

Exploring the Role of Paradata in Digitally Supported Qualitative Co-Research

Jay Rainey
j.rainey2@newcastle.ac.uk
Open Lab, Newcastle University
United Kingdom

Siobhan Macfarlane
s.macfarlane2@newcastle.ac.uk
Open Lab, Newcastle University
United Kingdom

Aare Puussaar
aare.puussaar@northumbria.ac.uk
Northumbria University
United Kingdom

Vasilis Vlachokyriakos
vasilis.vlachokyriakos1@newcastle.ac.uk
Open Lab, Newcastle University
United Kingdom

Roger Burrows
roger.burrows@newcastle.ac.uk
School of Architecture, Planning and
Landscape, Newcastle University
United Kingdom

Jan David Smeddinck
jan.smeddinck@newcastle.ac.uk
Open Lab, Newcastle University
United Kingdom

Pamela Briggs
p.briggs@northumbria.ac.uk
PaCT Lab, Northumbria University
United Kingdom

Kyle Montague
kyle.montague@northumbria.ac.uk
Northumbria University
United Kingdom

ABSTRACT

Academics and community organisations are increasingly adopting co-research practices where participants contribute to qualitative data collection, analysis, and dissemination. These qualitative practices can often lack transparency that can present a problem for stakeholders (such as funding agencies) who seek evidence of the rigour and accountability in these decision-making processes. When qualitative research is done digitally, *paradata* is available as interaction logs that reveal the underlying processes, such as the time spent engaging with different segments of an interview. In practice, paradata is seldom used to examine the decisions associated with undertaking qualitative research. This paper explores the role of paradata arising from a four-month engagement with a community-led charity that used a digital platform to support their qualitative co-research project. Through observations of platform use and reflective post-deployment interviews, our findings highlight examples of paradata generated through digital tools in qualitative research, e.g., *listening coverage*, *engagement rate*, *thematic maps and data discards*. From this, we contribute a conceptualisation of paradata and discuss its role in qualitative research to improve process transparency, enhance data sharing, and to create feedback loops with research participants.

CCS CONCEPTS

• **Human-centered computing** → **Empirical studies in HCI**; *Collaborative and social computing systems and tools*.



This work is licensed under a Creative Commons Attribution International 4.0 License.

CHI '22, April 29-May 5, 2022, New Orleans, LA, USA
© 2022 Copyright held by the owner/author(s).
ACM ISBN 978-1-4503-9157-3/22/04.
<https://doi.org/10.1145/3491102.3502103>

KEYWORDS

Paradata, Ethnography, Citizen Research, Co-Research, Qualitative Practices, Research Methods

ACM Reference Format:

Jay Rainey, Siobhan Macfarlane, Aare Puussaar, Vasilis Vlachokyriakos, Roger Burrows, Jan David Smeddinck, Pamela Briggs, and Kyle Montague. 2022. Exploring the Role of Paradata in Digitally Supported Qualitative Co-Research. In *CHI Conference on Human Factors in Computing Systems (CHI '22)*, April 29-May 5, 2022, New Orleans, LA, USA. ACM, New York, NY, USA, 16 pages. <https://doi.org/10.1145/3491102.3502103>

1 INTRODUCTION

Qualitative research is frequently used in many disciplines by academics, governments, and third-sector organisations to learn from experiences, understand concepts, and discover new meanings. At the same time, grant providers, including governments and funding agencies, are pushing for greater transparency and reproducibility in research practices [10]. This is of particular importance in qualitative research where attempts are made to capture and represent the lived experiences of research participants, but research decisions are often made that might introduce bias, intentional or otherwise. This paper comes at an important time in the HCI community where recent conference panels [65], SIGs [13], workshops, [23] and papers [69] have called for increased data sharing, replicability, and transparency of qualitative research procedures while highlighting a need for *process transparency*, i.e., “... where the various decisions made during a study, including the methods deployed, are communicated in detail” [65].

Civil society organisations are increasingly collaborating with academics and local government to collect, analyse, and use qualitative data to inform the delivery of public services more tailored to their needs, i.e., digital civics research [68]. Critical to the success of these collaborations is adopting research approaches that actively involve participants from outside the research community in a process of shared learning, i.e., *co-research* [27]. In co-research

projects, participants become active *co-researchers* where they can contribute to all research stages: from research question formulation to the dissemination of results. Examples of prior co-research projects include collaborations with regional transport authorities where co-researchers (citizens) used technology to share experiences of public transport that informed the redesign of future light rail carriages [5], and partnerships between community groups and local planning authorities to inform public policy [34, 35]. Key to these partnerships is the role co-researchers take in capturing, documenting, and sharing their lived experiences, which are qualitative practices often mediated through technology [55].

When qualitative research is digitally mediated, additional forms of data can be more easily automatically recorded, such as the order and frequency of how codes and comments on data evolved over time. This form of data is termed *paradata* that describes *how people access, use, or engage with a system, process, document of data*. To date, paradata has primarily been applied in survey methodology research where it is used to describe the *process of* completing a survey or questionnaire [16]. For example, by recording mouse clicks per question to determine the order of responses [9].

Multiple, distinct technologies are often used during qualitative research projects where capturing paradata automatically would be challenging as there is no unified approach to data management between systems [46, 72]. In contrast, recent HCI research has explored the design and use of digital platforms that encompass *all stages of the qualitative research process* to make qualitative research practices more inclusive for co-researchers, e.g., [3, 55, 59]. As these platforms structure participation in each and all stages they provide opportunities to explore the role of paradata to increase the transparency and visibility of contributions for different stakeholders involved, such as citizens and community organisations. To explore the possible challenges around paradata use, we explicitly selected a research context where an existing digital platform was used across the research process – but where paradata was not yet recorded – to enable more meaningful reflections on the decisions made with technology and the potential paradata that could be recorded to inform future design research.

This paper presents a four-month collaboration with a community-led charity where nine co-researchers co-led an end-to-end qualitative co-research project. This project, termed *Making Links*, was initiated by community members who used an open-source digital technology (Gabber [55]) to capture, analyse, and share snippets of audio interviews discussing their lived experiences to help foster peer connections. 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. This unique positioning could provide insights into multiple perspectives, i.e., through being both research participants and researchers. We report on two research phases: (1) a field deployment of Gabber to examine the qualitative practices of citizens (as co-researchers) through observations of platform use; and (2) post-deployment interviews with participants to reflect on how paradata could be meaningful to them. Our primary aim was to understand which characteristics of paradata were important in qualitative research to inform the design of paradata-driven interfaces for qualitative research.

Our findings contribute to HCI and qualitative research literature in three ways: (i) a conceptualisation of paradata to enhance qualitative research practices in contrast to prior uses in survey methodology; (ii) reflections from a real-world deployment of a digital system used across all stages of a co-research project and reflective interviews on the utility of paradata across the research process; and (iii) a characterisation of design challenges concerning how paradata could be used to improve process transparency in qualitative research.

2 RELATED WORK

This section outlines research domains where *paradata* is used to inform product and prototype development. The role of transparency in qualitative research is then described followed by how digital tools are used in qualitative research where paradata is not currently captured.

2.1 Paradata as a Digital By-product of Participation

Paradata is data captured during the *process of* interacting with a system, process, or data, such as completing a survey or questionnaire [16], listening to music streaming services [71], using online learning platforms [64], or participating in citizen science projects [11, 43, 44]. 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 *interaction logs*. One area that has seen extensive use of paradata is online learning where the aim is 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*. Shi et al. [61] use paradata collected from students of massive online open courses (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 [48] noted that collecting and representing paradata raised ethical challenges with consent as while students were not identifiable they desired increased transparency of how and when paradata is collected and used.

Sun et al. [64] extends this work through interviewing multiple stakeholders (i.e., students, teachers) 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 and quality of paradata within interfaces and illustrated how paradata could misrepresent student performance. This work also 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 [64]. These findings mirror prior survey methodology research on the need to inform users of which data is collected [9, 16, 32], which is critical given recent data protection legislation, e.g., GDPR [45] and CCPA [8].

One research area that has also explored paradata use is *citizen science* (CS), which describes the practice of public participation in scientific research in both traditional research activities (i.e., data

collection and analysis tasks [31]) and external engagements (i.e., community action, awareness raising, or education [43]). 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. Recent CS research has utilised usage logs (paradata) from in-the-wild studies [43] and word use on online forums [11] to examine how human values influence digital participation as a proxy to creating more sustained engagement. While other CS research has explored gamification of participation with paradata [30]. Most relevant to this paper is *citizen social science* (CSS) research that 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 [49]. To date, limited CSS research has adopted technology or explored paradata’s role in qualitative projects, which this paper examines.

2.2 Transparency in Qualitative Research

Transparency in qualitative research can help with establishing the *quality* of qualitative research [60] and frameworks have been developed in an attempt to standardise transparent research practices. For example, Meyrick [38] developed a framework where transparency and a systematic approach 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.*” [38]. In contrast, Hiles and Čermák [28] 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 [38]’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 [66] 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 [66].

In recent HCI research, Talkad Sukumar et al. [65] describe a need for transparency of the qualitative research process through documenting the decisions that researchers make in a way that could enhance reliability and improve the peer-review process, i.e., *process transparency*. While this work highlights the need for transparency of qualitative practices, what might the role (if any) be for technology in automatically documenting these decisions through paradata? This is particularly important to consider as data handling frameworks are increasingly being adopted to ensure research data is formatted and handled in a way that makes it Findability, Accessibility, Interoperability and Reusability (FAIR) [41, 70]. However, sharing qualitative data can be challenging due to

the ethical and consent constraints associated with sharing human experiences, which adds additional time constraints for researchers to adopt these practices [23, 65].

2.3 Digitally Supported Qualitative Research

Academics use a range of digital tools across their qualitative research practices, from performing literature reviews to undertaking qualitative data analysis [46, 72]. Managing data across these tools is challenging, as there is often no standardised way to export, view, or use the meta(data) created through them. Commercial (e.g., [15, 19, 53]) and non-commercial (e.g., [2, 18, 24, 56]) platforms for qualitative data analysis have the potential to record and visualise paradata, but are primarily designed and used to create outcomes from data analysis, e.g., themes and written reports [47]. While there exists a range of techniques designed to improve the reliability of qualitative research, they are primarily concerned with the data analysis stage, depend on methodological factors, and are infrequently used in practice, e.g., inter-rater reliability (IRR), data source triangulation, or member checking [37].

Qualitative practitioners are increasingly adopting *participatory* digital platforms that aim to engage stakeholders in all aspects of qualitative research, from ideation of project ideas, capturing and analysing data, to writing reports or creating media artefacts, e.g., [3, 4, 21, 51, 55]. Building on this work, Rainey et al. [55] conceptualises the intersecting qualitative practices of citizens, academics and civil society as a *qualitative research workflow* whereby data from each research stage – *preparation, consent, capture, analysis, curation, and reuse* – structures participation in the subsequent stage that are familiar and practical to practitioners. Likewise, recent work highlights the capacity for citizens (as researchers) to independently and actively engage in all qualitative workflow stages through technology [54]. Findings from that work surfaced desires from research participants 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., [17, 21, 34].

Recent work highlights how digital tools for qualitative research primarily exist to support qualitative data analysis as the coding of data is a time-consuming and repetitive process, particular for larger datasets [34, 47]. 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, and that emerging Natural Language Processing (NLP) techniques can automate coding practices with comparable coding results to academics [36]. More recent work describes how NLP can provide code suggestions that are incrementally improved as the corpus is coded [57, 58]. The increasing use of digital platforms and desire for automation in qualitative practices provides opportunity to explore where *paradata* might be derived from, impact and used to surface the decisions made at each research stage. However, limited research explores the potential role of paradata within qualitative research practices and the opportunities it could afford.

3 CONTEXT: MAKING LINKS

In 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)* [40, 42]. The increased autonomy associated with becoming a personal budget holder requires navigating complex administrative decisions that are often new to the individual and which are typically addressed through experience. Frequently it also means personal budget holders become an employer that involves recruiting and interviewing *personal assistants* to provide dedicated support or care in their homes or in their community. This involves a range of decisions: determining whether 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.

ActionHub is a community-led charity organisation that provides information, advice, and support to disabled people and their families, including support for those who access personalised care funding. ActionHub 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 co-research project began to develop this idea further between ActionHub members, and our research team, termed **Making Links**. As part of an initial meeting, a range of commercial and open-source participatory platforms were demoed as potential platforms that could be used by the co-researchers. It was important to the project that participants could lead and contribute throughout, and a media-based system was seen to increase accessibility whilst amplifying the experiences of community members, which motivated their choice of Gabber [55].

Prior to engaging in Making Links, an earlier preparatory research phase was established to explore what shape a peer network in this context might take and to examine how it could be developed. This earlier group highlighted a shared understanding of the challenges faced when trying to create pathways for sharing accumulated expertise concerning self-directing support and expressed how hard it was to seek direct input from peers with similar experiences. The qualitative practices of this phase involved in-person reflections on conversations from prior workshops. These insights were disseminated offline and distributed through internal email lists, with co-researchers seeking alternative ways to capture, analyse, and disseminate knowledge amongst the community. Due to time constraints, these workshops did not capture the full scope of roles associated with self directing care, spanning budget holders, personal assistants, family supporters and skilled advisers.

3.1 Digitally Enhanced Co-Research with the Gabber Platform

Gabber is an open-source, digital platform that makes all stages of qualitative research inclusive through its reuse of the original captured audio interview to structure the subsequent research stages,

i.e., *data preparation, data capture, consent, analysis, curation, and data reuse* [55]. Through Gabber, participants can prepare a *project* that contains metadata to guide participation across research stages, such as setting up *discussion topics* to structure data capture and a *codebook* for data analysis. A mobile application is used to capture and annotate an audio interview using the discussion topics in-situ (Figure 1.A). Informed consent for how the data is used and who can access it is taken through the mobile application with a dynamic consent process via email enabling participants to update their consent at any time. Recordings are then uploaded to a website where the data is accessible to all project members if consent on the interview has been granted. Discussion topics are then overlaid onto the audio to enhance how the interview is represented and project members can write textual comments and associate codes in response to segments of the audio interview (Figure 1.B). Data curation and dissemination occurs through a separate interface where participants can view all snippets of coded audio data, filter them based on topics or codes, and curate these snippets into individual playlists to represent a narrative that draws from voices across the dataset (Figure 1.C).

4 STUDY DESIGN

This section describes the research approach taken across two phases of Making Links, the co-researchers involved, and the data collection and analysis methods used in each phase.

4.1 Research Approach

To date, limited work has explicitly examined the role of paradata in qualitative practices, in part, because the characteristics of paradata that are meaningful to practitioners remain underexplored. Informed by the growing use of technology in qualitative and participatory media practices (e.g., [3, 67]), we posit paradata as one potential way to enhance process transparency, accountability, and trust for all stakeholders involved in the qualitative research workflow.

The context of Making Links provided a unique opportunity to observe how a digital tool (i.e., Gabber [55]) was adopted *as-is* and configured with minimal support and input from our research team. A co-author led the co-research project and was a collaborator in the analysis presented in this paper. The lead author’s role in the co-research project was principally ethnographic using *participant observations* to understand the qualitative practices and platform use by co-researchers. This ethnographic work provided insights into the qualitative practices of co-researchers concerning the collaborative activities at each workflow stage, while deepening our understandings of how paradata can be used in digital tools to support transparency. Following this, we sought to understand the perspectives of the co-researchers to compliment and contest our informed views on the role of paradata in qualitative research.

The research in this paper encompassed two phases detailed in the following sections: (1) a *field deployment* of Gabber to examine how the digital platform was configured and used by co-researchers to support their qualitative practices; and (2) *post-deployment interviews* with co-researchers from phase one to understand their perceptions of how paradata could be used to enhance process transparency.

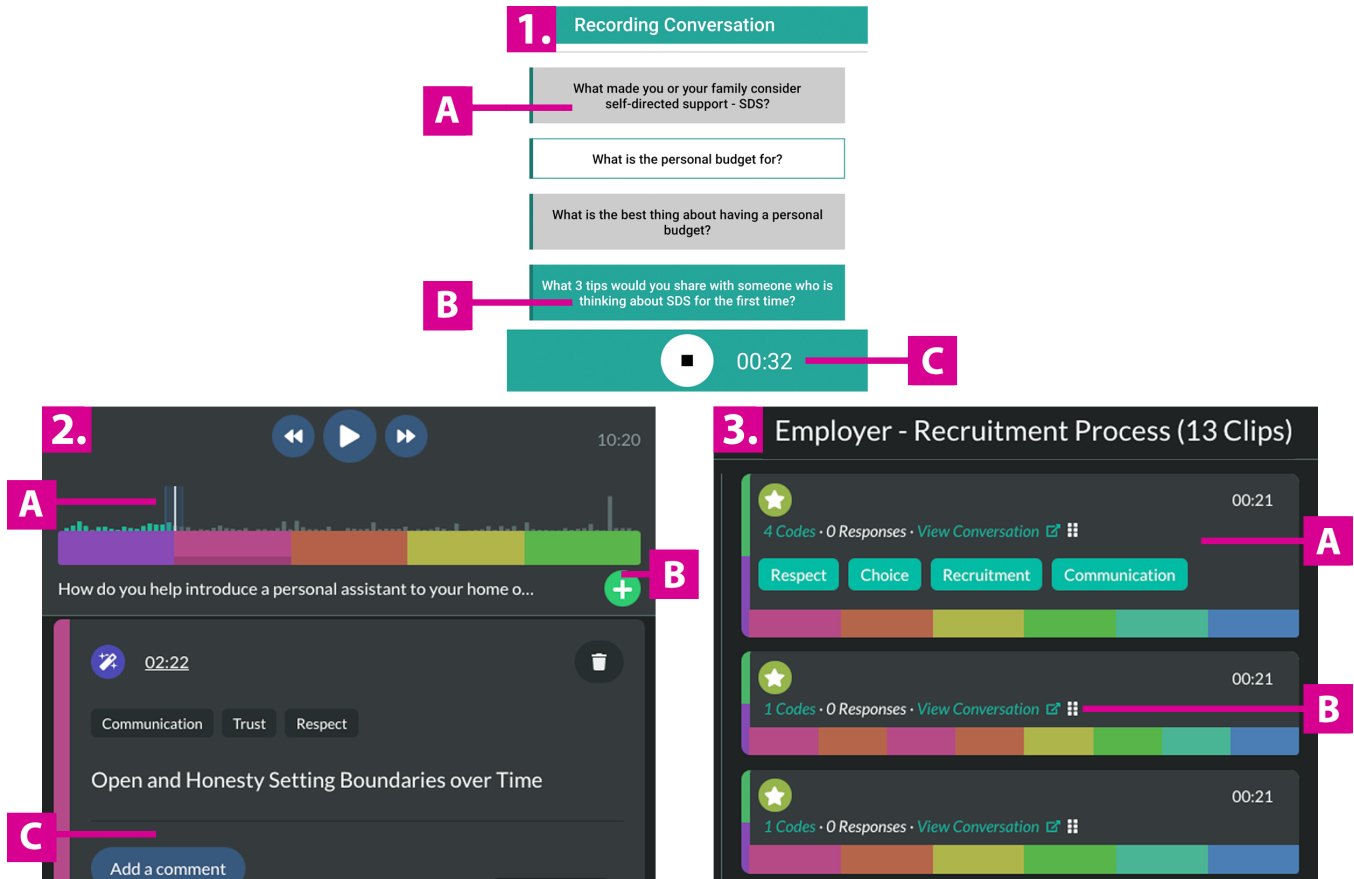


Figure 1: the interaction points on the Gabber platform: (1) a mobile application that captures and annotates audio interviews; and a website where audio recordings and metadata are made available for data analysis (2) and curation (3). In the mobile application, users are presented a list of discussion topics (1.A) that change colour to illustrate that a topic is covered (1.B), and when pressed begins recording a conversation (1.C). In the data analysis screen, the user can listen to the annotated audio recording and view other users’ textual annotations (2.A), leave comments (2.B) and respond to other user’s comments (2.C). The curation screen allows the user to listen to the annotated audio snippets (3.A) and reorder the curated snippets (3.B).

Figure 2 illustrates the two phases of the study and activities that co-researchers engaged in related to each stage of qualitative research workflow. Critically, qualitative activities were undertaken autonomously in phase one by the co-researchers, while the second phase was led by the lead author.

4.2 Participants

Across Making Links, nine participants – one researcher (P1, a member of our research team), two ActionHub staff (P2-3), and six service-users – engaged with varying degrees of participation across each research stage as outlined in Table 1. The role column outlines each participant’s role within ActionHub: *researcher* as the academic supporting the project (P1), *staff* who were employed by ActionHub as the CEO (P2) and support worker (P3), and *client* as individuals who have used the services offered by ActionHub. In particular, P5 and P8 were employed as or training to become *personal assistants* while the other clients were direct receivers of PHB’s and used ActionHub to gain support with managing their

PHB’s (i.e., P4, P6, P7 and P9). Likewise, under the *prior experience* column we define an *expert* as having previously led qualitative research projects and a *novice* as having engaged in co-research activities. The consent and reuse stages are not included in Table 1 as consent involved external stakeholders and the planned training activity to reuse curated content was postponed. Notably, a ‘core group’ of five participants (P1, P3, P6-8) were instrumental to Making Links through contributing to almost all research stages. Several participants had previously informally met through events held by ActionHub but had not previously participated together in a sustained research project in this way. All participants were invited to attend all research stages (workshops) and lack of attendance can be attributed to participant unavailability and was not deliberately planned in the research design.

For phase two (post-deployment interviews), all participants besides P9 took part in the semi-structured interviews. P3 and P6 had previously led qualitative research as part of their prior education. This was important for how the interview schedule was

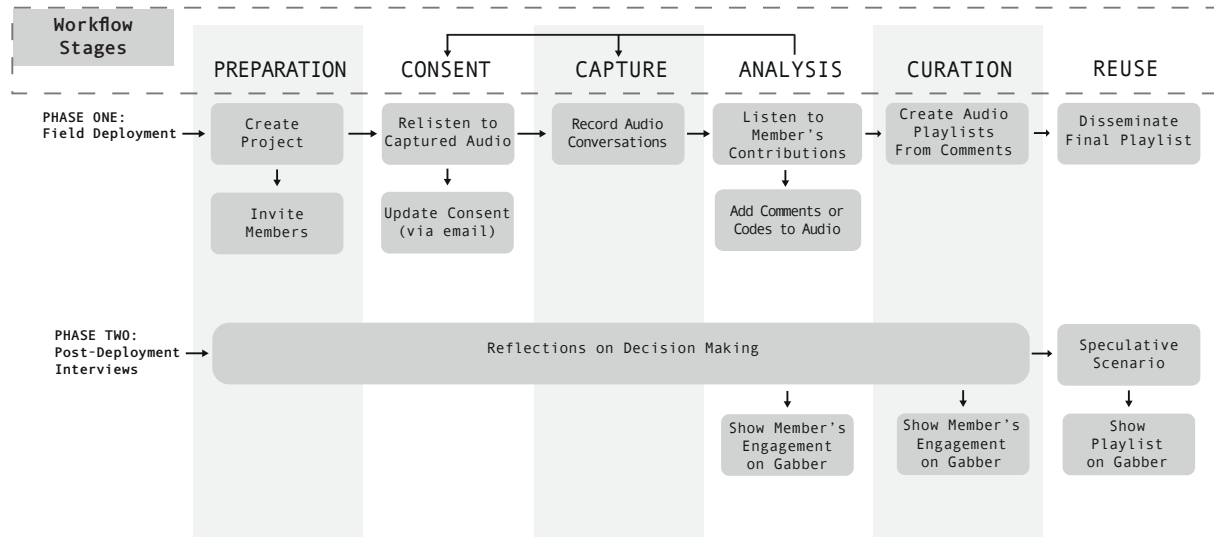


Figure 2: A process diagram highlighting the two phases of the Making Links project and the associated research activities undertaken in each qualitative workflow stage: *preparation*, *consent*, *capture*, *analysis*, *curation*, and *reuse*. Phase One highlights how the co-researchers structured participation with the Gabber platform. Phase Two highlights their reflections on the procedure and the research methods that our research team applied to examine these reflections.

approached when discussing decisions made, data representation, and transparency as outlined in the subsequent sections.

4.3 Data Collection

Interviews took place one week after the data curation stage of the *field deployment* phase (Figure 2) to ensure participants (co-researchers) 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, except for 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, prior research highlights desires from co-researchers 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 [54]. Secondly, prior work highlights that discussing the term ‘paradata’ explicitly could confuse participants as it is an unfamiliar term [16]. This motivated the choice of a scenario to

reflect on the role 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.

4.3.1 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, P4 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 A.

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 co-researchers in the data analysis and curation stages on Gabber’s website. For example, P5

Table 1: Participant’s role in Making Links, their prior experience of qualitative research, and their contributions to each qualitative workflow stage, i.e., Data Preparation, Capture, Analysis, and Curation.

Participants			Preparation	Capture	Analysis	Curation
ID	Role	Prior Experience	Attended	Interviewer (Interviewee)	Comments (codes)	Attended
P1	Researcher	Expert	Y	5 (0)	107 (217)	Y
P2	Staff	Expert	Y	0 (0)	0 (0)	Y
P3	Staff	Novice	N	1 (1)	18 (74)	N
P4	Client	None	N	0 (1)	77 (249)	N
P5	Client	None	Y	0 (0)	0 (0)	N
P6	Client	Novice	Y	2 (1)	175 (267)	N
P7	Client	None	N	0 (1)	0 (0)	N
P8	Client	None	Y	0 (1)	63 (101)	Y
P9	Client	None	N	0 (1)	0 (0)	N
Total			5	8 (6)	364 (793)	3

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 we prepared summary statistics to describe how others engaged with their contributed data, e.g., 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. Participants were then asked to reflect on 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 and what may be missing.

4.3.2 Speculative Scenario. The second half of the interview used a *speculative scenario* to understand how the decisions participants made when contributing to Making Links could be viewed and benefit others. Participants were presented with a handout of the following scenario that was read verbatim to contextualise the preceding discussion:

Sami, CEO of ActionHub, 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 ground participant’s responses in relation to the outcome of Making Links. Three questions were then asked to structure 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.

4.4 Data Analysis

All interviews were audio recorded one-week following the completion of the field deployment of Making Links. Interviews lasted 47-minutes on average (SD=09m33s, min=35m51s, max=62m) and were transcribed verbatim using a transcription service. An inductive thematic analysis (TA) approach was taken following Braun and Clarke [6]’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 throughout the field deployment – 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 our research team that 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. The Gabber platform was used to record the research interviews, but not for data analysis. This decision was influenced by co-authors preferences to read and interact with transcripts (compared with audio recordings in Gabber), prior collaboration practices amongst co-authors, and internal time constraints of upcoming publication deadlines. This iterative, inductive process resulted in four themes that are presented in the phase two section below.

5 PHASE ONE: FIELD DEPLOYMENT

This section describes the findings of a four-month field deployment of a digital platform (Gabber) that was used to support the qualitative practices of co-researchers in Making Links.

5.1 Findings

The Making Links qualitative research process spanned four months, where nine co-researchers contributed at various research stages as outlined in Table 1. Five workshops (each lasting three-hours) were held across this period to structure each research stage (i.e., preparation, data capture, analysis, curation) and to assist

co-researchers in familiarising themselves with Gabber. All co-researchers were invited to attend all stages and lack of attendance to any was due to participant unavailability.

Co-researchers created Gabber projects and associated topics to structure data capture (Figure 1.A.) from each group of interest: budget holders (employer), personal assistants (employees), and family supporters. Co-researchers took responsibility to capture interviews with peers from their personal networks that they believed could contribute valuable experiences or nominated peers to be interviewed by P1 (a researcher) where their personal scheduling made interviewing peers challenging. In total, seven co-researchers recorded eight interviews, creating 3 hours 12 minutes of audio recordings ($M=14m45s$, $SD=08m15s$, $min=03m53s$, $max=29m23s$).

Following the data capture stage, a workshop was held with five co-researchers who undertook close listening to the recorded audio to familiarise themselves with the data. Co-researchers then created a codebook resulting in 15 codes that spanned key themes of significance for the community such as 'Recruitment', 'Wellbeing', and 'Control'. This stage initiated the first steps of community members contributing to data analysis. Five co-researchers created 364 comments across all interviews in total ($M=17.3$, $SD=17.5$) where 793 codes were applied ($M=79.3$, $SD=32.2$ 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. Through paired analysis, 68 comments (18%) were created comprising 175 codes (22%), indicating that the data analysis workshop provided an opportunity for some co-researchers to engage in analysis who did not otherwise.

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 co-researchers (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, co-researchers 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 co-researchers to overlook specific data. As such, the group discussed and planned their playlists, resulting in the creation of 11 across a range of themes, e.g., "The role of a PA" and "Employer: Recruitment Process". In total, playlists lasted 35 minutes 38 seconds ($M=3m14s$, $SD=1m55s$, $min=0m44s$, $max=8m3s$) that each contained nine commented audios on average ($SD=4.7$, $min=2$, $max=19$). Four 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 documented by contributors.

Through a summary of the field deployment, this section illustrated the intensity of participation and decision-making undertaken at each qualitative workflow research stage. The following section outlines where paradata could be captured in Gabber and describes where it could be used in practice.

5.2 Process Transparency Through Audio Interaction Paradata

Through observing co-researchers with varying prior experiences in qualitative research, we gained insight concerning the challenges experienced in each qualitative workflow stage that informed our understanding of the ways that paradata could be used to address them. Being part of the Making Links project and analysing the results also served as a reflective process of our own research practices that helped shape our understanding on paradata's role.

Gabber already utilises *metadata* across the platform to represent what and when topics were discussed during interviews, who analysed and commented on interviews through pseudonymous icons to conceal identities, and the duration of interviews and playlists. Potential *paradata* measures that could be recorded in Gabber is described in Table 2, which has design implications for other digital tools for qualitative research such as QSR International [52], Condens [15], and OurStory [3]. Gabber is designed to enable interactions with the original captured audio interview. The *Listening Coverage* measure from Table 2 could leverage the playback logs from Gabber to highlight when a user starts and finishes listening to a portion of an audio (interview) to infer what proportion of the recording were listened to, if there were sections that were skipped, or sections that are repeatedly listened to. Likewise, *Engagement Rate* would provide insight into the total duration each researcher spent creating memos (comments), applying codes, or both. This combination of listening coverage and engagement rate could enable process transparency and trust that the research data represented (such as in a written report) are representative of what the participant said as we could observe if all researchers listened and annotated that data.

Data analysis was observed as the qualitative workflow stage that took the most time and effort from participants and so using paradata to represent decisions in that stage is critical. Generating *Thematic Maps* of the multiple processes associated data analysis is one potential role for paradata. For example, storing the *order* that audio interviews were listened to and *when* codes emerged or changed for each researcher in the research team. This paradata could enable data provenance of analytical procedures through visualisations that allow stepping through each change like version control systems in software development practices. This qualitative paradata could be automatically curated into a diary or journal to represent the process to others to overcome challenges of data sharing amongst qualitative researchers [65].

Our aim with Table 2 was to provide tangible descriptions of paradata derived from interactions with media. Taken together, paradata could be captured to provide insight into *process transparency* through making visible behaviours and interactions with the captured and analysed data, *researcher bias* such as if one researcher

Table 2: Examples of paradata that could be generated through Gabber during the data analysis stage.

Name	Description	Design Considerations
<i>Listening Coverage</i>	The proportion of the single audio clip listened to by an individual.	Could illustrate which data was <i>not</i> engaged with to surface researcher bias (and rigour) when reporting findings.
<i>Engagement Rate</i>	The time spent ‘engaging’ with data, such as listening to an audio interview, creating comments, or applying codes.	Could provide insight into the effort required to undertake research activities, but such paradata could result in ‘gaming’ the process through producing paradata in ways to achieve an ideal characteristic.
<i>Thematic Maps</i>	The order and frequency of how codes and comments (memos) on data evolved through reflection or/and collaboration.	Could enable data provenance of the decisions researchers made to support process transparency. This requires capturing and storing all (temporal) actions during an annotation such as word types, but introduces privacy considerations.
<i>Data Discards</i>	The quantity of raw data that has been removed, such as notes taken, proportion of interviews not used in data analysis, or the time spent creating annotations that were discarded before saved.	Could illustrate the decisions made and effort spent engaging in qualitative practices. This would require storing deleted paradata (associated with a deleted memo) that raised additional consent challenges.

disproportionately contributed to data analysis, and *representation* such as if analysed data was not reported despite being the ‘most listened’ in the dataset. Our observations and reflections on the field deployment of Gabber helped to understand the potential role of paradata that could be beneficial to qualitative research practices. To understand the utility of paradata in the co-research context, we sought to gain perspectives from co-researchers through follow-on interviews.

6 PHASE TWO: POST-DEPLOYMENT INTERVIEWS

Our findings outline four themes that highlight different roles of paradata in qualitative research practices: (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 creators 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, i.e., funding agencies.

6.1 Reflecting on Digitally Enhanced Qualitative Practices

Data analysis in Gabber occurs by creating textual comments and applying codes to snippets of an audio interview. 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 would not be shared publicly without specific additional consent.

Participants empathised decisions that occurred outside of Gabber usage that impacted their future interactions 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 that 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. Documenting how data 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 as outlined in Table 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 has the potential to help explain what and how participants engaged with qualitative data but can benefit from 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 particularly important to explain why an individual’s paradata may diverge from others, such as the time they spent when undertaking data analysis may be considerable despite not interacting with the media recording, e.g., being away from the screen.

6.2 Demystifying Decisions in Qualitative Practices

When presented with the analysis interface from interviews across Making Links, P2 – who was the CEO of ActionHub and only involved in the initial preparation and final curation stages – was surprised to see the quantity of comments and overall engagement with interviews. P2 then requested a breakdown on how long each participant spent contributing to gauge the overall effort required to run future instalments of Gabber. In contrast, P6, 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.” (P6)

P6 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?” (P6)

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 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.

6.3 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 [34, 35]. 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. Its 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 in this co-research project 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 it came from. ... if there was somewhere you could click into and 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 using predefined metadata, e.g., W3C’s PROV standard [26]. 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 co-researchers.

6.4 Evidencing Engagement

Researchers often strive to “give voice” to participants through how they represent their experiences as research findings [1]. 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 [17, 35]. 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 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 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 paper and strengthened though being able to “demonstrate the process you’ve gone through” (P2) that could be possible with paradata.

7 DISCUSSION

This paper 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 the field deployment phase 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). What our findings highlighted is that *objective* and *subjective* interpretations of paradata are desired and could be recorded through systems like Gabber and used to enhance process transparency amongst other practical uses. Here objective paradata could entail the time spent listening to an interview while subjective accounts 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, we posit the need to design *personalised* interfaces that represent paradata in ways that are meaningful to co-researchers and participants. 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.

7.1 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 considerable time being devoted to that activity. In this instance, paradata is *subjective* and requires *contextualisation* to be meaningful to the individual. 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.

Researchers are increasingly adopting reflexive approaches to qualitative research that emphasise transparency of the researcher's personal values and belief systems, and how these influence the research and analytical process [7, 29]. Reflexive statements could be used to further contextualise paradata by outlining *why* decisions were made [66]. However, reflexive statements can contain personal data that could introduce barriers to sharing, and if written ad-hoc by the researcher may not be meaningful to others, e.g., during data analysis.

Contextualising data automatically recorded by technologies to enhance its value is a well-documented design challenge in *personal informatics* [22, 33]. Without contextualisation, data generated by personal informatics tools can be difficult to interpret or often misunderstood when shared with others [62]. Contextual visualisation techniques have been used to help people gain insight from their data and communicate it to others [12]. Likewise, research has explored how other people's metadata from within a community (i.e., a workplace) can be overlaid to inform shared reflection around health practices [50].

While automating contextualisation of data remains an open-challenge, recent qualitative research has begun to explore semi-automated approaches to coding data where NLP models recommend codes based on prior coding practices [36, 57]. These approaches have the potential to transform existing qualitative practices, particularly for large datasets. In such systems, paradata could be derived when codes were accepted or rejected, and at that point capture context from the researcher regarding *why* they made their decision. Likewise, it would be critical to clarify when automated recommendations have been used within reports (e.g., a transcript) to ensure that there is human oversight, which could be achieved through contextualising outcomes with paradata. Automation is primarily focused on data analysis and so there is scope to explore the design of paradata interfaces within the other research stages.

Recent work explores how paradata can be used to visually summarise existing music listening practices. Wirfs-Brock et al. [71] 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 involved in the research as each data source further contextualises the other. In this way, and like [71], 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' needs. The following subsections outline the opportunities and challenges for designing and using paradata to supplement raw data for *researchers* and *research participants* respectively.

7.1.1 For Researchers to Enhance Data Sharing. Recent research within the HCI community frames transparency in qualitative research with two components: *process transparency* and *data sharing* [65]. Our findings highlight desires to make visible decisions from across the research process and therefore the potential of process transparency with it through paradata. 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 [23, 65]. 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 order, the thematic mapping process, 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. These risks could be alleviated by adding qualitative paradata as *thematic maps* that not only shows the time *“engaged”* with the transcripts, but also the trail of changes in coding. Beyond academia, paradata-driven interfaces could leverage playful and gamified approaches (such as daily streaks) to sustain participation from co-researchers, which have shown applicability in citizen science and personal informatics research [30, 63]. Such playful approaches could help overcome barriers associated with

the interpretability of large-scale quantitative [50] and qualitative data [34], but requires further exploration to understand how this could be applied within qualitative co-research.

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 paradata is largely independent of the 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 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 [23], such as verifying that all interviews were disseminated.

7.1.2 For Research Participants as a Feedback Loop. Qualitative research methods are increasingly being used by community organisations where transparency of decision-making is becoming increasingly important for accountability and to secure funding [34]. Research participants typically contribute to the preparation and data capture stage (Figure 1), 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 i.e., *listening coverage* and the journey taken i.e., *thematic maps* when *“engaging”* with the data as the co-researchers expressed and desired to know how much time they spent doing analysis and were surprised when they reflected on it. When sharing outcomes from data analysis we contest that aspects of reflexivity (e.g., reflexive statements) should be excluded as they could be difficult to interpret and lead to confusion amongst research participants (or other researchers) as they typically contain personal data from the researcher. Using data for reflection in this way is a widespread practice within personal informatics, e.g., tracking time spent across applications on a computer [25], 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.

Likewise, presenting the research background of the co-researcher in summary reports could add another dimension to help explain why decisions were made. For example, the levels of research *expertise* or context-specific lived experiences as expertise, e.g., years living with a health condition. This could help contextualise *why* pair analysis (e.g., time constraints or to train a collaborator) or bias in data analysis occurred (e.g., selecting data of research participants with similar lived experiences).

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 [39], 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 [16]. This introduces design challenges for how best to represent, capture, and consent for paradata use within research projects where the research participants and the anticipated stages of research that they will contribute to may vary.

In our study, 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 participants provides one way 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 [10, 14].

8 LIMITATIONS

This paper presents findings from an exploratory research study where participants from a real-world co-research project utilised a digital platform across *all research stages* and reflected on the intended paradata usage through follow-up interviews. 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., through digital civics research [20, 68]), and so there is a need to further explore the transferability of these findings. This paper 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 co-researchers or study participants where tangible forms of paradata – e.g., *data profiles* [71] – captured throughout the research workflow are presented, discussed, and reflected upon by the research team, and thus extend the design learning presented here.

9 CONCLUSION

This paper draws from existing research to conceptualise the potential role of paradata for practitioners of qualitative research as a tool to improve process transparency, i.e., the procedures associated with accessing, using, or engaging with a system, process, or data. We then present a co-research project, Making Links, where co-researchers engaged in all decision-making associated with qualitative research through using an existing open-source technology. Observations of technology use and post-deployment interviews reflecting on the decisions participants made provided unique perspectives on paradata that has implications for technology design for qualitative research. Our findings highlight how paradata has a potential role in demystifying the processes associated with research for research participants, provide opportunity to contest decisions made on contributed data, and could be used to observe how contributions create research impact. We posit two properties of paradata – *objective* and *subjective* – and the associated design challenges that can inform the design of future paradata-driven interfaces, i.e., a need for *contextualisation* of paradata to render it more meaningful to others.

ACKNOWLEDGMENTS

This research was funded by EPSRC's center for doctoral training (CDT) in Digital Civics (EP/L016176/1). Data supporting this work is available at: <https://doi.org/10.25405/data.ncl.14067209>.

REFERENCES

- [1] Christine Ashby. 2011. Whose "Voice" is it Anyway?: Giving Voice and Qualitative Research Involving Individuals that Type to Communicate. *Disability Studies Quarterly* 31 (2011), 55–66. <http://dsq-sds.org/article/view/1723/1771>
- [2] Louise Barkhuus and Barry Brown. 2011. TagPad for iPad – Designing a Support Tool for Interview Studies. In *The Eleventh Danish Human Computer Interaction Research Symposium*. Copenhagen Business School, Copenhagen, Denmark, 49–52.
- [3] Tom Bartindale, Delvin Varghese, Guy Schofield, and Miki Tsukamoto. 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* (Glasgow, Scotland Uk) (CHI '19). ACM, New York, NY, USA, Article 437, 12 pages. <https://doi.org/10.1145/3290605.3300667>
- [4] 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* (Vienna, Austria) (C&T '19). ACM, New York, NY, USA, 210–217. <https://doi.org/10.1145/3328320.3328405>
- [5] Simon Bowen, Peter Wright, Alexander Wilson, Andy Dow, Tom Bartindale, and Robert Anderson. 2020. Metro Futures: Experience-Centred Co-Design at Scale. In *Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems* (Honolulu, HI, USA) (CHI '20). ACM, New York, NY, USA, 1–13. <https://doi.org/10.1145/3313831.3376885>
- [6] Virginia Braun and Victoria Clarke. 2013. *Successful Qualitative Research: A Practical Guide for Beginners*. SAGE Publications Ltd, London.
- [7] Virginia Braun and Victoria Clarke. 2019. Reflecting on reflexive thematic analysis. *Qualitative Research in Sport, Exercise and Health* 11, 4 (2019), 589–597. <https://doi.org/10.1080/2159676X.2019.1628806>
- [8] California Department of Justice. 2018. California Consumer Privacy Act of 2018. Retrieved January 8, 2022 from http://leginfo.ca.gov/faces/codes_displayText.xhtml?lawCode=CIV&division=3.&title=1.81.5.&part=4.&chapter=&article=
- [9] Mario Callegaro. 2013. Paradata in Web Surveys. In *Improving Surveys with Paradata: Analytic Uses of Process Information*. John Wiley & Sons, Inc., Hoboken, New Jersey, 259–279. <https://doi.org/10.1002/9781118596869.ch11>
- [10] Amelia Chauvette, Kara Schick-Makaroff, and Anita E. Molzahn. 2019. Open Data in Qualitative Research. *International Journal of Qualitative Methods* 18 (2019), 0–6. <https://doi.org/10.1177/1609406918823863>
- [11] Jilin Chen, Gary Hsieh, Jalal U. Mahmud, and Jeffrey Nichols. 2014. Understanding Individuals' Personal Values from Social Media Word Use. In *Proceedings of the 17th ACM Conference on Computer Supported Cooperative Work & Social Computing* (Baltimore, Maryland, USA) (CSCW '14). ACM, New York, NY, USA, 405–414. <https://doi.org/10.1145/2531602.2531608>
- [12] Eun Kyoung Choe, Bongshin Lee, and m.c. schraefel. 2015. Characterizing Visualization Insights from Quantified Selfers' Personal Data Presentations. *IEEE Computer Graphics and Applications* 35, 4 (2015), 28–37. <https://doi.org/10.1109/MCG.2015.51>
- [13] Lewis L. Chuang and Ulrike Pfeil. 2018. Transparency and Openness Promotion Guidelines for HCI. In *Extended Abstracts of the 2018 CHI Conference on Human Factors in Computing Systems* (Montreal QC, Canada) (CHI EA '18). ACM, New York, NY, USA, 1–4. <https://doi.org/10.1145/3170427.3185377>
- [14] Andy Cockburn, Carl Gutwin, and Alan Dix. 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*. ACM, New York, New York, USA, 1–12. <https://doi.org/10.1145/3173574.3173715>
- [15] Condens. 2020. Supercharge Your UX Research Analysis. Retrieved January 8, 2022 from <https://condens.io/>
- [16] Mick P Couper and Eleanor Singer. 2013. Informed Consent for Web Paradata Use. *Survey research methods* 7, 1 (2013), 57–67. <https://doi.org/10.1038/mp.2011.182.doi>
- [17] Clara Crivellaro, Rob Anderson, Daniel Lambton-Howard, Tom Nappey, Patrick Olivier, Vasilis Vlachokyriakos, Alexander Wilson, and Pete Wright. 2019. Infrastructuring Public Service Transformation. *ACM Transactions on Computer-Human Interaction (TOCHI)* 26, 3 (may 2019), 1–29. <https://doi.org/10.1145/3310284>
- [18] Jaewoo Do and Lisa C. Yamagata-Lynch. 2017. Designing and Developing Cell Phone Applications for Qualitative Research. *Qualitative Inquiry* 23, 10 (2017), 757–767. <https://doi.org/10.1177/1077800417731085>
- [19] Dovetail. 2020. The User Experience Platform for Teams – DoveTailApp. Retrieved January 8, 2022 from <https://dovetailapp.com/>
- [20] Andy Dow, Rob Comber, and John Vines. 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* (Montreal QC, Canada) (CHI '18). ACM, New York, NY, USA, 1–13. <https://doi.org/10.1145/3173574.3174016>

- [21] Andy Dow, John Vines, Rob Comber, and Rob Wilson. 2016. ThoughtCloud: Exploring the Role of Feedback Technologies in Care Organisations. In *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems* (San Jose, California, USA) (CHI '16). ACM, New York, NY, USA, 3625–3636. <https://doi.org/10.1145/2858036.2858105>
- [22] Daniel A. Epstein, An Ping, James Fogarty, and Sean A. Munson. 2015. A Lived Informatics Model of Personal Informatics. In *Proceedings of the 2015 ACM International Joint Conference on Pervasive and Ubiquitous Computing* (Osaka, Japan) (UbiComp '15). ACM, New York, NY, USA, 731–742. <https://doi.org/10.1145/2750858.2804250>
- [23] Casey Fiesler, Jed R. Brubaker, Andrea Forte, Shion Guha, Nora McDonald, and Michael Muller. 2019. Qualitative Methods for CSCW: Challenges and Opportunities. In *Conference Companion Publication of the 2019 on Computer Supported Cooperative Work and Social Computing* (Austin, TX, USA) (CSCW '19). ACM, New York, NY, USA, 455–460. <https://doi.org/10.1145/3311957.3359428>
- [24] Borja Garcia, Jo Welford, and Brett Smith. 2016. Using a smartphone app in qualitative research: the good, the bad and the ugly. *Qualitative Research* 16, 5 (2016), 508–525. <https://doi.org/10.1177/1468794115593335>
- [25] Timing Software GmbH. 2020. The Automatic Mac Time Tracker – No More Start/Stop Timers – Timing. Retrieved January 8, 2022 from <https://timingapp.com/>
- [26] W3C Working Group. 2013. PROV-Overview. An Overview of the PROV Family of Documents. Retrieved January 8, 2022 from <https://www.w3.org/TR/prov-overview/>
- [27] Jean Hartley and John Benington. 2000. Co-research: A new methodology for new times. *European Journal of Work and Organizational Psychology* 9, 4 (2000), 463–476. <https://doi.org/10.1080/13594320050203085>
- [28] David Hiles and Ivo Čermák. 2007. Qualitative Research: Transparency and Narrative Oriented Inquiry. *10th European Congress of Psychology, Prague, CZ, July 1* (2007), 3–6.
- [29] Dorothy Howard and Lilly Irani. 2019. Ways of Knowing When Research Subjects Care. In *Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems*. ACM, New York, NY, USA, 1–16. <https://doi.org/10.1145/3290605.3300327>
- [30] Ioanna Iacovides, Charlene Jennett, Cassandra Cornish-Trestrail, and Anna L. Cox. 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* (Paris, France) (CHI EA '13). ACM, New York, NY, USA, 1101–1106. <https://doi.org/10.1145/2468356.2468553>
- [31] Christopher Kullenberg and Dick Kasperowski. 2016. What Is Citizen Science? – A Scientometric Meta-Analysis. *PLoS ONE* 11, 1 (01 2016), 1–16. <https://doi.org/10.1371/journal.pone.0147152>
- [32] Tanja Kunz, Camille Landesvatter, and Tobias Gummer. 2020. Informed consent for paradata use in web surveys. *International Journal of Market Research* 62, 4 (2020), 396–408. <https://doi.org/10.1177/1470785320931669>
- [33] Ian Li, Anind Dey, and Jodi Forlizzi. 2010. A Stage-Based Model of Personal Informatics Systems. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (Atlanta, Georgia, USA) (CHI '10). ACM, New York, NY, USA, 557–566. <https://doi.org/10.1145/1753326.1753409>
- [34] Narges Mahyar, Diana V. Nguyen, Maggie Chan, Jiayi Zheng, and Steven P. Dow. 2019. The Civic Data Deluge: Understanding the Challenges of Analyzing Large-Scale Community Input. In *Proceedings of the 2019 on Designing Interactive Systems Conference* (San Diego, CA, USA) (DIS '19). ACM, New York, NY, USA, 1171–1181. <https://doi.org/10.1145/3322276.3322354>
- [35] Jennifer Manuel, Geoff Vigar, Tom Bartindale, and Rob Comber. 2017. Participatory Media: Creating Spaces for Storytelling in Neighbourhood Planning. In *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems* (Denver, Colorado, USA) (CHI '17). ACM, New York, NY, USA, 1688–1701. <https://doi.org/10.1145/3025453.3025745>
- [36] Megh Marathe and Kentaro Toyama. 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* (Montreal QC, Canada) (CHI '18). ACM, New York, NY, USA, 1–12. <https://doi.org/10.1145/3173574.3173922>
- [37] Nora McDonald, Sarita Schoenebeck, and Andrea Forte. 2019. Reliability and Inter-Rater Reliability in Qualitative Research: Norms and Guidelines for CSCW and HCI Practice. *Proc. ACM Hum.-Comput. Interact.* 3, CSCW, Article 72 (Nov. 2019), 23 pages. <https://doi.org/10.1145/3359174>
- [38] Jane Meyrick. 2006. What is good qualitative research? A first step towards a comprehensive approach to judging rigour/quality. *Journal of Health Psychology* 11, 5 (2006), 799–808. <https://doi.org/10.1177/1359105306066643>
- [39] Lokesh P Nijhawan, Manthan D Janodia, B S Muddukrishna, K M Bhat, K L Bairy, N Udupa, and Prashant B Musmade. 2013. Informed consent: Issues and challenges. *Journal of advanced pharmaceutical technology & research* 4, 3 (07 2013), 134–140. <https://doi.org/10.4103/2231-4040.116779>
- [40] House of Commons Committee of Public Accounts. 2016. Personal budgets in social care. Retrieved January 8, 2022 from <https://publications.parliament.uk/pa/cm201617/cmsselect/cmpubacc/74/74.pdf>
- [41] Ministry of Education and Finland Culture. 2004. FAIR principles | Fairdata. Retrieved January 8, 2022 from <https://www.fairdata.fi/en/about-fairdata/fair-principles/>
- [42] Department of Health, Social Care, and NHS England. 2018. Extending legal rights to personal health budgets and integrated personal budgets: consultation response. Retrieved January 8, 2022 from https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/780330/Extending_legal_rights_to_health_budgets_consultation_response.pdf
- [43] Victoria Palacin, Maria Angela Ferrario, Gary Hsieh, Antti Knutas, Annika Wolff, and Jari Porras. 2021. Human values and digital citizen science interactions. *International Journal of Human-Computer Studies* 149 (2021), 102605. <https://doi.org/10.1016/j.ijhcs.2021.102605>
- [44] Victoria Palacin, Sile Ginnane, Maria Angela Ferrario, Ari Happonen, Annika Wolff, Sara Piutunen, and Niina Kupiainen. 2019. SENSEI: Harnessing Community Wisdom for Local Environmental Monitoring in Finland. In *Extended Abstracts of the 2019 CHI Conference on Human Factors in Computing Systems* (Glasgow, Scotland UK) (CHI EA '19). ACM, New York, NY, USA, 1–8. <https://doi.org/10.1145/3290607.3299047>
- [45] European Parliament. 2016. Regulation 2016/679 of the European Parliament and of the council. *Official Journal of the European Union* 59, 119 (2016), 149. Retrieved January 8, 2022 from <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=OJ:L:2016:119:FULL&from=EN>
- [46] Trena Paulus, Jessica Lester, and Paul Dempster. 2014. *Digital Tools for Qualitative Research*. SAGE Publications Ltd, SAGE Publications Ltd. 216 pages. <https://doi.org/10.4135/9781473957671>
- [47] Trena Paulus, Megan Woods, David P. Atkins, and Rob Macklin. 2017. 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 (2017), 35–47. <https://doi.org/10.1080/13645579.2015.1102454>
- [48] Paul Prinsloo and Sharon Slade. 2015. Student Privacy Self-management: Implications for Learning Analytics. In *Proceedings of the Fifth International Conference on Learning Analytics And Knowledge* (Poughkeepsie, New York) (LAK '15). ACM, New York, NY, USA, 83–92. <https://doi.org/10.1145/2723576.2723585>
- [49] Kingsley Purdam. 2014. Citizen social science and citizen data? Methodological and ethical challenges for social research. *Current Sociology* 62, 3 (2014), 374–392. <https://doi.org/10.1177/0011392114527997>
- [50] Aare Puussaar, Adrian K. Clear, and Peter Wright. 2017. Enhancing Personal Informatics Through Social Sensemaking. In *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems* (Denver, Colorado, USA) (CHI '17). ACM, New York, NY, USA, 6936–6942. <https://doi.org/10.1145/3025453.3025804>
- [51] Aare Puussaar, Ian G. Johnson, Kyle Montague, Philip James, and Peter Wright. 2018. Making Open Data Work for Civic Advocacy. *Proc. ACM Hum.-Comput. Interact.* 2, CSCW, Article 143 (Nov. 2018), 20 pages. <https://doi.org/10.1145/3274412>
- [52] QSR International. 2020. Qualitative Data Analysis Software | NVivo - QSR International. Retrieved January 8, 2022 from <https://www.qsrinternational.com/nvivo-qualitative-data-analysis-software/home>
- [53] Quirkos. 2020. Simple Qualitative Analysis Software | Quirkos. Retrieved January 8, 2022 from <https://www.quirkos.com/>
- [54] Jay Rainey, Juan Carlos Alvarez de la Vega, Dan Richardson, Daniel 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 ACM Designing Interactive Systems Conference* (Eindhoven, Netherlands) (DIS '20). ACM, New York, NY, USA, 771–784. <https://doi.org/10.1145/3357236.3395531>
- [55] 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* (Glasgow, Scotland UK) (CHI '19). ACM, New York, NY, USA, Article 377, 12 pages. <https://doi.org/10.1145/3290605.3300607>
- [56] Rémi Rampin and Vicky Rampin. 2021. Taguette: open-source qualitative data analysis. *Journal of Open Source Software* 6, 68 (2021), 3522. <https://doi.org/10.21105/joss.03522>
- [57] Tim Rietz and Alexander Maedche. 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* (Yokohama, Japan) (CHI '21). ACM, New York, NY, USA, Article 394, 14 pages. <https://doi.org/10.1145/3411764.3445591>
- [58] Tim Rietz, Peyman Toreini, and Alexander Maedche. 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* (Virtual Event, USA) (UIST '20 Adjunct). ACM, New York, NY, USA, 90–92. <https://doi.org/10.1145/3379350.3416195>
- [59] Guy Schofield, Tom Bartindale, and Peter Wright. 2015. Bootlegger: Turning Fans into Film Crew. In *Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems* (Seoul, Republic of Korea) (CHI '15). ACM, New York, NY, USA, 767–776. <https://doi.org/10.1145/2702123.2702229>

- [60] Clive Seale, Giampietro Gobo, Jaber Gubrium, and David Silverman. 2004. *Qualitative Research Practice*. SAGE Publications, Ltd., London. <https://doi.org/10.4135/9781848608191>
- [61] Conglei Shi, Siwei Fu, Qing Chen, and Huamin Qu. 2015. VisMOOC: Visualizing video clickstream data from Massive Open Online Courses. In *2015 IEEE Pacific Visualization Symposium (PacificVis)*. Institute of Electrical and Electronics Engineers (IEEE), online, 159–166. <https://doi.org/10.1109/PACIFICVIS.2015.7156373>
- [62] Petr Slovák, Joris Janssen, and Geraldine Fitzpatrick. 2012. Understanding Heart Rate Sharing: Towards Unpacking Physiosocial Space. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (Austin, Texas, USA) (CHI '12)*. ACM, New York, NY, USA, 859–868. <https://doi.org/10.1145/2207676.2208526>
- [63] Jan David Smeddinck, Marc Herrlich, Max Roll, and Malaka Rainer. 2014. Motivational Effects of a Gamified Training Analysis Interface. In *Mensch & Computer (M&M'14)*. De Gruyter Oldenbourg, Berlin, 397–404.
- [64] Kaiwen Sun, Abraham H. Mhaidli, Sonakshi Watel, Christopher A. Brooks, and Florian Schaub. 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 (Glasgow, Scotland Uk) (CHI '19)*. ACM, New York, NY, USA, Article 594, 14 pages. <https://doi.org/10.1145/3290605.3300824>
- [65] Poorna Talkad Sukumar, Ignacio Avellino, Christian Remy, Michael A. DeVito, Tawanna R. Dillahunt, Joanna McGrenere, and Max L. Wilson. 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 (Honolulu, HI, USA) (CHI EA '20)*. ACM, New York, NY, USA, 1–6. <https://doi.org/10.1145/3334480.3381066>
- [66] Rivka Tuval-Mashiach. 2017. Raising the curtain: The importance of transparency in qualitative research. *Qualitative Psychology* 4, 2 (aug 2017), 126–138. <https://doi.org/10.1037/qup0000062>
- [67] Delvin Varghese, Patrick Olivier, Tom Bartindale, and Matt Baillie Smith. 2020. Towards Participatory Video 2.0. In *Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems (Honolulu, HI, USA) (CHI '20)*. ACM, New York, NY, USA, 1–13. <https://doi.org/10.1145/3313831.3376694>
- [68] Vasillis Vlachokyriakos, Clara Crivellaro, Christopher A. Le Dantec, Eric Gordon, Pete Wright, and Patrick Olivier. 2016. Digital Civics: Citizen Empowerment With and Through Technology. In *Proceedings of the 2016 CHI Conference Extended Abstracts on Human Factors in Computing Systems (San Jose, California, USA) (CHI EA '16)*. ACM, New York, NY, USA, 1096–1099. <https://doi.org/10.1145/2851581.2886436>
- [69] Chat Wacharamanatham, Lukas Eisenring, Steve Haroz, and Florian Echtler. 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 (Honolulu, HI, USA) (CHI '20)*. ACM, New York, NY, USA, 1–14. <https://doi.org/10.1145/3313831.3376448>
- [70] Mark D. Wilkinson, Michel Dumontier, IJsbrand Jan Aalbersberg, Gabrielle Appleton, Myles Axton, Arie Baak, Niklas Blomberg, Jan-Willem Boiten, Luiz Bonino da Silva Santos, Philip E. Bourne, Jildau Bouwman, Anthony J. Brookes, Tim Clark, Mercè Crosas, Ingrid Dillo, Olivier Dumon, Scott Edmunds, Chris T. Evelo, Richard Finkers, Alejandra Gonzalez-Beltran, Alasdair J. G. Gray, Paul Groth, Carole Goble, Jeffrey S. Grethe, Jaap Heringa, Peter A. C 't Hoen, Rob Hooft, Tobias Kuhn, Ruben Kok, Joost Kok, Scott J. Lusher, Maryann E. Martone, Albert Mons, Abel L. Packer, Bengt Persson, Philippe Rocca-Serra, Marco Roos, Rene van Schaik, Susanna-Assunta Sansone, Erik Schultes, Thierry Sengstag, Ted Slater, George Strawn, Morris A. Swertz, Mark Thompson, Johan van der Lei, Erik van Mulligen, Jan Velterop, Andra Waagmeester, Peter Wittenburg, Katherine Wolstencroft, Jun Zhao, and Barend Mons. 2016. The FAIR Guiding Principles for scientific data management and stewardship. *Scientific Data* 3 (2016), 1–9. <https://doi.org/10.1038/sdata.2016.18>
- [71] Jordan Wirfs-Brock, Sarah Mennicken, and Jennifer Thom. 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 (Honolulu, HI, USA) (CHI '20)*. ACM, New York, NY, USA, 1–11. <https://doi.org/10.1145/3313831.3376493>
- [72] Megan Woods, Trena Paulus, David P. Atkins, and Rob Macklin. 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 (2016), 597–617. <https://doi.org/10.1177/0894439315596311>

A 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 **MakingChains**, 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): What if you could change anything?

- Challenges with using Gabber (depending on their role)
- How this process and tool could be improved? Anything you would change?