to reflect on participant's decision-making processes; (2) to demystify the decisions that are made by practitioners with data in the research workflow to increase the trustworthiness of findings; (3) to provide data owners with opportunity to contest decisions made from their data; and (4) to observe how data contributed impacts the research process as a proxy to create evidence for external stakeholders. The following subsections describe each theme.

7.6.2.1. Reflecting on Digitally Enhanced Qualitative Practices

Participants described their data analysis practices as primarily aiming to identify interesting content that would reduce the time and effort required from peers in the subsequent curation stage. For example, *"things that stood out which other people could relate to"* (P4) and *"What parts of what this person is saying are useful to other people, as opposed to personal situation stuff?"* (P7). This selfless focus came across these interviews, and notably where participants raised little concern for how their data and potential paradata could be misused. This could be attributed, in part, because Making Links was designed as a safe space from the offset and participants were aware that any data captured through this stage would not be shared publicly without specific additional consent.

Participants empathised decisions that occurred outside of Gabber usage that impacted their future decisions in Making Links. For example, P7 described trying to persuade a peer to be interviewed and contribute their live experiences, noting that this interaction *"perversely, brought up a lot of useful information out of them that I have not been able to capture"*, which impacted how they interpreted experiences when listening to content during data analysis. In contrast, P6 and P8 undertook data analysis in-person as a pair, which P6 described as requiring compromises due to conflicting analysis practices between the pairs:

> *"We're both quite alpha and we both think we know the right way to do it ... so we compromised how we would listen in sections and stop it and pause it or we listen to the whole thing. P8 wanted to listen to the whole thing and then just pick out like highlights, and I would rather go through it in bit-by-bit." (P6)*

This illustrates the multiplicity of decisions participants made within different stages of the research workflow. However, documenting how analysis is configured and approached could provide more granular insight into participation: P6 only contributed through the co-analysis process, but this is unknown to the Gabber platform as P8 was the user who created comments during analysis (Table 7.1). When asked why they selected the interviews they analysed, P6 explained that the limited time they had for co-analysis restricted which data could be chosen

and that interviews were selected to gain a *"broader sense"* of participant's experience, i.e., by viewing interviews from across multiple distinct participants.

Through Gabber it is possible to capture paradata on the specific interactions when selecting and coding audio interviews, which could provide insight into who and what decisions were made by each participant. For example, who of the research team did not engage in analysis or which timestamps of interviews were not listened to. Across these interviews, we were often surprised to hear the reasons for decisions participants made when conducting interviews or analysis, such as choosing who to conduct paired analysis with. Paradata could help explain what and how participants engaged with qualitative data but would require contextualisation from participants to enhance its meaning for others, such as knowing that the purpose of coding data was for reuse than nuance of content. This is particular important to explain why an individual's paradata may diverge from others, such as the time they spent when undertaking data analysis.

7.6.2.2. Demystifying Decisions in Qualitative Practices

When presented with the analysis interface from interviews across Making Links, P2 – who was the CEO of Action Hub and only involved in the initial preparation stage – was surprised to see the quantity of comments and overall engagement with interviews. This invoked P2 to request a breakdown on how long each participant spent contributing to gauge the overall effort that would be required to run future instalments of Gabber. In contrast, P3, who had engaged in all research stages, highlighted the importance of improving transparency so that participants who contribute their data can see how their contributions are used and enacted by the community:

> *"Anything that improves transparency and makes processes clearer is never a bad thing. It shouldn't be. If you're taken part in something, there should be no mystery to it. It should be clear what your contributions was, what was done with it, and how it fed into whatever the end product is."* (P3)

P3 went on to suggest that increased transparency could help practitioners critically reflect and become more aware of their current approaches to qualitative research as all decisions made could be visible to others:

> *"It's [paradata] going to make people who use Gabber think harder about what they're doing because the more transparency there is, the more conscious you've got to be: why am I doing this? How did I come to this conclusion? How do I justify it?"* (P3)

On reflecting on contributing to each research stage, the extensive time participants contributed was raised as important to document and visualise alongside reported findings to showcase the effort that went into each research stage. However, P6, who engaged in all research stages, noted that recording temporal paradata should include *"all the think time around it [the process]"*, noting that this was not shown through Gabber. The potential of visualising the individual or aggregated time spent undertaking data analysis was suggested by another participant

as a mechanism to gauge and compare the quality of disseminated results *"...how long did somebody take to make that playlist versus one of the others"* (P8), reflecting that this would only be meaningful at the end of a research process rather than during as showing this paradata could influence which data is engaged with. This highlights the potential fluidity of paradata: data can be captured in one form (time spent) but used at different moments of the research process to initiate representation, impact, or discussion. However, having *"fully transparent"* research processes raised concerns from P6 – who engaged in co-analysis – regarding the potential of implicitly introducing biases when collaborating on data analysis as how individuals or the community engaged with the data might influence selection: *"people might go to the one that's had the biggest hits, but it doesn't mean it's the one with the most useful information."* (P6).

Participants expressed desires for alternative ways to view and explore the decision-making process alongside disseminated results – in Making Links this was in the form of audio playlists – to reveal qualitative research practices for themselves, funders, and the general public. For one participant, knowing *"the background of the person and where they're coming from, not just a clip"* (P5) was important to contextualise, relate, and to further appreciate the research findings. Sharing of personal identifiable information goes against the professional, ethical conduct, and regulation of qualitative research practices. However, participants interviewed expressed a desire for more control over how data they contribute to research projects – such as in Making Links where (co)researchers also contributed their experiences as interviews – and the associated paradata is used and viewed by others.

7.6.2.3. Viewing and Contesting Personal Contributions

Qualitative research typically involves capturing experiences from participants, who often have limited involvement in the data analysis and dissemination research stages [172, 175]. In contrast, all stages of Making Links were led by community members who used Gabber across the complete qualitative workflow. P2, who was most experienced with qualitative research reflected that traditional qualitative research practices can feel isolating and saw the inclusion of participants across in all research stages as a democratic approach that enables individuals to explore narratives beyond their *"filter"*:

> *"When reporting peoples experiences ... the filter is me. Yeah, you can go back, and you can check themes, or do certain things, but really, the filter is me. But this way [Gabber], then the filter isn't just me. It's other people commenting on each other's interviews, really, more democratic ..."* (P2)

Many participants expressed the personal value from contributing to Making Links, in part due to the positive experience of meeting peers and the collaborative configuration of the project. Despite this, participants expressed wanting more control and ownership over how their experiences would be reused, particularly to redress any feelings of misrepresentation. This was in contrast to the data analysis and curation stages as they *"included the person with whom the interview was with"* (P3) and thus improving the validity of the results as the participants

have *"been instrumental in coding it and confirming its use"* (P3). Whereas how data was reused beyond the co-research project was unknown and therefore their experiences may be represented in ways that misalign with their values. For P3, it was therefore more important to be able to trace the provenance of their contributed data *from the final output* rather than see paradata when they contribute to research stages:

> *'It would be useful if you can link each exerted playlist back to where that came from. . . . if there was somewhere you could click into and you could see an explanation of where and you know, how this interview came about. . . . then you can see why it happened and why somebody gave their time for this."* (P3)

Data provenance is typically achieved through the use of predefined metadata, e.g., W3C's PROV standard [271]. However, enhancing each step taken through data provenance with paradata, such as listening metrics in Gabber, would further increase the visibility of engagement with participants data and the impact it has had. Moreover, being able to view contributions in this way could enable research participants to offer their opinions to clarify, confirm, or to contest how results are presented to ensure data is not misconstrued. One participant suggested that data owners should have a way to *"veto"* how their data is used in Gabber to overcome challenges of misrepresentation:

> *"It's always subjective, but at least the person whose information it is has had control over how it's been used because they've been involved in the process and they've always had final veto."* (P3)

When presented with a playlist, P4 was surprised to learn that their voice was included in *all* playlists created in Making Links, and was curious to know the cumulated time that others spent listening to their interview. For others, being able to not only view, but *contest* how their voice was represented was equally important. P8 suggested initiating a *"complaint procedure"* (P8) if they did not agree with how they were represented. Making paradata – such as listening behaviours in Gabber – visible for research participants could help demystify interactions that occur with data and qualitative research practices more generally from the perspective of citizens.

7.6.2.4. Evidencing Engagement

Researchers often strive to *"give voice"* to participants through how they represent their experiences as research findings [13]. Typically, participants are not included in the analysis stage, which can lead to participants sharing their experiences but not knowing how or if their contributions informed and impacted other research activities [60, 175]. In our interviews, it was important for participants to know and see how their experiences were heard and engaged with beyond the Making Links members:

> *"What would be interesting to know is how many people have actually listened to what I've said. To hear what they've highlighted about the actual interview itself ... It means somebody is listening to what I've said."* (P4)

When contributing experiences to research or consultation projects, having direct *"feedback"* from the hosts leading the project was noted by P4 as a way to evidence the impact they created: *"They might have spent £20,000, and it would be nice for us to say, 'Well, at least they've listened, and they've put this into effect.' "* (P4). In Gabber, disseminated results are represented as audio snippets that link back to the original source. This format of representing research findings was seen as trustworthy as *"... the raw data is always available, so the trust here is that you can track back and hear the whole person."* (P8). For P3, being able to trace the audio snippet from the reported outcome to the raw interview was seen as a way to make the process more tangible:

> *"I think it's when you've contributed to something, and this what's nice about using Gabber, is people can see the impact of their contribution. You've actually got a tangible product that you can see what you did."* (P3)

While traceability is often achieved through metadata, such as backlinks to source material, paradata could supplement each 'step' that is being traced where it could further demonstrate impact. For example, by representing aggregated statistics of how many researchers listened or coded *your* data. Transforming paradata into a tangible asset could help enable accountability of the research workflow to increase its perceived validity and be used as evidence to support funding bids. For example, one participant noted that funders now require *"evidence of what your users want"* (P8), which could be achieved through a co-research project as presented in this chapter and strengthened though being able to *"demonstrate the process you've gone through"* (P2) that could be possible with paradata.

7.7. Discussion

This chapter explored the role of paradata across a complete qualitative research workflow to understand which types are most meaningful to both research participants and (co)researchers. Findings from this field deployment highlight desires for *"tangible"* interactions with paradata to demystify research practices and explore the impact participants have had on research. Moreover, paradata was seen as a multifaceted form of data, ranging from being *intangible* (i.e., perceived effort) to *temporal* (i.e., time spent on analysis). Critically, this chapter has not presented specific types of paradata but rather highlighted how *objective* and *subjective* measures of paradata are desired and could be recorded through systems like Gabber and used to enhance transparency amongst other practical uses. Here objective paradata could entail the time spent listening to an interview while subjective could be the perceived effort spent listening to the interview.

The following subsections situate these findings within existing qualitative techniques and digital tools that aim to improve the reliability of research practices. In doing so, this chapter posits the need to design *personalised* interfaces that represent paradata in ways that are meaningful to research participants and researchers (who lead qualitative projects), and the associated challenges with privacy and consent when (re)using paradata. For researchers, this meant using paradata to make their decisions visible to increase research rigour and accountability and for research participants representing how their contributions created impact.

7.7.1. Increasing Transparency with Paradata

The decisions a researcher makes during a qualitative research workflow can create paradata that we argue is personal and more meaningful to its creator as they understand and can explain variations in paradata. For example, the time spent analysing an interview may be because one participant is deeply engaged in that specific research activity, or as experienced in our study, paired analysis took place, resulting in significant time being devoted to that activity. In this instance, paradata is *subjective* and requires *contextualisation* by its "owner" for it to be meaningful to the individual (i.e., for evidencing impact) and when aggregated (i.e., for summary statistics of participation to account and adjust for this explanation). Consequently, we argue that designing mechanisms to enable contextualisation of paradata where it is often automatically captured is scope for future work. This insight on the need for context to render meaning to paradata can inform interface design and prioritisation in the types of paradata that are captured in digital qualitative systems, i.e., *temporal* that is objective and automatically captured, and *intangible* that is subjective and could be captured via a questionnaire or in-app prompt. However, the motivations, utility, and opportunities for how paradata is represented and utilised varies depending on who is viewing its representations, i.e., (co)researchers or academics, and thus having both individualised and aggregated interfaces would be beneficial depending on the context of use.

Contextualising log files and data automatically recorded by technologies to enhance its value is a well-documented design challenge in *personal informatics* [165], with research exploring how other people's metadata from within a community can be overlaid to inform shared annotations and reflections similar to the use of digital prototypes in chapter 4 [217]. In contrast, Wirfs-Brock et al. [278] presented paradata to users of a music streaming platform – *i.e., top songs, play-counts, hours listened to music* – to discuss their usage patterns with the aim of informing interaction design for voice assistants. This work calls for more user involvement in the design of interfaces where paradata is used. P6 noted that Gabber's use of the raw audio interview across all research stages enhanced engagement and accessibility. We posit that presenting paradata alongside the original source data (such as an interview) provides a context that can be meaningful to all stakeholders involved as each data source further contextualises the other. In this way and similar to [278], paradata from real-world qualitative practices could be used as a resource to facilitate participatory design sessions that bring together the diverse range of stakeholders involved to ensure systems that are designed respond to the stakeholders' diverse needs and therefore produce systems that are meaningful to use. The following subsections outline the motivations, opportunities, and challenges for designing and using paradata to supplement raw data for *researchers* and *research participants* respectively.

7.7.1.1. For Researchers to Enhance Data Sharing

Recent research within the HCI community frames transparency in qualitative research as two components: *process transparency* and *data sharing* [256]. Findings from this chapter highlight desires to make visible decisions from across the research process and therefore the potential of

process transparency with it through the use of paradata. In contrast to (co)researchers, where motivations to utilise paradata are intrinsic, for academics they are frequently extrinsic as they require evidencing rigour for accountability purposes. Sharing qualitative data remains a key tension point within the qualitative research community due to the ethical and informed consent constraints associated with sharing human experiences, such as interview transcripts or audio [89, 256]. Designing interfaces that aggregate paradata could be one way to reveal procedural aspects of the research process to others while working within existing constraints because aggregated paradata would ideally be anonymous and owned by the academic. For example, if a researcher conducted an interview study, a *summary report* that includes who in the research team engaged in data collection and analysis, their listening coverage of the interviews, and the portion of transcripts unused. Such a report could be interactive to enable others to query and explore this paradata, i.e. *"Has all the data contributed by participants been analysed?"*.

Future work could explore and expand on these *paradata-driven interfaces* to enhance or supplant existing qualitative data sharing practices and in doing so uncover the associated challenges through use. Caution must be taken when designing such interfaces as they could lead to practitioners *"gaming"* the process through producing paradata in ways to achieve an optimal characteristic. For example, assuming *"representation"* was a key characteristic, then the research team could have everyone open the transcripts and *"engage"* with them by leaving the digital tool open while they are not present.

In contrast to viewing a personal interface containing paradata, *aggregated paradata* has the potential to become a new form of supplementary material that can enhance qualitative data sharing as we argue paradata is independent of methodology applied during research. For this paradata to be meaningful to others would also require sharing notes or annotations to contextualise the paradata as outlined above. Requiring contextualised notes introduces additional layers of consent that could deter paradata's adoption. However, using paradata for data sharing could be one tool to respond to emerging challenges of sharing raw qualitative data through providing a proxy that gives insights without revealing participant details [89], such as verifying that all research staff engaged in data analysis or that all interviews were disseminated.

7.7.1.2. For Research Participants as a Feedback Loop

Qualitative research methods are increasingly being used by citizens and community organisations where transparency of decision-making is becoming increasingly important for accountability and to secure funding [172]. Research participants typically contribute to the preparation and data capture stage as outlined in chapter 5, and so future work could explore the design of paradata interfaces for *data analysis* processes as these would create more impact for research participants, such as displaying how many and for how long researchers spent listening, analysing and engaging with participant's lived experiences. This provides unique design constraints as participants would be both the providers of source data and consumers of researcher's paradata. For example, should participants know the total duration researchers spent with their data, but

what if this time is short or non-existing? Particularly if this can be observed and compared amongst a set of interviews.

The use of technology across the complete qualitative workflow provided opportunity for participants to reflect on the potential utility of paradata. For participants interviewed, paradata was imagined as a *"tangible"* asset that would satisfy their curiosity through showing how their contributions impacted the research workflow and how these were engaged with by others. In Gabber, such an interface could contain the time spent *"engaging"* with the data i.e., *listening coverage* as the co-researchers expressed and desired to know how much time they spent doing analysis and were surprised when they reflected on it. Using data for reflection in this way is a common practice within personal informatics, e.g., tracking time spent across applications on a computer [261], but has yet to be applied to qualitative practices. For participants interviewed, knowing personal details of who engaged with their data was important to build trust and a relationship between the research participants, the researchers, and their data. One approach could be the use of pseudonymisation for exploration of paradata at an individual level, i.e., which researchers listened to my data. In this way, paradata can form a feedback mechanism to the people that were involved in the research and thus as a way of closing the direct connection with research participants, but without revealing personal details between participant and researcher.

7.7.2. Implications for Privacy and Consent with Paradata

Informed consent is an integral step of the ethical conduct and regulation of qualitative research to ensure participants understand the implications of participating in research activities and how their contributed data will inform research [199], which motivated the embedded, multi-step dynamic consent process within the Gabber platform over the raw data captured. Prior survey methodology research highlights how *"the concept of paradata is inherently difficult to grasp and is unfamiliar to virtually all respondents"* when taking informed consent, leading to low attrition in surveys [59]. This introduces design challenges for how best to represent, capture, and consent for paradata use within research projects where the stakeholders and the anticipated stages of research that they will contribute to may vary.

In the case study presented in this chapter, participants had trust in one another as collaborators, and so did not perceive any potential privacy concerns with how paradata could be misused within the predefined boundaries of the safe space created through Making Links. While digital tools for qualitative practices could automate the capture of paradata, enabling participants to observe, trace, or contest how their data is used, paradata also has the potential to facilitate malicious use, such as recording other forms of paradata (keystrokes) or monitoring time spent undertaking activities for performance review. Having an additional tool that provides measurements of *"productivity"* creates a risk of being used as a performance management tool rather than to promote transparency of qualitative practices. As noted previously, such an intended performance measurement use could impact how qualitative research is undertaken through shifting the focus on evaluation of the process (via paradata) rather than research outcomes. As noted above, this could lead to researchers 'gaming' the process to ensure objectives are met

(e.g., listening to a specific quantity of interviews) or to 'improve' performance with regards to the proportion of analysis over time, which retracts from the purpose of conducting data analysis. As such, careful design must be taken to ensure paradata-driven interfaces and the associated tools are used for their specific purposes when applied to qualitative research practices, e.g., to supplement sharing of raw data. How this could be realised remains an open challenge, but consent of sharing this data from both researchers and research subjects provides one way that to restrict access to those who need it.

Moreover, the need to contextualise and catalogue paradata adds additional time and labour requirements that could prevent its adoption, and so determining which subset of objective paradata that can be automatically captured would be most meaningful is a crucial next step of this research. It is therefore critical to design platforms that consume paradata to explicitly document what paradata is being collected and why, and for the paradata owner to have granular access control over what is recorded and who has access. For academics, this could be in the form of open data through pre-registration of paradata that intends to be recorded for research purposes and shared to make the decisions and intent transparent to further build trust amongst the research community concerning qualitative data [44, 49].

7.8. Limitations

This chapter provided insight into the use of Gabber across the complete qualitative workflow by *citizen practitioners*, and reflected on the intended use of paradata through follow-up interviews. Participant's role as both (co)researchers and research participants informed actionable design recommendations of interface design for both roles. Participants were mostly inexperienced with qualitative research practices prior to participating in Making Links, and so the design findings are not generalizable to other contexts. Nevertheless, inexperience is a side effect of participatory and co-research approaches that are increasingly being adopted within HCI (e.g., [78, 270]), and so there is a need to further explore the transferability of these findings. Moreover, this chapter has provided the conceptual foundation for paradata as a potential design tool in qualitative research practices and initial exploratory fieldwork to build upon. Future research could explore interface design with researchers and study participants where tangible forms of paradata – e.g., *data profiles* [278] – captured throughout the research workflow are presented, discussed, and reflected upon by the research team, and thus extend the design learning presented in this chapter.

7.9. Summary

This chapter presented a case study of a co-research project led by citizen practitioners who adopted, configured, and used the Gabber platform across the complete qualitative workflow where they engaged in all decision-making activities. Observations of these qualitative practices and post-deployment interviews provided insight into the challenges that arise through real-world use across the workflow (i.e., **RO2**) and in particular the practices not facilitated through technology but where paradata might be meaningful to capture, such as to overcome issues of

representation (i.e., **RO3**). Our findings highlight how paradata has the potential to demystify the processes associated with research for practitioners, provide opportunity to contest decisions made on contributed data, and could be used to observe how contributions created research impact. Through this, the associated design challenges – i.e., a need for *contextualisation* and designing *with* data owners – that could inform the design of future paradata-driven interfaces were presented. In particular, paradata could be used to illuminate the activities currently undertaken *"behind the scenes"* [263] that we argue could increase transparency and representation of decisions made.

The following chapter reflects on findings from across all case studies undertaken in this thesis in relation to the research objectives outlined in the introduction, i.e., how technology might support inclusive participation in each qualitative workflow stage. Following this, the overarching limitations of the methodology used across this thesis and proposed qualitative workflow are described before concluding with a discussion on potential future research directions.

Chapter 8. Discussion and Conclusions

8.1. Introduction

Participatory partnerships between citizens, civil society, and local government are increasingly being adopted by public authorities and academics with the aim of drawing from local expertise to inform decision-making [101, 270]. This thesis argues that such partnerships mirror aspects of the qualitative research process, but like traditional consultations, can less often include all stakeholders in the data analysis and dissemination stages [146, 172]. Human-Computer Interaction (HCI) and more recently digital civics research has demonstrated how digital tools can enhance participation, but to date primarily enhance individual research stages [141, 171].

In response, this thesis primarily aimed was to explore the design of digital tools to enable inclusive participation for qualitative practitioners across each and every stage of the qualitative research workflow. This began through critically reviewing literature to characterise the research practices of *academics, civil society organisations and citizens* who are key stakeholders in such participatory partnerships, i.e., chapter 2, where the distinct and overlapping research practices of each were summarised, including how digital tools are adopted and used. From this, chapter 5 outlined a novel conceptualisation of a *qualitative research workflow* that draws from the intersection of these qualitative research practices, thereby creating design opportunities to increase inclusivity across these intersecting qualitative practices for each stakeholder group.

To understand this workflow in practice, an action-oriented research approach was taken through fostering partnerships with stakeholders who were interested in or actively engaging in qualitative research. Five case studies were undertaken in distinct contexts with academic, civil society, and citizen practitioners to observe and examine the adoption of the proposed workflow. In particular, chapter 4 described the participatory action design research (PADRE) approach taken to iteratively design, develop, and deploy digital prototypes across the first three case studies in academic and civil society contexts. Design insights gained through this informed the development of **Gabber**, a digital platform that realises the workflow through a single technology as outlined in chapter 3. Gabber was then used in two longitudinal case studies with the IFRC (chapter 6) and a citizen-led initiative (chapter 7) where observations of and interview with participants focused on how these digital qualitative practices were configured and adopted.

This chapter begins through revisiting the research objectives outlined in the introduction chapter in relation to key findings from across the case studies to show how these were addressed. This thesis' contributions to the wider research fields of HCI and citizen social science (CSS) are then outlined. The limitations of the underlying methodology and proposed qualitative workflow are described, followed by offering suggestions for areas of future research.

8.2. Reflecting on the Research Objectives

How can digital tools be designed to enable inclusive stakeholder participation throughout a qualitative research workflow?

This guiding research agenda was presented in chapter 1 that underpinned the research presented throughout this thesis, which was then divided into three distinct research objectives. This thesis has made direct responses to these objectives and discussed the implications for each in relation to relevant literature within each case study chapter. The following subsections revisit and provide direct responses to each objective in relation to findings from across this thesis.

8.2.1. RO1: Explore the Design of Digital Tools to Enable Stakeholder Participation in All Qualitative Research Stages

To address this research objective, chapter 5 considered the qualitative research process as a workflow through explicitly defining and characterising the research stages that are often overlapping or implicit within existing literature, i.e., *Preparation, Consent, Capture, Analysis, Curation, and Reuse*. Through this conceptualisation a design space was defined where alternative modes of stakeholder participation can be explored. Chapter 4 outlines three chronological case studies (CS) conducted over two-years where each workflow stage was iteratively examined through the design, development, and deployment of digital prototypes to enhance existing qualitative practices. These case studies offered design learning from the perspective of enabling academic (CS1/3) and a civil society organisation (CS2) to participate in all qualitative research stages as illustrated in Table 4.1. These three research contexts provide a range of design insights into each workflow stage as outlined in chapter 4, with three challenges surfacing across the subsequent two case studies: *the use of voice, dynamic consent, and configuration participation*.

Firstly, building on prior participatory media research [21, 267], a key design decision of the proposed workflow is the prioritisation of interactions with the original captured audio media as a design technique to increase opportunity for participation. The importance of the nuances audio affords was best highlighted in findings from CS2 – *a partnership with a local charity that deliver services to individuals with complex needs* – where captured conversations were presented back to service-users in subsequent visits with the aim of supporting personal reflection. In one case, a support worker attributed this reflective process to an increased desire from the individual to get better as they were seen to realise their own words, which would not have been possible in written form due to the individual's literacy levels. The decision by our collaborators in CS5 – *service-users from a community-led charity organisation that provides support to disabled individuals* – to select Gabber from a range of existing commercial and research tools was driven by the perception of how audio preserved individuality through voice and how it could reduce barriers for these individuals to take part in all workflow stages.

The distinct context, backgrounds, and experiences with qualitative research of participants in each case study highlighted the utility and value that the Gabber platform provided, and in particular how it accommodated participation in each research stage with limited support from

researchers. How participation in workflow stages is structured varies drastically: from sharing your voice (capture stage) to having your voice shared by others (reuse stage). A key distinction in the proposed workflow compared with prior digital systems as outlined in Table 3.1 is making consent an explicit workflow stage and designing this into the associated platform. Through this, participants have autonomy over how their data is (re)used throughout the workflow and therefore how they are represented and participate in subsequent stages. Findings in CS2/5 highlight the challenges of audio reuse in sensitive contexts where service staff desire to consent on behalf of their service users, illustrating a need for interface design to offer more granular control to participants in how their data could be used in the future.

Finally, a notable challenge identified in chapter 4 and chapter 7 was that a small portion of the community disproportionately contributed to specific research stages, which resulted in subsequent stages being drastically shaped by individuals. This is a common challenge amongst community-driven platforms where content moderation is typically introduced to mitigate these challenges, e.g., [1, 160, 262]. However, moderation requires additional work and could be perceived as less inclusive as the ultimate decision on which content to include is taken by the moderators. One alternative solution explored through RO3 is to surface the decisions made through the technology (i.e., paradata), such as whose voices contributed to a curated playlist, which could facilitate transparency on who and how contributions are used and engaged with.

8.2.2. RO2: Explore How Practitioners Use Digital Tools Across The Qualitative Workflow

The iterative design of digital prototypes examined through chapter 4 informed the refinement and development of the Gabber platform, which encompasses the complete qualitative workflow through a single system as outlined in chapter 3. In contrast to the initial three case studies, the aim of the final two was to explore how practitioners configure, adopt and use Gabber across the *complete* workflow. As such, two distinct research contexts were sought that provided contrasting uses of the system, from a top-down configuration by an NGO (chapter 6) to the bottom-up use by a citizen-led initiative (chapter 7). Each empirical study provided unique insights into how Gabber was used to support the associated qualitative workflow of these practitioners with the key challenges and opportunities identified across these case studies summarised below.

In chapter 6, a partnership with the International Federation of Red Cross and Red Crescent Societies (IFRC) was presented where Gabber was configured and used as part of an ongoing *globally distributed* community engagement to explore alternative ways for their members to capture, analyse, and disseminate ideas from local members. Due to the distributed nature of the engagement a digital campaign was designed termed *TalkFutures* where three distinct roles were created that map to individual qualitative workflow stages – i.e., capture, analysis and curation – with the aim of creating lightweight modes of participation as limited support could be provided due to the geographically configuration of the case study. In contrast to the prior case studies, the curation and reuse stages were not used and instead the curation role was designed around the application of graphic design skills to produce summary visualisations in digital tools outside of Gabber that could be used to promote TalkFutures on social media. This highlights the flexibility

of the workflow through a modular use that was adopted to work within the practices of IFRC decision-makers.

In chapter 7, citizens led a partnership with a local charity with the aim of capturing the voices of service-users to raise awareness and share knowledge for a specific purpose. In contrast to chapter 6, this was a grassroots configuration of the end-to-end workflow through Gabber. One critical insight raised through observations of participation was the emergence of co-analysis practices whereby individuals split into pairs to listen, discuss, and analyse audio content as a team. Many of these rich discussions were not captured or documented through the Gabber platform, resulting in tagged content lacking contextualisation of *why* it was chosen that may benefit others during the subsequent workflow stages. For example, participants identified in interviews that they selected individuals to listen to so as to increase representation within the curated dataset, which paralleled findings from CS2.

While each context was distinct in its content, location, and scope of participation, each resulted in a large corpus of captured and annotated audio conversations that could be curated and reused by practitioners when desired. Likewise, the community in chapter 7 selected Gabber due to its use of prioritisation of voice across all stages of the workflow, whereas chapter 6 configured and used it primarily for data capture, consent, and analysis. This modular use could be attributed to the challenges of decision-makers to engage with media to create action as outlined in prior digital civics research, in part because their existing practices are designed around written reports [78, 146]. This presents opportunity to explore how alternative versions of Gabber could provide supplementary transcripts to work within current reporting practices of decision-makers.

8.2.3. RO3: Investigate The Types of Paradata Meaningful To Qualitative Practitioners To Enhance Process Transparency

Chapter 6 presented a geographically distributed partnership with the IFRC's innovation team who sought to engage its members in an ongoing community engagement. Findings from post-deployment interviews with members who contributed to varying stages of the digital qualitative workflow highlighted desires for increased transparency in who and how other stakeholders engaged with their contributed data, paralleling findings from recent digital civics research [60, 78]. As such, this thesis sought to investigate which types types of *paradata – i.e., data generated through the process of engaging in qualitative practices through digital tools* – that could be recorded through Gabber might be used to enhance *process transparency* [256], i.e., to make the steps associated with each stage of the qualitative workflow transparent and accessible to others.

To date, paradata has primarily been used within survey methodology research to improve attrition and monitor engagement [58]. In contrast, chapter 7 provides a distinct conceptualisation of paradata to enhance process transparency of qualitative research practices and an initial investigation in response to this research objective. An exploratory study was taken rather than a PADRE approach as in chapter 4 because it was unclear how paradata might be framed and meaningful to practitioners. Findings from post-deployment interviews with participants

following this case study surfaced insights into the *objective* (i.e., time spent on data analysis) and *subjective* (i.e., perceived effort) measures of paradata that were meaningful to practitioners and how a combination of these would be necessary to provide insight to participants. In particular, participants desired viewing visual representations of paradata to help demystify the research practices to themselves and for others.

One notable challenge raised was the need to contextualise paradata within interfaces to make it meaningful beyond those who created it, which could result in a time-consuming process for participants if they are required to manually annotate and contextualise all paradata recorded. One solution presented was the aggregation of paradata to provide a summary report that could provide insights into high-level decisions made *"behind the scenes"* [263] without compromising anonymity. We posit that there is potential to create more inclusive and representative participation with paradata through facilitating process transparency [256], but how this could be realised within existing digital systems like Gabber requires further exploration. In addition, and in response to the challenges of consent raised in response to RO2 above, paradata could become supplementary material in place of the raw content to evidence that data contributed exists and was engaged with by a range of participants.

8.3. Reflecting on the Research Approach

This thesis sought to understand how digital tools could be designed to enable inclusive participation across all stages of a qualitative research workflow. To that end, it was important for me to undertake design research in realistic contexts, and so a case-study approach was adopted where technologies could be designed with participants and deployed to support ongoing participatory partnerships [249]. Two research approaches were adopted across this thesis: an action research (AR) approach in case studies where the partnership's objective was to create social action; and a human-centred design (HCD) to ensure research observations and findings could more meaningfully inform the iterative design of digital tools that was applied across all case studies. This section reflects on these approaches in relation to the design of digital tools to support inclusivity, activism, and knowledge construction.

Participatory partnerships between academics, civil society organisations, and citizens are increasingly becoming common within HCI research [124, 246]. Recent work highlights that taking an action design research approach can help strengthen long-term partnerships through creating an inclusive design space where all stakeholders can participate on equal terms [246], while other work highlights the significant energy, time, and resources needed to scaffold and support participation [5]. My role in conducting action design research involved brokering partnerships to ensure participants could contribute to all qualitative workflow stages. In practice, this was not always possible or preferable. For example, due to the stakeholders involved during CS2 arranging times suitable for all participants was problematic, and so the data curation stage was undertaken by a single manager in the partner organization. During this, they often selected data that they had previously engaged with in favour of content contributed by other participants, which was seen to introduce personal bias in how narratives were presented when the curated

content was used to support training delivery. An HCD approach afforded inclusive participation in the design of digital tools for those who could attend sessions, which highlights a need to design alternative ways for participants to observe or contest how their data is represented.

Digital civics research often involves a range of stakeholders to help create local and long-lasting impact, and in particular decision-makers who have the resources or knowledge to create change, such as local government and charities [201, 270]. As such, DC research is an inherently political process due to the stakeholders involved, power dynamics between them, and who or how the agenda is set. Prior DC research highlights that this can take direct form through conducting research that enables *political activism* [10, 25] or indirectly through *civic advocacy* [216]. Marres [178] posits that material artefacts are increasingly reconfiguring how the public participate in contemporary politics, such as digital tools like Gabber, and to that end highlights the multiplicity of how participation can be undertaken, i.e., *"material participation"*. For example, during CS2 one participant reflected on the transformative impact that participating in the project had on their personal wellbeing, and attributed this to engaging in the data capture and analysis stages rather than the anticipated outcome of the project. This could be because each workflow stage necessitated distinct forms of participation through material artefacts, such as deciding who to interview (CS1–5) or whom to conduct data analysis with (CS5).

As shown throughout this thesis, for digital tools to be successfully adopted by qualitative practitioners they need to be designed with stakeholder groups and in response to real problems experienced by participants. Haraway [120]'s frames knowledge production as contingent on individuals position in the world (i.e., their background, location, etc.), and highlights that due to this each individual interprets and makes meaning of data individually, i.e., *"situated knowledges"*. Taylor et al. [259] extends this idea through highlighting how data produced is *"bound up with place, both in terms of physical and social geographic"*. Underpinning Gabber was the aim to create inclusive participation in citizen social science projects that Albert [5] frames as *"a distinctive approach that highlights the politics of method, and has a highly transformative potential impact as it enrols participants in reflecting on, and recognising different situated knowledges"*. Taken together, Gabber provides a distinct material form through which participants have conducted qualitative enquiry across the complete workflow stage by drawing upon their situated knowledge to inform their overall participation and position to analytical practices. This thesis offers examples through the case studies presented for how a multifaceted research approach can be undertaken in practice within CSS projects.

8.4. Contributions

Through exploring these research objectives throughout this thesis, four distinct contributions were made as detailed in the introduction and summarised as follows:

1. A *conceptual contribution* of a qualitative research workflow that structures design research at the intersection of qualitative practitioners as outlined in chapter 2 and chapter 5.

2. A *system contribution* through synthesizing design findings from three distinct case studies that examined the proposed workflow (chapter 4). This resulted in an open-source digital platform encompassing the complete qualitative workflow (chapter 3).

3. An *empirical contribution* through practical design insights from across five case studies led by academics (chapter 4), civil society (chapters 4 and 6) and citizen practitioners (chapter 7).

4. A *design contribution* through exploring how paradata from digital tools could improve process transparency and demystify decision-making for stakeholders involved (chapter 7).

These contributions have had a direct impact on facilitating the practices of stakeholders involved in qualitative research as evidenced throughout this thesis, dissemination of research knowledge through four peer-reviewed publications [24, 224, 225, 268], and the development of an open-source digital platform for conducting qualitative research [222]. How these contributions relate to and impact the fields of digital civics and human-computer interaction (HCI), and citizen social science (CSS) are summarised below.

8.4.1. Digital Civics and HCI

Recent HCI research has explored the design of inclusive digital tools to support new modes of civic participation, such as through new feedback technologies [79] or contributing to deliberative processes [145]. To date, much of this research aimed to enhance individual workflow stages, with limited work exploring how participation can be structured beyond data capture and across all workflow stages. In contrast, this thesis examined the practices and methodologies undertaken throughout digital civics partnerships by focusing on the design of digital tools to make participation across the research process more inclusive for all stakeholders involved. Through analysing existing literature, a *qualitative workflow* was posited that creates a distinct design space to pursue research at the intersection of qualitative practitioners critical to digital civics research. Building on this workflow and taking a participatory action design research (PADRE) approach to research, this thesis presents a deeper understanding of the role of qualitative practitioners beyond academics. Moreover, this thesis offers an open-source implementation of the proposed qualitative workflow (chapter 5) that can be adopted and built upon to extend future digital civics research [222]. Finally, chapter 6 and chapter 7 provide a characterisation of how qualitative practitioners configure and use technology throughout the end-to-end qualitative workflow that future practitioners can build upon when configuring technology use in participatory partnerships.

8.4.2. Citizen Social Science

Citizen social science (CSS) is an emerging research field where citizens can contribute to ongoing qualitative research projects that typically aspire to create societal impact [215]. Prior CSS projects are typically driven by academics and typically include participants as data collectors [126, 215]. While this aim of creating societal impact resonates with the digital civics [201] and

participatory media research [171], there has not yet been any direct connection between these distinct research fields, which this thesis sought to overcome. Thus, this thesis offers five distinct examples of CSS projects through the case studies presented herein. Each case study highlights how participation can be configured to enable stakeholders to contribute to all research stages and the role of technology in facilitating such partnerships, including how commercial technologies can be used to provide support and training to participants, i.e., through the use of WhatsApp in chapter 6. Moreover, ethical and privacy concerns for capturing data and involving participants in research have been previously raised by CSS researchers [6, 126], which have underpinned the design of the dynamic consent model presented in the Gabber platform (chapter 3). Gabber could be adopted in future CSS projects where consent is designed into the workflow.

8.5. Limitations

There are several limitations with the underlying research undertaken in this thesis and the proposition for a qualitative research workflow. Limitations pertaining to the study design of each case study are outlined in associated subsections in the Design, TalkFutures, and Paradata chapters respectively. Consequently, the following subsections reflect on the overarching limitations identified through conducting this work pertaining to the action research (AR) methodology used and the application of the qualitative workflow across these case studies.

8.5.1. Methodology

The aim of this research was to explore how qualitative practitioners adopted and used digital tools to accommodate their practices. In line with existing digital civics research, it was integral to pursue partnerships with a range of stakeholders to observe real-world use of emerging qualitative practices [270]. As such, an action research approach was taken throughout this thesis that required shifting research focus to accommodate the needs and aims of the research collaborators. Due to the AR and qualitative nature of this research, generalisability of the presented research findings beyond the study sample of each case study cannot be proven. However, given the adoption of the qualitative workflow across multiple distinct case studies we can posit *transferability* of the research findings pertaining to the conceptualisation and use of a qualitative workflow through Gabber [122]. Moreover, the credibility of AR is often evaluated on whether outcomes of research partnerships solve real-world problems, i.e., *workability* [116]. The research presented in each case study formed part of ongoing projects that directly impacted participants and solved real-world problems for those involved. In addition, other digital civics researchers have adopted and used Gabber to support their own participatory partnerships resulting in two peer-reviewed publications (i.e., [24, 268]) and several other collaborations yet to be published, which further evidences the workability of the contributions of this thesis.

8.5.2. *Qualitative Workflow*

Existing social science research has primarily explored the analysis practices of academics [209], while HCI research has explored the design of digital tools to enhance the data capture and analysis stages [19, 75]. In contrast, this thesis examines *all stages of the qualitative research workflow* from the perspective of civil society and citizen practitioners. The three case studies presented in chapter 4 iteratively examined multiple workflow stages in succession, while chapter 6 and chapter 7 examined the complete workflow. Through focusing on gaining insight concerning the complete workflow throughout this thesis, the breadth of qualitative practices was explored in contrast to examining individual stages in-depth as in prior work. While this provided broader insight into the real-world practices of stakeholders, chapter 6 outlined a dependency of data between each workflow stage such that if one workflow stage had limited participation, then the subsequent stages could not be examined. For example, if the research aim is to examine data curation then the prior stages – i.e., consent, capture, and analysis – must be complete unless an existing dataset is used that could be impractical in the contexts of participatory partnerships.

The *voice first* design choice in the Gabber platform prioritises the design of participant's voice through capturing and using audio in each workflow stage. While this thesis has shown that the use of audio can create inclusive practices in the data analysis, curation, and reuse stages where participants are typically excluded as outlined in prior research, a larger challenge was identified with making the final summary output from Gabber – i.e., audio playlists – practical for decision-makers to create action. This mirrors prior digital civics research where community groups and civil society organisations have captured media, but that decision-makers are often under resourced to meaningful engage and use the contributed insights [79, 145, 146]. One approach as described in future work below is to enhance the curation stage of Gabber to output transcripts alongside the audio playlist so that decision-makers can more easily use these within their existing practices. In this way, the nuance of voice that audio offers could continue to be used as a resource by practitioners – i.e., enhancing training delivery as in this thesis and [268] – alongside transcripts depending on the needs of the context.

8.6. Future Research

The findings and discussion resulting from the case studies presented in this thesis provide subsequent research opportunities both in relation to augmenting and utilising the Gabber platform as a research tool and for qualitative research practices more generally. As such, and informed by the limitations above, three areas of research are outlined below:

8.6.1. *Data Profiles with Paradata*

Research presented in chapter 7 provided an initial exploration of how paradata could be meaningful to citizen practitioners to enhance the transparency of the qualitative practices associated with decision-making processes. Building on this work, and similar to [278], an immediate opportunity could be to augment the Gabber platform to capture paradata pertaining

to the types suggested by participants interviewed and creating *"data profiles"* [278] from these as part of an ongoing project to ground discussions with participants and their existing practices. This research could provide practical insights into: (i) how interfaces might be designed to inform decisions in qualitative practices; and (ii) perceptions of individual and aggregated visualisations using paradata. However, as noted above, undertaking a complete qualitative workflow could be impractical due to time constraints or lack of existing partnerships. Instead, a study could be configured that examines the data analysis stage as findings in chapter 7 highlight that it is where most decisions and subsequent paradata would be recorded. Moreover, Gabber could be pre-populated with data and a user study conducted to explore the design of paradata interfaces.

8.6.2. Designing With and For Academics

This research sought to make qualitative research practices more inclusive for all stakeholders involved through long-term partnerships with a range of practitioners. As noted above, the AR methodology undertaken in this thesis afforded exploration of qualitative practices through such partnerships. However, AR may be impractical when examining individual workflow stages as stakeholders may desire to engage in the complete workflow rather than individual stages. In contrast, working with academic practitioners could provide convenient sampling whereby specific research stages could be examined in-depth that could inform the design of digital tools that benefit other practitioners. As such, there is opportunity to explore how the proposed workflow is adopted by and for academics, which is in contrast to supporting participatory workflows of academics as undertaken in this thesis and through Gabber adoption by other academics, i.e., [24, 268]. The advantage of designing with and for academics is the convenient sample to more rapidly explore designs that may be impeded by long-term collaborations often associated with the qualitative practices of other practitioners. Design learning from academics could inform prototypes to be used and evaluated in participatory partnerships as in chapter 4.

8.6.3. Automation in Qualitative Research Workflows

Digital tools for qualitative research primarily exist to support qualitative data analysis, e.g., [51, 71, 77], as the coding of data is a time-consuming and repetitive process, particular for larger datasets [172, 209]. Across the case studies presented in this thesis, the time required to meaningfully participate in the data analysis stage was reported as time consuming, mirroring prior research on academic practitioners [176, 194]. In chapter 6, the decision-makers (IFRC) produced a written report to showcase insights across the engagements that they led including from TalkFutures, while participants from chapter 7 desired ways to share quotes from the audio in textual form to raise awareness to their community through email and other forms of communication. Written documents are the primary medium for civil society organisations to report insights to funders [145]. However, as noted in the design of Gabber (chapter 3), written reports can limit who participates in the curation and reuse stages. While Gabber designed interactions around the reuse of audio to create inclusive modes of participation, there is opportunity to augment and enhance workflow stages to utilise audio transcripts, such as to

include the experiences of participants in reports. This is at a time when there has been rapid development in natural language processing (NLP) research in both the automated transcription of audio and the automated coding of transcripts using a range of techniques. Exploratory HCI research highlights that academics desire automation of their qualitative practices, but only after an initial codebook is developed and applied to a subset of data by academics, and that emerging NLP techniques can automate coding practices with comparable coding results to academics [176]. More recent work highlights how such NLP techniques can provide code suggestions that are incrementally improved as the corpus is coded [232–234]. As such, a principal recommendation for extending the work in this thesis is exploring how automated transcription and NLP techniques for automated coding of transcripts could enhance the *data analysis* and *reuse* workflow stages while persisting provenance to the original audio. In this way, the rich nuance audio affords is pertained while working within existing decision-makers practices where textual output would be most useful to create impact.

Appendix A. Case Study 2: Reflective Feedback in a Sensitive Context

The following participant information and consent sheets are representative of those used across case studies where the content of each varied depending on the collaborators and study purpose.

A.1. Participant Information Sheet

Participation Information Sheet

Designing interactive technologies to support the collection and interpretation of semi-structured speech data by communities

Your invitation to be part of this research project

The researcher invites you to be part of an on-going research project between Open Lab, Newcastle University and **OrganisationName (anonymous for thesis)**, which aims to understand how audio can be collaboratively interpreted through annotations, and how this process can be used within an organisation to improve their service. It is important for you to understand why this research is being carried out, why you have been asked to be involved, and how your involvement (and the data that is produced) will be processed and used by the researcher and **OrganisationName**. Please take your time to read the following information carefully, and when you are happy to be involved sign and return the provided consent form.

What is the purpose of this research?

This research is being conducted to understand how technologies can be designed to support the collection (via audio interviews around topics that you have experience with) and interpretation of audio data by yourself and service staff of services that you use. To explore this, we have developed a mobile application for structuring and recording interviews, and a web application for listening to and collaboratively discussing the content of these audios. We are collaborating with OrganisationName to examine how this audio data can be used to understand your needs to improve their service.

What is involved in taking part of this research?

The researcher would like to observe yourself and a service staff member using the mobile application to understand how using the system affects the conversation, and how it helps structure the conversation. These interviews will be shared with the service staff member that is part of the interview for them to respond to through comments and annotations. When you next meet the service worker who interviewed you, or if you have access to the Internet (where you can view the website and interviews you are part of), then you can view and reply to these responses.

You are also invited to be involved in other aspects of this research as it evolves, including several interviews (with and without the service worker) to discuss your experiences using these technologies, and the conversations that they created. The researcher will also bring together all participants of this study (yourself and service staff) for a final open-discussion and reflection of your experiences with the systems in the form of a workshop. During this, short excerpts from the audios you created may be used (if you agree to this in the consent form) to guide discussions at the initial stage of this workshop. Closer to the date of these activities, the researcher will contact you through your service worker (from OrganisationName) to check your availability and to confirm that you wish to continue to be involved in these activities.

Do I have to take part?

It is up to you to decide whether or not to take part. If you do decide to take part, you will be given this information sheet to keep, and be asked to sign a consent form to confirm that you have agreed to take part. You are free to withdraw at any time and without giving a reason.

What happens to the audio interviews that are created?

The mobile application used to record your interview conversation sends these audios securely across the Internet to our webserver where these can be accessed by service staff who conducted the interview through the website, and is only accessible through a unique email and password by registered service staff. When you request for this audio to be shared with other service staff, they will be sent a unique, time sensitive hyperlink that expires after clicked. This ensures they have the opportunity to listen to the audio and provide a response while minimising the chance of this link being accessed by other people. These audio interviews or sections of these may be used in a workshop towards the end of the study, where yourself, service staff and other users of this system can come together to discuss your experiences as part of this research. We understand that there is potential for sensitive information to be divulged using this system, and if there is any reason you want your data to be removed from the research then contact the collaborators listed below.

Will my taking part in this study be kept confidential?

All information that is collected during the course of this research will be kept strictly confidential, and will be stored in accordance with the Data Protection Act 1998, secured against unauthorised access.

What will happen to the results of the research study?

The results of this research will be used as part of a research thesis, which will be written-up and made available online for anyone to download. If you would like a copy of the results, this can be sent to you when the research is complete. You will not be identified in any way through research publication, as all names will be anonymised for publication. The data collected as part of this research will be retained for **10 years**, in line with current university funding policies. If you are happy to take part in this research, please sign and date a consent form to confirm.

Contact for further information

If you have any questions about this research, please contact the following collaborators:

Jay Rainey
Open Lab,
Newcastle University
j.rainey2@ncl.ac.uk

Ray Anonymous
Organisation Role,
OrganisationName
Ray.anon@organisation.org

Thank you for taking your time to read this information sheet!
Please keep a form for your records.

A.2. Informed Consent Form

Participation Consent Form

Designing interactive technologies to support the collection and interpretation of semi-structured speech data by communities

Open Lab
School of Computing Science, Newcastle University
Newcastle upon Tyne, NE8 8HW

I confirm that *(please mark each box as appropriate):*

1) I have read and understood the **Participant Information Sheet** provided. ☐

2) I have been given the opportunity to ask questions about the research and my involvement in it, including what will be done with data collected. ☐

3) I understand that these interviews will be audio recorded and used **by researchers from OpenLab and by staff from OrganisationName** for training purposes to help staff develop skills and appreciate the needs and circumstances of their clients. ☐

4) I understand that these recordings may be transcribed and any personal or identifiable details will be anonymized when this research is published. ☐

5) I understand that I can leave the study at any time without giving reasons. ☐

6) The use of data collected has been explained and I understand the implications of its use. I understand how data will be retained and that it will be processed securely. ☐

7) **Optional:** I provide consent for my audio interviews to be made publically available (where anyone can listen to these on the Internet, e.g. YouTube). ☐

8) **Optional:** I request that this audio interview be shared with the following service-staff:

1. ……
2. ……
3. ……

Participant signature:	……..	**Collaborator signature:**	……
Printed name:	……..	**Printed name:**	……
Date:	……..	**Date:**	……

If you have any questions about this research, please contact one of the the following:

Jay Rainey
Open Lab,
Newcastle University
j.rainey2@ncl.ac.uk

Ray Anonymous
Organisation Role,
OrganisationName
Ray.anon@organisation.org

Appendix B. Case Study 4: TalkFutures

B.1. Iteration of Gabber Project and Topics

The following content represents the iteration of the Gabber project through discussion with the head of innovation. Notably, the inclusion of instructions within the description and refocus of topics from national society (hyper-local) to reflection on global issues.

(Initial) Project Title

> THE FUTURE OF THE RED CROSS RED CRESCENT

Project Description

> Strategy 2030 (https://future-rcrc.com) is a vision for how the Red Cross Red Crescent should change over the next 10 years in response to global challenges or opportunities (technology advances, climate change, etc.). To inform this process, we are using TalkFutures to capture the ideas of the future from people like you and we will transform these discussions into podcasts to share with the world.

Project Topics

Structured as follows: context, problem, future ideas (actions):

1. What do you love most about your national society?
2. What would you change about your national society?
3. What external factors are creating change that are affecting your national society?
4. What factors in the future will impact your national society?
5. How do you see your national society in 10 years?

(Final) Project Title

> THE FUTURE RED CROSS RED CRESCENT

Project Description

Strategy 2030 (https://ifrc.org/s2030) revolves around understanding how the Red Cross and Red Crescent should adapt to global challenges and seize emerging opportunities over the next 10 years.

The Innovation Correspondent will interview leaders, staff, volunteers and/or external experts to capture their visions on how the organization can be ready for future challenges. Your interviews will be transformed into podcasts and other communications and research products.

All it takes is 3 steps: (1) add your participant(s); (2) provide consent; (3) choose a topic to start interviewing.

Project Topics

1. What trends in your country will most affect people in the next 10 years?
2. How will these trends impact the Red Cross and Red Crescent?
3. What practical steps should your national society take in response to these trends?
4. Given these changes, what would be your vision of the Red Cross Red Crescent in 2030?
5. Ask your own question

B.2. Certificate of Participation

Figure B.1 Certificate of Participation provided upon completion of the innovation correspondent role.

B.3. Interview Protocol

Motivation & Purpose

Thanks for taking part in the interview today. I'm Jay Rainey, researcher from Open Lab, Newcastle University, and working with the IFRC Innovation and Futures team on Strategy 2030. I'm interested in evaluating the TalkFutures process and learning about the main challenges and opportunities for improving it, so that future global engagements like it can be engaging for a broad audience.

Today we will cover four areas in our conversation: (1) why you took part in TalkFutures campaign, (2) the value you got from contributing, (3) how you want the IFRC to use these contributions impact, and (4) how this process could be improved.

During this, we will use snippets from interviews you captured, comments or the thought piece you created to reflect on your experiences creating these.

Interview

Ease into Conversation

1. Tell me a bit about yourself?
2. How are you involved with the Red Cross?
3. Have you been part of other global initiatives with the network?

Motivations for Engaging with TalkFutures

1. How did you hear/learn about TalkFutures?
2. What motivated you to participate?
3. What did you hope to learn from participating?
    - What role did you pursue? [IC, RA]
    - What appealed to you about that specific role

Value from Interviewing and Using TalkFutures

Note: must be tailored for each participant before the interview

1. Was this your first-time interviewing?
2. What was the biggest challenge with being an interviewer?
3. Talk me through your process for preparing and recording an interview.
4. What did you learn from this interviewing process?

5. What were the main challenges with this interviewing process?
6. What would you change about this interview process?

About the TalkFutures Mobile Application

1. What was the main challenge/advantage when using the TalkFutures app?
2. What did you think of the consent process in the TalkFutures app?
3. How would you change the topics that you used to structure the conversation?
4. When you recorded your interviews, did you listen to any others on the website? Tell me about your process of listening.

Commenting on audio IF they pursued RA role

Note: must be tailored and prepared for each participant before the interview.

Now would be a good time to chat a bit about the specifics of the comments you created and your thought piece.

1. What was your process for undertaking this role?
2. What made you choose to create a comment at this point?
3. What were you thinking about when you created this comment?
4. How did your comments help you create your thought pieces?
5. Talk me through your research process when selecting content for your thought piece?

Purpose and value of their contributions

Note: must be tailored and prepared for each participant before the interview.

1. How do you feel that your contributions (interviews, comments, or thought piece) will shape Strategy2030?
2. Are there any different ways that you would like to have contributed differently during the TalkFutures campaign?
3. If you were the designer of the campaign what would you have done differently?

Debriefing

Thanks for taking part, your conversation will both help our research and the design of future processes like TalkFutures for engaging our global network. **Do you have any questions for me?**

Appendix C. Case Study 5: Making Links

C.1. Configuration of Gabber Projects

Six Gabber projects were created and configured for the Making Links project. The title, description, and topics used in each are listed below:

Project Title

THINKING ABOUT BECOMING A PERSONAL ASSISTANT

Project Description

This project explores views of people thinking about becoming a personal assistant – why they have considered this role and what they would like to know.

Project Topics

1. Why are you thinking about becoming a Personal Assistant?
2. What aspects of the PA role appeal to you?
3. Are there things you would like to know about self-directed support?
4. What information would help you take this interest further?

Project Title

EXPERIENCES OF SELF DIRECTED SUPPORT HELPERS & SUPPORTERS

Project Description

This project explores views and experiences of people who help and support the SDS process informally or professionally.

Project Topics

1. What is your role in helping or facilitating the SDS process?
2. What do you think are the strengths of SDS?
3. How do you think SDS experiences can be shared and how can you help people connect?
4. From your perspective, what 3 themes best sum up the SDS experience?
5. What would you add to a list of questions exploring experiences of SDS?

Project Title

VIEWS AND EXPERIENCES OF SELF-DIRECTING SUPPORT

Project Description

This project explores views and experiences of self-directed support from different perspectives

Project Topics

1. What made you or your family consider self-directed support - SDS?
2. What is the personal budget for?
3. What is the best thing about having a personal budget?
4. What 3 tips would you share with someone who is thinking about SDS for the first time?
5. What do you know about the SDS process that you wish you had known at the beginning?

Project Title

VIEWS OF FAMILY OR CARERS EMPLOYING A PERSONAL ASSISTANT

Project Description

This project explores the experiences of family or carers who use a personal budget to employ a personal assistant.

Project Topics

1. What is important to think about when creating a profile to recruit a personal assistant?
2. How do you help introduce a personal assistant to your home or family space?
3. How do you encourage respect and openness in the relationship between employer and personal assistant?
4. When recruiting a personal assistant how do you help plan for a good match of interests?
5. What motivated you to consider employing a personal assistant?

Project Title

VIEWS OF SELF DIRECTED SUPPORT EMPLOYER

Project Description

This project is to provide a starting point of things to consider when using a personal budget to employ a personal assistant

Project Topics

1. What do you think is important to include in the job description for a personal assistant
2. What should be included in the advert for a personal assistant
3. How to structure a formal interview
4. How to structure an informal interview
5. Thinking about questions you can ask to get to know one another
6. Why are supervision meetings important for employers

Project Title

VIEWS OF PERSONAL ASSISTANTS

Project Description

This project is to provide an introduction to the role of personal assistant in the context of self-directed support

Project Topics

1. The best thing about being a Personal Assistant
2. The hardest thing about being a Personal Assistant
3. What you feel you need to be a Personal Assistant
4. Interviewing to be a Personal Assistant
5. Why supervision meetings are important for Personal Assistants

---

C.2. Interview Protocol

- Tell me a bit about yourself?
- Why you got involved in this project?
- Can you walk me through the stages you contributed to?
- Tell me a bit about your process?

Representation, Trust and Transparency

Scenario: how can others learn from and engage in a similar digital co-research process?

Sami, CEO of **DisabilityCardiff**, has come across a playlist created through this co-research project. Sam has loved listening to the experiences shared and the innovative way technology has been used. Sami wants to lead his own co-research project and would love to learn about what happened behind the scenes so he can replicate the process: *not just what data went in (the interviews) and what came out (a playlist), but why you made the choices you did*. Sami's got three questions that he thinks would help him get started.

1. *How can we trust that a playlist represents a community's experiences?*

Keep in mind, the data we could capture about the steps you took when you contributed, for example, how many times a conversation was listened to, who listened to it, or which members voices are not included in the final report.

1. *Sami is concerned that it could be possible to misrepresent members experiences, for example, by taking a quote out of context or only included the voice of certain people.*

From your experience, what could we do to prevent this? How can data from each stage help show that you did not misrepresent experiences?

1. *Finally, Sami thinks that the time and effort that went into each stage of the process is A LOT!*

From your experience, which data could we use to represent the effort from each stage of the co-research project? What about the content that was contributed by each person?

Evaluating Gabber stages (Process Evaluation): <u>What if you could change anything?</u>

- Challenges with using Gabber (depending on their role)
- How this process and tool could be improved? Anything you would change?

References

[1] Abdulgalimov, D., Kirkham, R., Nicholson, J., Vlachokyriakos, V., Briggs, P., and Olivier, P. (2020). Designing for Employee Voice. In *Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems*, CHI '20, pages 1–13, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/3313831.3376284.

[2] Adams, B. and Venkatesh, S. (2005). Situated Event Bootstrapping and Capture Guidance for Automated Home Movie Authoring. In *Proceedings of the 13th Annual ACM International Conference on Multimedia*, MULTIMEDIA '05, pages 754–763, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/1101149.1101312.

[3] Ahn, L. v. (2007). Human Computation. In *Proceedings of the 4th International Conference on Knowledge Capture*, K-CAP '07, pages 5–6, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/1298406.1298408.

[4] Ailamaki, A., Kantere, V., and Dash, D. (2010). Managing Scientific Data. *Commun. ACM*, 53(6):68–78. DOI: https://doi.org/10.1145/1743546.1743568.

[5] Albert, A. (2019). *Citizen social science: a critical investigation*. PhD thesis, Manchester University.

[6] Albert, A., Balázs, B., Butkevičienė, E., Mayer, K., and Perelló, J. (2021). Citizen Social Science: New and Established Approaches to Participation in Social Research. In *The Science of Citizen Science*, pages 119–138. Springer International Publishing, Cham. DOI: https://doi.org/10.1007/978-3-030-58278-4_7.

[7] Alper, P., Goble, C. A., and Belhajjame, K. (2013). On Assisting Scientific Data Curation in Collection-Based Dataflows Using Labels. In *Proceedings of the 8th Workshop on Workflows in Support of Large-Scale Science*, WORKS '13, pages 7–16, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/2534248.2534249.

[8] Amazon Web Services (2020a). AWS | Amazon Elastic Transcoder – Media & Video Transcoding in the Cloud. Accessed 22 Jan 2021 from: https://aws.amazon.com/elastictranscoder/.

[9] Amazon Web Services (2020b). Cloud Object Storage | Store & Retrieve Data Anywhere | Amazon Simple Storage Service (S3). Accessed 22 Jan 2021 from: https://aws.amazon.com/s3/.

[10] Asad, M. and Le Dantec, C. A. (2015). Illegitimate Civic Participation: Supporting Community Activists on the Ground. In *Proceedings of the 18th ACM Conference on Computer Supported Cooperative Work & Social Computing*, CSCW '15, pages 1694–1703, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/2675133.2675156.

[11] Asad, M., Le Dantec, C. A., Nielsen, B., and Diedrick, K. (2017). Creating a Sociotechnical API: Designing City-Scale Community Engagement. In *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems*, CHI '17, pages 2295–2306, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/3025453.3025963.

[12] Asad, M. and Schoemann, S. (2015). Designing for Civic Events. *Interactions*, 22(6):58–61. DOI: https://doi.org/10.1145/2829859.

[13] Ashby, C. (2011). Whose "Voice" is it Anyway?: Giving Voice and Qualitative Research Involving Individuals that Type to Communicate. *Disability Studies Quarterly*, 31:55–66. DOI: http://doi.org/10.18061/dsq.v31i4.1723.

[14] ATLAS.ti (2020). ATLAS.ti: The Qualitative Data Analysis & Research Software. Accessed 22 Jan 2021 from: https://atlasti.com/.

[15] Bachour, K., Wetzel, R., Flintham, M., Huynh, T. D., Rodden, T., and Moreau, L. (2015). Provenance for the People: An HCI Perspective on the W3C PROV Standard through an Online Game. In *Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems*, CHI '15, pages 2437–2446, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/2702123.2702455.

[16] Bailey, J. (2008). First steps in qualitative data analysis: transcribing. *Family Practice*, 25(2):127–131. DOI: https://doi.org/10.1093/fampra/cmn003.

[17] Balaam, M., Comber, R., Jenkins, E., Sutton, S., and Garbett, A. (2015). FeedFinder: A Location-Mapping Mobile Application for Breastfeeding Women. In *Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems*, CHI '15, pages 1709–1718, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/2702123.2702328.

[18] Balestrini, M., Rogers, Y., Hassan, C., Creus, J., King, M., and Marshall, P. (2017). A City in Common: A Framework to Orchestrate Large-Scale Citizen Engagement around Urban Issues. In *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems*, CHI '17, pages 2282–2294, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/3025453.3025915.

[19] Barkhuus, L. and Brown, B. (2011). TagPad for iPad – Designing a Support Tool for Interview Studies. In *The Eleventh Danish Human Computer Interaction Research Symposium*, page 35, Copenhagen, Denmark. Copenhagen Business School.

[20] Barkhuus, L. and Brown, B. (2012). The Sociality of Fieldwork: Designing for Social Science Research Practice and Collaboration. In *Proceedings of the 17th ACM International Conference on Supporting Group Work*, GROUP '12, pages 35–44, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/2389176.2389183.

[21] Bartindale, T., Varghese, D., Schofield, G., and Tsukamoto, M. (2019). Our Story: Addressing Challenges in Development Contexts for Sustainable Participatory Video. In *Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems*, CHI '19, pages 1–12, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/3290605.3300667.

[22] Bauer, A. and Popović, Z. (2017). Collaborative Problem Solving in an Open-Ended Scientific Discovery Game. *Proc. ACM Hum.-Comput. Interact.*, 1(CSCW). DOI: https://doi.org/10.1145/3134657.

[23] Baum, F., MacDougall, C., and Smith, D. (2006). Participatory action research. *Journal of Epidemiology & Community Health*, 60(10):854–857. DOI: https://doi.org/10.1136/jech.2004.028662.

[24] Bellini, R., Rainey, J., Garbett, A., and Briggs, P. (2019a). Vocalising Violence: Using Violent Mens' Voices for Service Delivery and Feedback. In *Proceedings of the 9th International Conference on Communities & Technologies - Transforming Communities*, C&T '19, pages 210–217, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/3328320.3328405.

[25] Bellini, R., Strohmayer, A., Olivier, P., and Crivellaro, C. (2019b). Mapping the Margins: Navigating the Ecologies of Domestic Violence Service Provision. In *Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems*, CHI '19, pages 1–13, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/3290605.3300352.

[26] Bergold, J. and Thomas, S. (2012). Participatory Research Methods: A Methodological Approach in Motion. *Historical Social Research / Historische Sozialforschung*, 37(4 (142)):191–222. DOI: https://doi.org/10.17169/fqs-13.1.1801.

[27] Boehner, K. and DiSalvo, C. (2016). Data, Design and Civics: An Exploratory Study of Civic Tech. In *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems*, CHI '16, pages 2970–2981, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/2858036.2858326.

[28] Boezeman, D., Vink, M., Leroy, P., and Halffman, W. (2014). Participation under a spell of instrumentalization? Reflections on action research in an entrenched climate adaptation policy process. *Critical Policy Studies*, 8(4):407–426. DOI: https://doi.org/10.1080/19460171.2014.950304.

[29] Bonney, R., Ballard, H., Jordan, R., McCallie, E., Phillips, T., Shirk, J., and Wilderman, C. (2009). Public Participation in Scientific Research: Defining the Field and Assessing Its Potential for Informal Science Education. Technical report, Center for Advancement of Informal Science Education, Washington, DC. Accessed 22 Jan 2021 from: https://eric.ed.gov/?id=ED519688.

[30] Bonney, R., Shirk, J. L., Phillips, T. B., Wiggins, A., Ballard, H. L., Miller-Rushing, A. J., and Parrish, J. K. (2014). Next Steps for Citizen Science. *Science*, 343(6178):1436–1437. DOI: https://doi.org/10.1126/science.1251554.

[31] Bowen, S., Wright, P., Wilson, A., Dow, A., Bartindale, T., and Anderson, R. (2020). Metro Futures: Experience-Centred Co-Design at Scale. In *Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems*, CHI '20, page 1–13, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/3313831.3376885.

[32] Bradbury, H. (2015). *The SAGE Handbook of Action Research*. SAGE Publications Ltd. DOI: https://doi.org/10.4135/9781473921290.

[33] Braun, V. and Clarke, V. (2006). Using Thematic Analysis in Psychology. *Qualitative Research in Psychology*, 3(May 2015):77–101. DOI: https://doi.org/10.1191/1478088706qp063oa.

[34] Braun, V. and Clarke, V. (2013). *Successful Qualitative Research: A Practical Guide for Beginners*. SAGE Publications Ltd.

[35] Bringer, J. D., Johnston, L. H., and Brackenridge, C. H. (2004). Maximizing Transparency in a Doctoral Thesis: The Complexities of Writing About the Use of QSR*NVIVO Within a Grounded Theory Study. *Qualitative Research*, 4(2):247–265. DOI: https://doi.org/10.1177/1468794104044434.

[36] Brown, B., Weilenmann, A., McMillan, D., and Lampinen, A. (2016). Five Provocations for Ethical HCI Research. In *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems*, CHI '16, pages 852–863, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/2858036.2858313.

[37] Bruckman, A. S., Fiesler, C., Hancock, J., and Munteanu, C. (2017). CSCW Research Ethics Town Hall: Working Towards Community Norms. In *Companion of the 2017 ACM Conference on Computer Supported Cooperative Work and Social Computing*, CSCW '17 Companion, pages 113–115, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/3022198.3022199.

[38] Burrows, R. and Savage, M. (2014). After the crisis? big data and the methodological challenges of empirical sociology. *Big Data & Society*, 1(1). DOI: https://doi.org/10.1177/2053951714540280.

[39] Burton, J., Johnson, K., and Nah, S. (2014). Patch.com: The challenge of connective community journalism in the digital sphere. *Journalism Practice*, 8(2):197–212. DOI: https://doi.org/10.1080/17512786.2013.859835.

[40] California Department of Justice (2018). California Consumer Privacy Act of 2018. Accessed 22 Jan 2021 from: http://leginfo.legislature.ca.gov/faces/codes_displayText.xhtml?lawCode=CIV&division=3.&title=1.81.5.&part=4.&chapter=&article=.

[41] Callegaro, M. (2013). Paradata in Web Surveys. In *Improving Surveys with Paradata: Analytic Uses of Process Information*, pages 259–279. John Wiley & Sons, Inc., Hoboken, New Jersey.

[42] Carter, S., Adcock, J., Doherty, J., and Branham, S. (2010). NudgeCam: Toward Targeted, Higher Quality Media Capture. In *Proceedings of the 18th ACM International Conference on Multimedia*, MM '10, pages 615–618, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/1873951.1874034.

[43] Center for Media literacy (2020). Media Literacy: A Definition and More. Accessed 22 Jan 2021 from: https://www.medialit.org/media-literacy-definition-and-more.

[44] Chauvette, A., Schick-Makaroff, K., and Molzahn, A. E. (2019). Open Data in Qualitative Research. *International Journal of Qualitative Methods*, 18:1–6. DOI: https://doi.org/10.1177/1609406918823863.

[45] Chess, C. and Purcell, K. (1999). Public Participation and the Environment: Do We Know What Works? *Environmental Science & Technology*, 33(16):2685–2692. DOI: https://doi.org/10.1021/es980500g.

[46] Chuang, L. L. and Pfeil, U. (2018). Transparency and Openness Promotion Guidelines for HCI. In *Extended Abstracts of the 2018 CHI Conference on Human Factors in Computing Systems*, CHI EA '18, pages 1–4, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/3170427.3185377.

[47] Cibin, R., Teli, M., and Robinson, S. (2019). Institutioning and Community Radio. A Comparative Perspective. In *Proceedings of the 9th International Conference on Communities & Technologies - Transforming Communities*, C&T '19, pages 143–154, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/3328320.3328392.

[48] Clery, D. (2011). Galaxy Zoo Volunteers Share Pain and Glory of Research. *Science*, 333(6039):173–175. DOI: https://doi.org/10.1126/science.333.6039.173.

[49] Cockburn, A., Gutwin, C., and Dix, A. (2018). HARK No More: On the Preregistration of CHI Experiments. In *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems*, CHI '18, pages 1–12, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/3173574.3173715.

[50] Cohen, C. J., Kahne, J., Bowyer, B., Middaugh, E., and Rogowski, J. (2012). Participatory Politics: New Media and Youth Political Action. Accessed 22 Jan 2021 from: https://ypp.dmlcentral.net/publications/107.html.

[51] Condens (2020). Supercharge Your UX Research Analysis. Accessed 22 Jan 2021 from: https://condens.io/.

[52] Corbett, E. and Le Dantec, C. A. (2018a). Exploring Trust in Digital Civics. In *Proceedings of the 2018 Designing Interactive Systems Conference*, DIS '18, pages 9–20, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/110.1145/3196709.3196715.

[53] Corbett, E. and Le Dantec, C. A. (2018b). Going the Distance: *Trust Work* for Citizen Participation. In *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems*, CHI '18, pages 1–13, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/3173574.3173886.

[54] Corbett, E. and Le Dantec, C. A. (2018c). The Problem of Community Engagement: Disentangling the Practices of Municipal Government. In *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems*, CHI '18, pages 1–13, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/3173574.3174148.

[55] Cornwall, A. and Jewkes, R. (1995). What is participatory research? *Social Science & Medicine*, 41(12):1667 – 1676. DOI: https://doi.org/10.1016/0277-9536(95)00127-S.

[56] Corti, L. and Fielding, N. (2016). Opportunities From the Digital Revolution: Implications for Researching, Publishing, and Consuming Qualitative Research. *SAGE Open*, 6(4):2158244016678912. DOI: https://doi.org/10.1177/2158244016678912.

[57] Couldry, N. (2010). *Why Voice Matters: Culture And Politics After Neoliberalism*. SAGE Publications. DOI: http://doi.org/10.4135/9781446269114.

[58] Couper, M. P. (2017). New Developments in Survey Data Collection. *Annual Review of Sociology*, 43(1):121–145. DOI: https://doi.org/10.1146/annurev-soc-060116-053613.

[59] Couper, M. P. and Singer, E. (2013). Informed Consent for Web Paradata Use. *Survey research methods*, 7(1):57–67. DOI: https://pubmed.ncbi.nlm.nih.gov/24098312/.

[60] Crivellaro, C., Anderson, R., Lambton-Howard, D., Nappey, T., Olivier, P., Vlachokyriakos, V., Wilson, A., and Wright, P. (2019). Infrastructuring public service transformation: Creating collaborative spaces between communities and institutions through hci research. *ACM Trans. Comput.-Hum. Interact.*, 26(3). DOI: https://doi.org/10.1145/3310284.

[61] Crivellaro, C., Comber, R., Bowers, J., Wright, P. C., and Olivier, P. (2014). A Pool of Dreams: Facebook, Politics and the Emergence of a Social Movement. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, CHI '14, pages 3573–3582, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/2556288.2557100.

[62] Crivellaro, C., Comber, R., Dade-Robertson, M., Bowen, S. J., Wright, P. C., and Olivier, P. (2015). Contesting the City: Enacting the Political Through Digitally Supported Urban Walks. In *Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems*, CHI '15, pages 2853–2862, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/2702123.2702176.

[63] Crivellaro, C., Taylor, A., Vlachokyriakos, V., Comber, R., Nissen, B., and Wright, P. (2016). Re-Making Places: HCI, 'Community Building' and Change. In *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems*, CHI '16, pages 2958–2969, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/2858036.2858332.

[64] Crowe, S., Cresswell, K., Robertson, A., Huby, G., Avery, A., and Sheikh, A. (2011). The case study approach. *BMC Medical Research Methodology*, 11(1):100. DOI: https://doi.org/10.1186/1471-2288-11-100.

[65] Csíkszentmihályi, C. and Mukundane, J. (2015). RootIO – Platform Design for Civic Media. In *Proceedings of the 2nd Biennial Research Through Design Conference*, Cambridge, UK. DOI: https://doi.org/10.6084/m9.figshare.1328001.

[66] Currier, S., Barton, J., O'Beirne, R., and Ryan, B. (2004). Quality assurance for digital learning object repositories: issues for the metadata creation process. *Research in Learning Technology*, 12(1):5–20. DOI: https://doi.org/10.3402/rlt.v12i1.11223.

[67] Davidson, J. and di Gregorio, S. (2011). Qualitative research and technology: In the midst of a revolution. In *Handbook of Qualitative Research*, chapter 38, pages 627–643. SAGE Publications, Inc, 4 edition.

[68] Davidson, J., Paulus, T., and Jackson, K. (2016). Speculating on the Future of Digital Tools for Qualitative Research. *Qualitative Inquiry*, 22(7):606–610. DOI: https://doi.org/10.1177/1077800415622505.

[69] Davis, M., Heer, J., and Ramirez, A. (2003). Active Capture: Automatic Direction for Automatic Movies. In *Proceedings of the Eleventh ACM International Conference on Multimedia*, MULTIMEDIA '03, pages 88–89, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/957013.957028.

[70] Davis, S. (2016). Case Study: MídiaNINJA and the Rise of Citizen Journalism in Brazil. In *Civic Media: Technology, Design, Practice*, chapter 35, pages 527–533. The MIT Press, 1 edition.

[71] Dedoose (2020). Home | Dedoose. Accessed 22 Jan 2021 from: https://www.dedoose.com/home/features.

[72] Deelman, E. and Chervenak, A. (2008). Data Management Challenges of Data-Intensive Scientific Workflows. In *Proceedings of the 2008 Eighth IEEE International Symposium on Cluster Computing and the Grid*, CCGRID '08, pages 687–692, USA. IEEE Computer Society. DOI: https://doi.org/10.1109/CCGRID.2008.24.

[73] Department of Health and Social Care and NHS England (2018). Extending legal rights to personal health budgets and integrated personal budgets: consultation response. Accessed 22 Jan 2021 from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/780330/Extending_legal_rights_to_health_budgets_consultation_response.pdf.

[74] Dewey, J. (2012). *The Public and Its Problems: An Essay in Political Inquiry*. Penn State University Press, Henry Holt and Company.

[75] Do, J. and Yamagata-Lynch, L. C. (2017). Designing and Developing Cell Phone Applications for Qualitative Research. *Qualitative Inquiry*, 23(10):757–767. DOI: https://doi.org/10.1177/1077800417731085.

[76] Docker (2020). Empowering App Development for Developers | Docker. Accessed 22 Jan 2021 from: https://docker.com.

[77] Dovetail (2020). The User Experience Platform for Teams – DoveTailApp. Accessed 22 Jan 2021 from: https://dovetailapp.com/.

[78] Dow, A., Comber, R., and Vines, J. (2018). Between Grassroots and the Hierarchy: Lessons Learned from the Design of a Public Services Directory. In *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems*, CHI '18, pages 1–13, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/3173574.3174016.

[79] Dow, A., Vines, J., Comber, R., and Wilson, R. (2016). ThoughtCloud: Exploring the Role of Feedback Technologies in Care Organisations. In *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems*, CHI '16, pages 3625–3636, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/2858036.2858105.

[80] Dryzek, J. S., Bächtiger, A., Chambers, S., Cohen, J., Druckman, J. N., Felicetti, A., Fishkin, J. S., Farrell, D. M., Fung, A., Gutmann, A., Landemore, H., Mansbridge, J., Marien, S., Neblo, M. A., Niemeyer, S., Setälä, M., Slothuus, R., Suiter, J., Thompson, D., and Warren, M. E. (2019). The crisis of democracy and the science of deliberation. *Science*, 363(6432):1144–1146. DOI: https://doi.org/10.1126/science.aaw2694.

[81] Dublin Core Metadata Initiative (2019). DCMI: Home. Accessed 22 Jan 2021 from: https://www.dublincore.org/.

[82] Echtler, F. and Häußler, M. (2018). Open Source, Open Science, and the Replication Crisis in HCI. In *Extended Abstracts of the 2018 CHI Conference on Human Factors in Computing Systems*, CHI EA '18, pages 1–8, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/3170427.3188395.

[83] ELEN (2020). ELEN description – the language archive. Accessed 22 Jan 2021 from: https://tla.mpi.nl/tools/tla-tools/elan/elan-description/.

[84] Erete, S., Ryou, E., Smith, G., Fassett, K. M., and Duda, S. (2016). Storytelling with Data: Examining the Use of Data by Non-Profit Organizations. In *Proceedings of the 19th ACM Conference on Computer-Supported Cooperative Work & Social Computing*, CSCW '16, pages 1273–1283, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/2818048.2820068.

[85] European Parliament (2016). Regulation 2016/679 of the European Parliament and of the council. *Official Journal of the European Union*, 59(119):149. Accessed 22 Jan 2021 from: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=OJ:L:2016:119:FULL{&}from=EN.

[86] Farnham, S., Keyes, D., Yuki, V., and Tugwell, C. (2012). Puget Sound off: Fostering Youth Civic Engagement through Citizen Journalism. In *Proceedings of the ACM 2012 Conference on Computer Supported Cooperative Work*, CSCW '12, pages 285–294, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/2145204.2145251.

[87] Feger, S. S., Dallmeier-Tiessen, S., Woundefinedniak, P. W., and Schmidt, A. (2019). The Role of HCI in Reproducible Science: Understanding, Supporting and Motivating Core Practices. In *Extended Abstracts of the 2019 CHI Conference on Human Factors in Computing Systems*, CHI EA '19, pages 1–6, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/3290607.3312905.

[88] Fielding, N. (2008). The Role of Computer-Assisted Qualitative Data Analysis: Impact on Emergent Methods in Qualitative Research. In *Handbook of Emergent Methods*, pages 221–236. Guilford Press, Guilford MA, USA.

[89] Fiesler, C., Brubaker, J. R., Forte, A., Guha, S., McDonald, N., and Muller, M. (2019). Qualitative Methods for CSCW: Challenges and Opportunities. In *Conference Companion Publication of the 2019 on Computer Supported Cooperative Work and Social Computing*, CSCW '19, pages 455–460, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/3311957.3359428.

[90] Figueiredo, M. A., Prado, P., Câmara, M. A., and Albuquerque, A. M. (2009). Empowering Rural Citizen Journalism via Web 2.0 Technologies. In *Proceedings of the Fourth International Conference on Communities and Technologies*, C&T '09, pages 77–84, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/1556460.1556473.

[91] Fink, A. S. (2000). The Role of the Researcher in the Qualitative Research Process. A Potential Barrier to Archiving Qualitative Data. *Forum: Qualitative Social Research*, 1(3):13. DOI: https://doi.org/10.17169/fqs-1.3.1021.

[92] Fischer, F. (1993). Citizen participation and the democratization of policy expertise: From theoretical inquiry to practical cases. *Policy Sciences*, 26(3):165–187. DOI: https://doi.org/10.1007/BF00999715.

[93] Fischer, F. (2000). *Citizens, Experts, and the Environment: The Politics of Local Knowledge*. Duke University Press.

[94] Fischer, F. (2006). Participatory Governance as Deliberative Empowerment: The Cultural Politics of Discursive Space. *The American Review of Public Administration*, 36(1):19–40. DOI: https://doi.org/10.1177/0275074005282582.

[95] Fischer, F. (2008). *Participatory Governance: From Theory To Practice*, pages 457–71. Oxford University Press. DOI: https://doi.org/10.1093/oxfordhb/9780199560530.013.0032.

[96] Fishkin, J. S. (2009). *When the People Speak: Deliberative Democracy and Public Consultation*. Oxford University Press.

[97] Foth, Marcus, B. M. (2016). Participatory Action Research for Civic Engagement. In *Civic Media: Technology, Design, Practice*, chapter 38, pages 539–563. The MIT Press, 1 edition.

[98] Fox, S. and Le Dantec, C. (2014). Community Historians: Scaffolding Community Engagement through Culture and Heritage. In *Proceedings of the 2014 Conference on Designing Interactive Systems*, DIS '14, pages 785–794, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/2598510.2598563.

[99] Friese, S. (2011). *Qualitative Data Analysis with ATLAS.ti*. SAGE Publications Ltd.

[100] Fung, A. (2004). *Empowered Participation: Reinventing Urban Democracy*. Princeton University Press.

[101] Fung, A. and Wright, E. O. (2001). Deepening Democracy: Innovations in Empowered Participatory Governance. *Politics & Society*, 29(1):5–41. DOI: https://doi.org/10.1177/0032329201029001002.

[102] Garbett, A., Comber, R., Jenkins, E., and Olivier, P. (2016). App Movement: A Platform for Community Commissioning of Mobile Applications. In *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems*, CHI '16, pages 26–37, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/2858036.2858094.

[103] Garbett, A. T., Comber, R., Egglestone, P., Glancy, M., and Olivier, P. (2014). Finding "Real People": Trust and Diversity in the Interface between Professional and Citizen Journalists. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, CHI '14, pages 3015–3024, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/2556288.2557114.

[104] García, B., Welford, J., and Smith, B. (2016). Using a smartphone app in qualitative research: the good, the bad and the ugly. *Qualitative Research*, 16(5):508–525. DOI: https://doi.org/10.1177/1468794115593335.

[105] Garg, K., Kim, Y., Gergle, D., and Zhang, H. (2019). 4X: A Hybrid Approach for Scaffolding Data Collection and Interest in Low-Effort Participatory Sensing. *Proc. ACM Hum.-Comput. Interact.*, 3(CSCW). DOI: https://doi.org/10.1145/3359192.

[106] Gastil, J. and Levine, P. (2011). *The Deliberative Democracy Handbook: Strategies for Effective Civic Engagement in the Twenty-First Century*. Jossey-Bass.

[107] Gaventa, J. (2004). Towards participatory governance: assessing the transformative possibilities. In *Participation: From Tyranny to Transformation: Exploring New Approaches to Participation in Development*, pages 25–41. Zed Books.

[108] Genius (2020). Genius Song Lyrics & Knowledge. Accessed 22 Jan 2021 from: https://genius.com.

[109] Gilbert, L. S., Jackson, K., and di Gregorio, S. (2014). Tools for Analyzing Qualitative Data: The History and Relevance of Qualitative Data Analysis Software. In *Handbook of Research on Educational Communications and Technology*, chapter 18, pages 221–236. Springer New York. DOI: https://doi.org/10.1007/978-1-4614-3185-5_18.

[110] Golsteijn, C., Gallacher, S., Koeman, L., Wall, L., Andberg, S., Rogers, Y., and Capra, L. (2015). VoxBox: A Tangible Machine That Gathers Opinions from the Public at Events. In *Proceedings of the Ninth International Conference on Tangible, Embedded, and Embodied Interaction*, TEI '15, pages 201–208, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/2677199.2680588.

[111] Gooch, D., Barker, M., Hudson, L., Kelly, R., Kortuem, G., Linden, J. V. D., Petre, M., Brown, R., Klis-Davies, A., Forbes, H., Mackinnon, J., Macpherson, R., and Walton, C. (2018). Amplifying Quiet Voices: Challenges and Opportunities for Participatory Design at an Urban Scale. *ACM Transactions on Computer-Human Interaction (TOCHI)*, 25(1):2:1–2:34. DOI: https://doi.org/10.1145/3139398.

[112] Google (2020a). Firebase Cloud Messaging. Accessed 22 Jan 2021 from: https://firebase.google.com/docs/cloud-messaging.

[113] Google (2020b). Firebase Crashlytics. Accessed 22 Jan 2021 from: https://firebase.google.com/docs/crashlytics.

[114] Gordon, E., Michelson, B., and Haas, J. (2016). @Stake: A Game to Facilitate the Process of Deliberative Democracy. In *Proceedings of the 19th ACM Conference on Computer Supported Cooperative Work and Social Computing Companion*, CSCW '16 Companion, pages 269–272, New York, NY, USA. Association for Computing Machinery. DOI: 10.1145/2818052.2869125.

[115] Gordon, E. and Mihailidis, P. (2016). *Civic Media: Technology, Design, Practice*. The MIT Press, 1 edition.

[116] Greenwood, D. J. and Levin, M. (2006). *Introduction to Action Research: Social Research for Social Change Paperback*. SAGE Publications Ltd.

[117] Grimes, A., Bednar, M., Bolter, J. D., and Grinter, R. E. (2008). EatWell: Sharing Nutrition-Related Memories in a Low-Income Community. In *Proceedings of the 2008 ACM Conference on Computer Supported Cooperative Work*, CSCW '08, pages 87–96, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/1460563.1460579.

[118] Haj-Bolouri, A., Bernhardsson, L., and Rossi, M. (2016). PADRE: A Method for Participatory Action Design Research. In *Tackling Society's Grand Challenges with Design Science*, Lecture Notes in Computer Science, pages 19–36, Cham. Springer International Publishing. DOI: https://doi.org/10.1007/978-3-319-39294-3_2.

[119] Hand, E. (2010). Volunteer army catches interstellar dust grains. *Nature*, 466(August):685–687. DOI: https://doi.org/10.1038/news.2010.106.

[120] Haraway, D. (1988). Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspective. *Feminist Studies*, 14(3):575–599. DOI: https://doi.org/10.2307/3178066.

[121] Harding, M., Knowles, B., Davies, N., and Rouncefield, M. (2015). HCI, Civic Engagement & Trust. In *Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems*, CHI '15, pages 2833–2842, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/2702123.2702255.

[122] Hayes, G. R. (2011). The Relationship of Action Research to Human-Computer Interaction. *ACM Trans. Comput.-Hum. Interact.*, 18(3). DOI: https://doi.org/10.1145/1993060.1993065.

[123] Hayes, G. R. (2014). Knowing by Doing: Action Research as an Approach to HCI. In Olson, J. S. and Kellogg, W. A., editors, *Ways of Knowing in HCI*, pages 49–68. Springer, New York, NY. DOI: https://doi.org/10.1007/978-1-4939-0378-8_3.

[124] Hayes, G. R. (2020). Inclusive and engaged hci. *Interactions*, 27(2):26–31. DOI: https://doi.org/10.1145/3378561.

[125] Head, B. W. (2007). Community Engagement: Participation on Whose Terms? *Australian Journal of Political Science*, 42(3):441–454. DOI: https://doi.org/10.1080/10361140701513570.

[126] Heiss, R. and Matthes, J. (2017). Citizen Science in the Social Sciences: A Call for More Evidence. *GAIA - Ecological Perspectives for Science and Society*, 26(1):22–26. DOI: https://doi.org/10.14512/gaia.26.1.7.

[127] Hiles, D. and Čermák, I. (2007). Qualitative Research: Transparency and Narrative Oriented Inquiry. *10th European Congress of Psychology, Prague, CZ, July*, 1:3–6.

[128] House of Commons Committee of Public Accounts (2016). Personal budgets in social care. Accessed 22 Jan 2021 from: https://publications.parliament.uk/pa/cm201617/cmselect/cmpubacc/74/74.pdf.

[129] Hsu, Y.-C., Cross, J., Dille, P., Tasota, M., Dias, B., Sargent, R., Huang, T.-H. K., and Nourbakhsh, I. (2020). Smell Pittsburgh: Engaging Community Citizen Science for Air Quality. *ACM Trans. Interact. Intell. Syst.*, 10(4). DOI: https://doi.org/10.1145/3369397.

[130] Hsu, Y.-C. and Nourbakhsh, I. (2020). When Human-Computer Interaction Meets Community Citizen Science. *Commun. ACM*, 63(2):31–34. DOI: https://doi.org/10.1145/3376892.

[131] HyperRESEARCH (2020). Researchware – Qualitative Research Software for the Analysis of Qualitative Data. Accessed 22 Jan 2021 from: http://www.researchware.com/products/hyperresearch.html.

[132] Iacovides, I., Jennett, C., Cornish-Trestrail, C., and Cox, A. L. (2013). Do Games Attract or Sustain Engagement in Citizen Science? A Study of Volunteer Motivations. In *CHI '13 Extended Abstracts on Human Factors in Computing Systems*, CHI EA '13, pages 1101–1106, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/2468356.2468553.

[133] Innes, J. E. and Booher, D. E. (2004). Reframing public participation: strategies for the 21st century. *Planning Theory & Practice*, 5(4):419–436. DOI: https://doi.org/10.1080/1464935042000293170.

[134] International Federation of Red Cross and Red Crescent Societies (IFRC) (2020a). About S2030 | The Future Red Cross and Red Crescent. Accessed 22 Jan 2021 from: https://future-rcrc.com/about-s2030/.

[135] International Federation of Red Cross and Red Crescent Societies (IFRC) (2020b). Strategy 2030. Platform for change. Global reach, local action. Accessed 22 Jan 2021 from: https://future-rcrc.com/wp-content/uploads/2020/01/S2030-EN.pdf.

[136] International Federation of Red Cross and Red Crescent Societies (IFRC) (2020c). Volunteers - International Federation of Red Cross and Red Crescent Societies. Accessed 22 Jan 2021 from: https://media.ifrc.org/ifrc/what-we-do/volunteers/.

[137] International Federation of Red Cross and Red Crescent Societies (IFRC) (2020d). Youth Policy - International Federation of Red Cross and Red Crescent Societies. Accessed 22 Jan 2021 from: https://www.ifrc.org/Global/Governance/Policies/youth-policy-en.pdf.

[138] Irwin, A. (1995). *Citizen Science: A Study of People, Expertise, and Sustainable Development*. Routledge.

[139] Jafarinaimi, N. and Meyers, E. M. (2015). Collective Intelligence or Group Think? Engaging Participation Patterns in World without Oil. In *Proceedings of the 18th ACM Conference on Computer Supported Cooperative Work & Social Computing*, CSCW '15, pages 1872–1881, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/2675133.2675258.

[140] Jafarinaimi, N., Meyers, E. M., and Trumble, A. (2014). Designing Meaningful Participation: Analyzing Contribution Patterns in an Alternate Reality Game. In *Proceedings of the 18th International Conference on Supporting Group Work*, GROUP '14, pages 306–309, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/2660398.2663778.

[141] Jasim, M., Khaloo, P., Wadhwa, S., Zhang, A. X., Sarvghad, A., and Mahyar, N. (2020a). CommunityClick: Towards Improving Inclusivity in Town Halls. In *Conference Companion Publication of the 2020 on Computer Supported Cooperative Work and Social Computing*, CSCW '20 Companion, pages 37–41, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/3406865.3418561.

[142] Jasim, M., Sarvghad, A., Hoque, E., and Mahyar, N. (2020b). Towards Understanding Desiderata for Large-Scale Civic Input Analysis. In *Extended Abstracts of the 2020 CHI Conference on Human Factors in Computing Systems*, CHI EA '20, pages 1–8, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/3334480.3382964.

[143] Jenkins, H., Shresthova, S., Gamber-Thompson, L., Kligler-Vilenchik, N., Zimmerman, A. M., and Soep, E. (2016). *By Any Media Necessary: The New Youth Activism (Connected Youth and Digital Futures)*. NYU Press.

[144] Johnson, D. W. and Johnson, R. T. (1999). Making Cooperative Learning Work. *Theory Into Practice*, 38(2):67–73. DOI: https://doi.org/10.1080/00405849909543834.

[145] Johnson, I. G., Al-Shahrabi, D., and Vines, J. (2020). From Creating Spaces for Civic Discourse to Creating Resources for Action. In *Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems*, CHI '20, pages 1–14, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/3313831.3376464.

[146] Johnson, I. G., MacDonald, A., Briggs, J., Manuel, J., Salt, K., Flynn, E., and Vines, J. (2017). Community Conversational: Supporting and Capturing Deliberative Talk in Local Consultation Processes. In *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems*, CHI '17, pages 2320–2333, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/3025453.3025559.

[147] Jones, J., Merritt, D., and Ackerman, M. S. (2017). KidKeeper: Design for Capturing Audio Mementos of Everyday Life for Parents of Young Children. In *Proceedings of the 2017 ACM Conference on Computer Supported Cooperative Work and Social Computing*, CSCW '17, pages 1864–1875, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/2998181.2998348.

[148] Katz, Y. (2020). JSON:API – A specification for building APIs in JSON. Accessed 22 Jan 2021 from: https://jsonapi.org/.

[149] Kaye, J., Whitley, E. A., Lund, D., Morrison, M., Teare, H., and Melham, K. (2015). Dynamic consent: a patient interface for twenty-first century research networks. *European Journal of Human Genetics*, 23(2):141–146. DOI: https://doi.org/10.1038/ejhg.2014.71.

[150] Kim, J., Ko, E.-Y., Jung, J., Lee, C. W., Kim, N. W., and Kim, J. (2015). Factful: Engaging Taxpayers in the Public Discussion of a Government Budget. In *Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems*, CHI '15, pages 2843–2852, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/2702123.2702352.

[151] Kim, J. S., Greene, M. J., Zlateski, A., Lee, K., Richardson, M., Turaga, S. C., Purcaro, M., Balkam, M., Robinson, A., Behabadi, B. F., Campos, M., Denk, W., Seung, H. S., and the EyeWirers (2014). Space–time wiring specificity supports direction selectivity in the retina. *Nature*, 509(7500):331–336. DOI: https://doi.org/10.1038/nature13240.

[152] Kim, S., Mankoff, J., and Paulos, E. (2013). Sensr: Evaluating a Flexible Framework for Authoring Mobile Data-Collection Tools for Citizen Science. In *Proceedings of the 2013 Conference on Computer Supported Cooperative Work*, CSCW '13, pages 1453–1462, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/2441776.2441940.

[153] Koeman, L., Kalnikaité, V., and Rogers, Y. (2015). "Everyone Is Talking about It!": A Distributed Approach to Urban Voting Technology and Visualisations. In *Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems*, CHI '15, pages 3127–3136, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/2702123.2702263.

[154] Krause, M. and Smeddinck, J. (2011). Human computation games: A survey. In *2011 19th European Signal Processing Conference*, pages 754–758.

[155] Kriplean, T., Morgan, J., Freelon, D., Borning, A., and Bennett, L. (2012). Supporting Reflective Public Thought with Considerit. In *Proceedings of the ACM 2012 Conference on Computer Supported Cooperative Work*, CSCW '12, pages 265–274, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/2145204.2145249.

[156] Kuhn, T. S. (1962). *The structure of scientific revolutions*. Chicago, University of Chicago Press.

[157] Kullenberg, C. and Kasperowski, D. (2016). What Is Citizen Science? – A Scientometric Meta-Analysis. *PLOS ONE*, 11(1):1–16. DOI: https://doi.org/10.1371/journal.pone.0147152.

[158] Kunz, T., Landesvatter, C., and Gummer, T. (2020). Informed consent for paradata use in web surveys. *International Journal of Market Research*, 62(4):396–408. DOI: https://doi.org/10.1177/1470785320931669.

[159] Kythreotis, A. P., Mantyka-Pringle, C., Mercer, T. G., Whitmarsh, L. E., Corner, A., Paavola, J., Chambers, C., Miller, B. A., and Castree, N. (2019). Citizen Social Science for More Integrative and Effective Climate Action: A Science-Policy Perspective. *Frontiers in Environmental Science*, 7:10. DOI: https://doi.org/10.3389/fenvs.2019.00010.

[160] Lambton-Howard, D., Anderson, R., Montague, K., Garbett, A., Hazeldine, S., Alvarez, C., Sweeney, J. A., Olivier, P., and Kharrufa, A. (2019). WhatFutures: Designing Large-Scale Engagements on WhatsApp. In *Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems*, CHI '19, pages 159:1–159:14, New York, NY, USA. ACM. DOI: https://doi.org/10.1145/3290605.3300389.

[161] Le Dantec, C. (2012). Participation and Publics: Supporting Community Engagement. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, CHI '12, pages 1351–1360, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/2207676.2208593.

[162] Le Dantec, C. A., Asad, M., Misra, A., and Watkins, K. E. (2015). Planning with Crowdsourced Data: Rhetoric and Representation in Transportation Planning. In *Proceedings of the 18th ACM Conference on Computer Supported Cooperative Work & Social Computing*, CSCW '15, pages 1717–1727, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/2675133.2675212.

[163] Le Dantec, C. A. and Fox, S. (2015). Strangers at the Gate: Gaining Access, Building Rapport, and Co-Constructing Community-Based Research. In *Proceedings of the 18th ACM Conference on Computer Supported Cooperative Work & Social Computing*, CSCW '15, pages 1348–1358, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/2675133.2675147.

[164] Lee, R. M. (2004). Recording Technologies and the Interview in Sociology, 1920–2000. *Sociology*, 38(5):869–889. DOI: https://doi.org/10.1177/0038038504047177.

[165] Li, I., Dey, A., and Forlizzi, J. (2010). A Stage-Based Model of Personal Informatics Systems. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, CHI '10, pages 557–566, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/1753326.1753409.

[166] Lindley, S. E., Thieme, A., Taylor, A. S., Vlachokyriakos, V., Regan, T., and Sweeney, D. (2017). Surfacing Small Worlds through Data-In-Place. *Computer Supported Cooperative Work (CSCW)*, 26(1):135–163. DOI: https://doi.org/10.1007/s10606-017-9263-3.

[167] Lovejoy, K. and Saxton, G. D. (2012). Information, Community, and Action: How Nonprofit Organizations Use Social Media. *Journal of Computer-Mediated Communication*, 17(3):337–353. DOI: https://doi.org/10.1111/j.1083-6101.2012.01576.x.

[168] Lowndes, V. and Gardner, A. (2016). Local governance under the Conservatives: super-austerity, devolution and the 'smarter state'. *Local Government Studies*, 42(3):357–375. DOI: https://doi.org/10.1080/03003930.2016.1150837.

[169] Lucy, Y. (2000). Dilemmas in qualitative health research. *Psychology & Health*, 15(2):215–228. DOI: https://doi.org/10.1080/08870440008400302.

[170] Lynn, P. and Nicolaas, G. (2018). Making Good Use of Survey Paradata. *Survey Practice*, 3(2):1–5. DOI: https://doi.org/10.29115/sp-2010-0010.

[171] Mahyar, N., James, M. R., Ng, M. M., Wu, R. A., and Dow, S. P. (2018). CommunityCrit: Inviting the Public to Improve and Evaluate Urban Design Ideas through Micro-Activities. In *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems*, CHI '18, pages 1–14, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/3173574.3173769.

[172] Mahyar, N., Nguyen, D. V., Chan, M., Zheng, J., and Dow, S. P. (2019). The Civic Data Deluge: Understanding the Challenges of Analyzing Large-Scale Community Input. In *Proceedings of the 2019 on Designing Interactive Systems Conference*, DIS '19, pages 1171–1181, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/3322276.3322354.

[173] MailGun (2020). Transactional Email API Service For Developers | Mailgun. Accessed 22 Jan 2021 from: https://www.mailgun.com/.

[174] Manuel, J. and Crivellaro, C. (2020). Place-Based Policymaking and HCI: Opportunities and Challenges for Technology Design. In *Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems*, CHI '20, pages 1–16, New York, NY, USA. Association for Computing Machinery. DOI: 10.1145/3313831.3376158.

[175] Manuel, J., Vigar, G., Bartindale, T., and Comber, R. (2017). Participatory Media: Creating Spaces for Storytelling in Neighbourhood Planning. In *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems*, CHI '17, pages 1688–1701, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/3025453.3025745.

[176] Marathe, M. and Toyama, K. (2018). Semi-Automated Coding for Qualitative Research: A User-Centered Inquiry and Initial Prototypes. In *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems*, CHI '18, pages 1–12, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/3173574.3173922.

[177] Marlow, C., Naaman, M., Boyd, D., and Davis, M. (2006). HT06, Tagging Paper, Taxonomy, Flickr, Academic Article, to Read. In *Proceedings of the Seventeenth Conference on Hypertext and Hypermedia*, HYPERTEXT '06, pages 31–40, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/1149941.1149949.

[178] Marres, N. (2012). *Material Participation: Technology, the Environment and Everyday Publics*. Palgrave Macmillan UK, University of Chicago Press. DOI: https://doi.org/10.2307/3178066.

[179] Marshall, M., Kirk, D. S., and Vines, J. (2016). Accountable: Exploring the Inadequacies of Transparent Financial Practice in the Non-Profit Sector. In *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems*, CHI '16, pages 1620–1631, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/2858036.2858301.

[180] Maskell, T., Crivellaro, C., Anderson, R., Nappey, T., Araújo-Soares, V., and Montague, K. (2018). Spokespeople: Exploring Routes to Action through Citizen-Generated Data. In *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems*, CHI '18, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/3173574.3173979.

[181] Matias, J. N. and Monroy-Hernandez, A. (2014). NewsPad: Designing for Collaborative Storytelling in Neighborhoods. In *CHI '14 Extended Abstracts on Human Factors in Computing Systems*, CHI EA '14, pages 1987–1992, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/2559206.2581354.

[182] Maulsby, D., Greenberg, S., and Mander, R. (1993). Prototyping an Intelligent Agent through Wizard of Oz. In *Proceedings of the INTERACT '93 and CHI '93 Conference on Human Factors in Computing Systems*, pages 277–284, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/169059.169215.

[183] MAXQDA (2020). MAXQDA | All-In-One Tool for Qualitative Data Analysis. Accessed 22 Jan 2021 from: https://www.maxqda.com.

[184] McDonald, N., Schoenebeck, S., and Forte, A. (2019). Reliability and Inter-Rater Reliability in Qualitative Research: Norms and Guidelines for CSCW and HCI Practice. *Proc. ACM Hum.-Comput. Interact.*, 3(CSCW). DOI: https://doi.org/10.1145/3359174.

[185] McMillan, D., Engström, A., Lampinen, A., and Brown, B. (2016). Data and the city. In *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems*, CHI '16, pages 2933–2944, New York, NY, USA. Association for Computing Machinery. DOI: 10.1145/2858036.2858434.

[186] Meyrick, J. (2006). What is Good Qualitative Research?: A First Step towards a Comprehensive Approach to Judging Rigour/Quality. *Journal of Health Psychology*, 11(5):799–808. DOI: https://doi.org/10.1177/1359105306066643.

[187] Microsoft (2020a). Xamarin | Open-source mobile app platform for .NET. Accessed 22 Jan 2021 from: https://dotnet.microsoft.com/apps/xamarin.

[188] Microsoft (2020b). Xamarin.Forms | .NET. Accessed 22 Jan 2021 from: https://dotnet.microsoft.com/apps/xamarin/xamarin-forms.

[189] Mihailidis, P. (2015). Digital curation and digital literacy: Evaluating the role of curation in developing critical literacies for participation in digital culture. *E-Learning and Digital Media*, 12(5-6):443–458. DOI: https://doi.org/10.1177/2042753016631868.

[190] Mihailidis, P. (2018). Civic media literacies: re-Imagining engagement for civic intentionality. *Learning, Media and Technology*, 43(2):152–164. DOI: https://doi.org/10.1080/17439884.2018.1428623.

[191] Mihailidis, P. (2019). *Civic Media Literacies*. Routledge. DOI: https://doi.org/10.4324/9781315526058.

[192] Monroy-Hernández, A., Boyd, d., Kiciman, E., De Choudhury, M., and Counts, S. (2013). The New War Correspondents: The Rise of Civic Media Curation in Urban Warfare. In *Proceedings of the 2013 Conference on Computer Supported Cooperative Work*, CSCW '13, pages 1443–1452, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/2441776.2441938.

[193] Moravcsik, A. (2014). Transparency: The Revolution in Qualitative Research. *PS: Political Science & Politics*, 47(1):48–53. DOI: https://doi.org/10.1017/S1049096513001789.

[194] Moylan, C. A., Derr, A. S., and Lindhorst, T. (2015). Increasingly mobile: How new technologies can enhance qualitative research. *Qualitative Social Work: Research and Practice*, 14(1):36–47. DOI: https://doi.org/10.1177/1473325013516988.

[195] Muller, M., Lange, I., Wang, D., Piorkowski, D., Tsay, J., Liao, Q. V., Dugan, C., and Erickson, T. (2019). How Data Science Workers Work with Data: Discovery, Capture, Curation, Design, Creation. In *Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems*, CHI '19, pages 1–15, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/3290605.3300356.

[196] Munafò, M. R., Nosek, B. A., Bishop, D. V. M., Button, K. S., Chambers, C. D., Percie du Sert, N., Simonsohn, U., Wagenmakers, E.-J., Ware, J. J., and Ioannidis, J. P. A. (2017). A manifesto for reproducible science. *Nature Human Behaviour*, 1(1):0021. DOI: https://doi.org/10.1038/s41562-016-0021.

[197] Nah, S. and Chung, D. S. (2020). *Understanding Citizen Journalism as Civic Participation*. Routledge. DOI: https://doi.org/10.4324/9781315271286.

[198] Nelimarkka, M. (2019). A Review of Research on Participation in Democratic Decision-Making Presented at SIGCHI Conferences. Toward an Improved Trading Zone Between Political Science and HCI. *Proc. ACM Hum.-Comput. Interact.*, 3(CSCW). DOI: https://doi.org/10.1145/3359241.

[199] Nijhawan, L. P., Janodia, M. D., Muddukrishna, B. S., Bhat, K. M., Bairy, K. L., Udupa, N., and Musmade, P. B. (2013). Informed consent: Issues and challenges. *Journal of advanced pharmaceutical technology & research*, 4(3):134–140. DOI: https://doi.org/10.4103/2231-4040.116779.

[200] Oliver, J. L., Brereton, M., Turkay, S., Watson, D. M., and Roe, P. (2020). Exploration of Aural & Visual Media About Birds Informs Lessons for Citizen Science Design. In *Proceedings of the 2020 ACM Designing Interactive Systems Conference*, DIS '20, pages 1687–1700, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/3357236.3395478.

[201] Olivier, P. and Wright, P. (2015). Digital Civics: Taking a Local Turn. *Interactions*, 22(4):61–63. DOI: https://doi.org/10.1145/2776885.

[202] Pallets (2020a). ItsDangerous – ItsDangerous Documentation (1.1.x). Accessed 22 Jan 2021 from: https://itsdangerous.palletsprojects.com/.

[203] Pallets (2020b). Welcome to Flask – Flask Documentation (1.1.x). Accessed 22 Jan 2021 from: https://flask.palletsprojects.com/.

[204] Pasquetto, I. V., Sands, A. E., Darch, P. T., and Borgman, C. L. (2016). Open Data in Scientific Settings: From Policy to Practice. In *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems*, CHI '16, pages 1585–1596, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/2858036.2858543.

[205] Paulus, T. M., Jackson, K., and Davidson, J. (2017a). Digital Tools for Qualitative Research: Disruptions and Entanglements. *Qualitative Inquiry*, 23(10):751–756. DOI: https://doi.org/10.1177/1077800417731080.

[206] Paulus, T. M., Lester, J., and Dempster, P. (2014). *Digital Tools for Qualitative Research*. SAGE Publications Ltd. DOI: https://doi.org/10.4135/9781473957671.

[207] Paulus, T. M. and Lester, J. N. (2016). ATLAS.ti for conversation and discourse analysis studies. *International Journal of Social Research Methodology*, 19(4):405–428. DOI: https://doi.org/10.1080/13645579.2015.1021949.

[208] Paulus, T. M., Lester, J. N., and Britt, V. G. (2013). Constructing Hopes and Fears Around Technology: A Discourse Analysis of Introductory Qualitative Research Texts. *Qualitative Inquiry*, 19(9):639–651. DOI: http://doi.org/10.1177/1077800413500929.

[209] Paulus, T. M., Woods, M., Atkins, D. P., and Macklin, R. (2017b). The discourse of QDAS: reporting practices of ATLAS.ti and NVivo users with implications for best practices. *International Journal of Social Research Methodology*, 20(1):35–47. DOI: http://doi.org/10.1080/13645579.2015.1102454.

[210] Peters, V. and Wester, F. (2007). How Qualitative Data Analysis Software may Support the Qualitative Analysis Process. *Quality & Quantity*, 41(5):635–659. DOI: https://doi.org/10.1007/s11135-006-9016-8.

[211] Plowman, L. and Stevenson, O. (2012). Using mobile phone diaries to explore children's everyday lives. *Childhood*, 19(4):539–553. DOI: https://doi.org/10.1177/0907568212440014.

[212] Prinsloo, P. and Slade, S. (2015). Student Privacy Self-Management: Implications for Learning Analytics. In *Proceedings of the Fifth International Conference on Learning Analytics And Knowledge*, LAK '15, pages 83–92, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/2723576.2723585.

[213] Prost, S., Vlachokyriakos, V., Midgley, J., Heron, G., Meziant, K., and Crivellaro, C. (2019). Infrastructuring food democracy: The formation of a local food hub in the context of socio-economic deprivation. *Proc. ACM Hum.-Comput. Interact.*, 3(CSCW). DOI: https://doi.org/10.1145/3359159.

[214] Punch, K. F. (2013). *Introduction to Social Research*. SAGE Publications Ltd.

[215] Purdam, K. (2014). Citizen social science and citizen data? Methodological and ethical challenges for social research. *Current Sociology*, 62(3):374–392. DOI: https://doi.org/10.1177/0011392114527997.

[216] Puussaar, A. (2020). *Democratising Data Science: Effective Use of Data by Communities for Civic Participation, Advocacy and Action*. PhD thesis, Newcastle University.

[217] Puussaar, A., Clear, A. K., and Wright, P. (2017). Enhancing Personal Informatics Through Social Sensemaking. In *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems*, CHI '17, pages 6936–6942, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/3025453.3025804.

[218] Puussaar, A., Johnson, I. G., Montague, K., James, P., and Wright, P. (2018). Making Open Data Work for Civic Advocacy. *Proc. ACM Hum.-Comput. Interact.*, 2(CSCW). DOI: https://doi.org/10.1145/3274412.

[219] QSR International (2020). Qualitative Data Analysis Software | NVivo - QSR International. Accessed 22 Jan 2021 from: https://www.qsrinternational.com/nvivo-qualitative-data-analysis-software/home.

[220] Quirkos (2020). Simple Qualitative Analysis Software | Quirkos. Accessed 22 Jan 2021 from: https://www.quirkos.com/.

[221] Rainey, J. (2020). [TalkFutures]: Post-deployment Interviews. Dataset. DOI: https://doi.org/10.25405/data.ncl.12148659.v1.

[222] Rainey, J. (2021a). Gabber Platform Source Code. Dataset. DOI: https://doi.org/10.25405/data.ncl.14067203.

[223] Rainey, J. (2021b). [Paradata]: Post-deployment Interviews. Dataset. DOI: https://doi.org/10.25405/data.ncl.14067209.

[224] Rainey, J., Alvarez de la Vega, J. C., Richardson, D., Lambton-Howard, D., Armouch, S., Bartindale, T., Hazeldine, S., Briggs, P., Olivier, P., and Montague, K. (2020). TalkFutures: Supporting Qualitative Practices in Distributed Community Engagements. In *Proceedings of the 2020 ACM Designing Interactive Systems Conference*, DIS '20, pages 771–784, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/3357236.3395531.

[225] Rainey, J., Montague, K., Briggs, P., Anderson, R., Nappey, T., and Olivier, P. (2019). Gabber: Supporting Voice in Participatory Qualitative Practices. In *Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems*, CHI '19, pages 1–12, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/3290605.3300607.

[226] Reason, P. and Bradbury, H. (2008). *The SAGE Handbook of Action Research*. SAGE Publications Ltd. DOI: https://dx.doi.org/10.4135/9781848607934.

[227] Reed, J., Raddick, M. J., Lardner, A., and Carney, K. (2013). An Exploratory Factor Analysis of Motivations for Participating in Zooniverse, a Collection of Virtual Citizen Science Projects. In *2013 46th Hawaii International Conference on System Sciences*, pages 610–619. DOI: https://doi.org/10.1109/HICSS.2013.85.

[228] Reuter, A., Bartindale, T., Morrissey, K., Scharf, T., and Liddle, J. (2019). Older Voices: Supporting Community Radio Production for Civic Participation in Later Life. In *Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems*, CHI '19, pages 1–13, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/3290605.3300664.

[229] Reuter, A., Scharf, T., and Smeddinck, J. (2021). Content Creation in Later Life: Reconsidering Older Adults' Digital Participation and Inclusion. *Proc. ACM Hum.-Comput. Interact.*, 4(CSCW3). DOI: https://doi.org/10.1145/3434166.

[230] Richardson, D., Crivellaro, C., Kharrufa, A., Montague, K., and Olivier, P. (2017). Exploring Public Places as Infrastructures for Civic M-Learning. In *Proceedings of the 8th International Conference on Communities and Technologies*, C&T '17, pages 222–231, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/3083671.3083678.

[231] Richardson, D. and Kharrufa, A. (2020). We are the greatest showmen: Configuring a framework for project-based mobile learning. In *Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems*, CHI '20, page 1–12, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/3313831.3376650.

[232] Rietz, T. and Maedche, A. (2020). Towards the Design of an Interactive Machine Learning System for Qualitative Coding. In *ICIS 2020 – Making Digital Inclusive: Blending the Local and the Global*. DOI: https://doi.org/10.5445/IR/1000124563.

[233] Rietz, T. and Maedche, A. (2021). Cody: An ai-based system to semi-automate coding for qualitative research. In *Proceedings of the 2021 CHI Conference on Human Factors in Computing Systems*, CHI '21, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/3411764.3445591.

[234] Rietz, T., Toreini, P., and Maedche, A. (2020). Cody: An Interactive Machine Learning System for Qualitative Coding. In *Adjunct Publication of the 33rd Annual ACM Symposium on User Interface Software and Technology*, UIST '20 Adjunct, page 90–92, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/3379350.3416195.

[235] Right Question Institute (2020). What is the QFT? - Right Question Institute. Accessed 22 Jan 2021 from: https://rightquestion.org/what-is-the-qft/.

[236] Ritchie, J. and Lewis, J. (2003). *Qualitative Research Practice: A Guide for Social Science Students and Researchers*. SAGE Publications Ltd.

[237] Rittel, H. W. J. and Webber, M. M. (1973). Dilemmas in a general theory of planning. *Policy Sciences*, 4(2):155–169. DOI: https://doi.org/10.1007/BF01405730.

[238] Rodger, S., Vines, J., and McLaughlin, J. (2016). Technology and the Politics of Mobility: Evidence Generation in Accessible Transport Activism. In *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems*, CHI '16, page 2417–2429, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/2858036.2858146.

[239] Rogers, Y. (2011). Interaction Design Gone Wild: Striving for Wild Theory. *interactions*, 18(4):58–62. DOI: http://doi.org/10.1145/1978822.1978834.

[240] Rotman, D., Preece, J., Hammock, J., Procita, K., Hansen, D., Parr, C., Lewis, D., and Jacobs, D. (2012). Dynamic Changes in Motivation in Collaborative Citizen-Science Projects. In *Proceedings of the ACM 2012 Conference on Computer Supported Cooperative Work*, CSCW '12, pages 217–226, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/2145204.2145238.

[241] Sanderson, R., Ciccarese, P., and Van de Sompel, H. (2013). Designing the W3C Open Annotation Data Model. In *Proceedings of the 5th Annual ACM Web Science Conference*, WebSci '13, pages 366–375, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/2464464.2464474.

[242] Sauermann, H. and Franzoni, C. (2015). Crowd science user contribution patterns and their implications. *Proceedings of the National Academy of Sciences*, 112(3):679–684. DOI: https://doi.org/10.1073/pnas.1408907112.

[243] Savage, S., Monroy-Hernandez, A., and Höllerer, T. (2016). Botivist: Calling Volunteers to Action Using Online Bots. In *Proceedings of the 19th ACM Conference on Computer-Supported Cooperative Work & Social Computing*, CSCW '16, pages 813–822, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/2818048.2819985.

[244] Schell, J. (2008). *The Art of Game Design: A Book of Lenses*. Morgan Kaufmann Publishers Inc., San Francisco, CA, USA.

[245] Schofield, G., Bartindale, T., and Wright, P. (2015). Bootlegger: Turning Fans into Film Crew. In *Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems*, CHI '15, pages 767–776, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/2702123.2702229.

[246] Schouten, B., Klerks, G., Hollander, M. D., and Hansen, N. B. (2020). Action design research shaping university-industry collaborations for wicked problems. In *32nd Australian Conference on Human-Computer Interaction*, OzCHI '20, pages 36–44, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/3441000.3441078.

[247] Seale, C., Gobo, G., Gubrium, J., and Silverman, D. (2004). *Qualitative Research Practice*. SAGE Publications Ltd. DOI: https://doi.org/10.4135/9781848608191.

[248] Shi, C., Fu, S., Chen, Q., and Qu, H. (2015). VisMOOC: Visualizing video clickstream data from Massive Open Online Courses. In *2015 IEEE Pacific Visualization Symposium (PacificVis)*, pages 159–166. DOI: https://doi.org/10.1109/PACIFICVIS.2015.7156373.

[249] Siek, K. A., Hayes, G. R., Newman, M. W., and Tang, J. C. (2014). Field Deployments: Knowing from Using in Context. In Olson, J. S. and Kellogg, W. A., editors, *Ways of Knowing in HCI*, pages 119–142. Springer, New York, NY. DOI: https://doi.org/10.1007/978-1-4939-0378-8_6.

[250] Silver, C. and Lewins, A. (2014). *Using Software in Qualitative Research: A Step-by-Step Guide*. SAGE Publications Ltd, 2 edition. DOI: https://doi.org/10.4135/9781473906907.

[251] Simonsen, J. and Robertson, T. (2013). *Routledge International Handbook of Participatory Design*. Princeton University Press.

[252] Simpson, E., Comber, R., Garbett, A., Jenkins, E. I., and Balaam, M. (2017). Experiences of Delivering a Public Health Data Service. In *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems*, CHI '17, pages 6171–6183, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/3025453.3025881.

[253] SoundCloud (2020). SoundCloud - Listen to free music and podcasts on SoundCloud. Accessed 22 Jan 2021 from: https://soundcloud.com.

[254] Stake, R. E. (1995). *The Art of Case Study Research*. SAGE Publications.

[255] Sun, K., Mhaidli, A. H., Watel, S., Brooks, C. A., and Schaub, F. (2019). It's My Data! Tensions Among Stakeholders of a Learning Analytics Dashboard. In *Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems*, CHI '19, pages 1–14, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/3290605.3300824.

[256] Talkad Sukumar, P., Avellino, I., Remy, C., DeVito, M. A., Dillahunt, T. R., McGrenere, J., and Wilson, M. L. (2020). Transparency in Qualitative Research: Increasing Fairness in the CHI Review Process. In *Extended Abstracts of the 2020 CHI Conference on Human Factors in Computing Systems*, CHI EA '20, pages 1–6, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/3334480.3381066.

[257] Tauginienė, L., Butkevičienė, E., Vohland, K., Heinisch, B., Daskolia, M., Suškevičs, M., Portela, M., Balázs, B., and Prūse, B. (2020). Citizen science in the social sciences and humanities: the power of interdisciplinarity. *Palgrave Communications*, 6(1):89. DOI: https://doi.org/10.1177/0011392114527997.

[258] Taylor, A. S., Lindley, S., Regan, T., Sweeney, D., Vlachokyriakos, V., Grainger, L., and Lingel, J. (2015). Data-in-Place: Thinking through the Relations Between Data and Community. In *Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems*, CHI '15, pages 2863–2872, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/2702123.2702558.

[259] Taylor, N., Frohlich, D. M., Egglestone, P., Marshall, J., Rogers, J., Blum-Ross, A., Mills, J., Shorter, M., and Olivier, P. (2014). Utilising Insight Journalism for Community Technology Design. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, CHI '14, pages 2995–3004, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/2556288.2557054.

[260] Taylor, N., Marshall, J., Blum-Ross, A., Mills, J., Rogers, J., Egglestone, P., Frohlich, D. M., Wright, P., and Olivier, P. (2012). Viewpoint: Empowering Communities with Situated Voting Devices. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, CHI '12, pages 1361–1370, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/2207676.2208594.

[261] Timing Software GmbH (2020). The Automatic Mac Time Tracker — No More Start/Stop Timers — Timing. Accessed 22 Jan 2021 from: https://timingapp.com/.

[262] Tinati, R., Van Kleek, M., Simperl, E., Luczak-Rösch, M., Simpson, R., and Shadbolt, N. (2015). Designing for Citizen Data Analysis: A Cross-Sectional Case Study of a Multi-Domain Citizen Science Platform. In *Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems*, CHI '15, pages 4069–4078, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/2702123.2702420.

[263] Tuval-Mashiach, R. (2017). Raising the curtain: The importance of transparency in qualitative research. *Qualitative Psychology*, 4(2):126–138. DOI: https://doi.org/10.1037/qup0000062.

[264] UK Government (2020). Localism Act 2011. Accessed 22 Jan 2021 from: http://www.legislation.gov.uk/ukpga/2011/20/contents/enacted.

[265] United Nations (2015). World Youth Report: Youth Civic Engagement. Accessed 22 Jan 2021 from: https://www.un.org/development/desa/youth/world-youth-report/2015-2.html.

[266] Unsplash (2020). Beautiful Free Images & Pictures | Unsplash. Accessed 22 Jan 2021 from: https://unsplash.com/.

[267] Varghese, D., Olivier, P., Bartindale, T., and Baillie Smith, M. (2020a). Towards Participatory Video 2.0. In *Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems*, CHI '20, page 1–13, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/3313831.3376694.

[268] Varghese, D., Rainey, J., Montague, K., Bartindale, T., Olivier, P., and Baillie Smith, M. (2020b). Utilizing Participant Voice in Volunteer Training. In *Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems*, CHI '20, pages 1–14, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/3313831.3376208.

[269] Vlachokyriakos, V., Comber, R., Ladha, K., Taylor, N., Dunphy, P., McCorry, P., and Olivier, P. (2014). PosterVote: Expanding the Action Repertoire for Local Political Activism. In *Proceedings of the 2014 Conference on Designing Interactive Systems*, DIS '14, pages 795–804, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/2598510.2598523.

[270] Vlachokyriakos, V., Crivellaro, C., Le Dantec, C. A., Gordon, E., Wright, P., and Olivier, P. (2016). Digital Civics: Citizen Empowerment With and Through Technology. In *Proceedings of the 2016 CHI Conference Extended Abstracts on Human Factors in Computing Systems*, CHI EA '16, pages 1096–1099, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/2851581.2886436.

[271] W3C Working Group (2013). PROV-Overview. An Overview of the PROV Family of Documents. Accessed 22 Jan 2021 from: https://www.w3.org/TR/prov-overview/.

[272] W3C Working Group (2020). Solid Community Group. Accessed 22 Jan 2021 from: https://www.w3.org/community/solid/.

[273] Wacharamanotham, C., Eisenring, L., Haroz, S., and Echtler, F. (2020). Transparency of CHI Research Artifacts: Results of a Self-Reported Survey. In *Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems*, CHI '20, pages 1–14, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/3313831.3376448.

[274] Wall, M. (2015). Citizen Journalism: A retrospective on what we know, an agenda for what we don't. *Digital Journalism*, 3(6):797–813. DOI: https://doi.org/10.1080/21670811.2014.1002513.

[275] Wiggins, A. and Crowston, K. (2011). From Conservation to Crowdsourcing: A Typology of Citizen Science. In *2011 44th Hawaii International Conference on System Sciences*, pages 1–10. IEEE. DOI: https://doi.org/10.1109/HICSS.2011.207.

[276] Williamson, I., Leeming, D., Lyttle, S., and Johnson, S. (2012). 'It should be the most natural thing in the world': exploring first-time mothers' breastfeeding difficulties in the UK using audio-diaries and interviews. *Maternal & Child Nutrition*, 8(4):434–447. DOI: https://doi.org/10.1111/j.1740-8709.2011.00328.x.

[277] Wilson, A., Tewdwr-Jones, M., and Comber, R. (2019). Urban planning, public participation and digital technology: App development as a method of generating citizen involvement in local planning processes. *Environment and Planning B: Urban Analytics and City Science*, 46(2):286–302. DOI: https://doi.org/10.1177/2399808317712515.

[278] Wirfs-Brock, J., Mennicken, S., and Thom, J. (2020). Giving Voice to Silent Data: Designing with Personal Music Listening History. In *Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems*, CHI '20, pages 1–11, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/3313831.3376493.

[279] Woods, M., Paulus, T., Atkins, D. P., and Macklin, R. (2016). Advancing Qualitative Research Using Qualitative Data Analysis Software (QDAS)? Reviewing Potential Versus Practice in Published Studies using ATLAS.ti and NVivo, 1994–2013. *Social Science Computer Review*, 34(5):597–617. DOI: https://doi.org/10.1177/0894439315596311.

[280] You, E. (2020). Vue.js – The Progressive JavaScript Framework. Accessed 22 Jan 2021 from: https://vuejs.org/.

[281] Zuckerman, E. (2014). New Media, New Civics? *Policy & Internet*, 6(2):151–168. DOI: https://doi.org/10.1002/1944-2866.POI360.

[282] Zuckerman, E. (2016). Effective Civics. In *Civic Media: Technology, Design, Practice*, chapter 3, pages 49–77. The MIT Press, 1 edition.