The Case for Computational Competence and Transversal Skills: Using Digital Tools and Spaces for Qualitative Research

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Abstract

When digital tools or spaces are involved in the design and implementation of qualitative research projects, the researcher is faced with the need to develop another type of competence, computational. Digital tools and spaces are growing avenues which facilitate data collection and analysis in new ways, such as through online surveys, videoconferencing platforms, social media sites, and qualitative data analysis software (QDAS). To utilize these tools, researchers need both computational competence and transversal skills. These skills allow the researcher (or research team) to transfer their knowledge of designing and implementing qualitative research to the digital realm, assuring trustworthiness and ethical behavior in using a digital tool or space. This essay discusses these two dimensions and how appropriating computational competence and transversal skills through digital tools or spaces may lead to higher-quality research projects.

Keywords

digital tools and spaces, computational competence, CAQDAS, reflexivity, transversal skills, ethics, trustworthiness

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When digital tools or spaces are involved in the design and implementation of qualitative research projects, the researcher is faced with the need to develop another type of competence, computational. Digital tools and spaces are growing avenues which facilitate data collection and analysis in new ways, such as through online surveys, videoconferencing platforms, social media sites, and qualitative data analysis software (QDAS). To utilize these tools, researchers need both computational competence and transversal skills. These skills allow the researcher (or research team) to transfer their knowledge of designing and implementing qualitative research to the digital realm, assuring trustworthiness and ethical behavior in using a digital tool or space. This essay discusses these two dimensions and how appropriating computational competence and transversal skills through digital tools or spaces may lead to higher-quality research projects.

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Introduction

Using technology at various stages of a qualitative research project is becoming commonplace for many researchers. For some, the use of digital tools and spaces may have been a natural shift in the trajectory of their research agenda with the Digital Age. Others may have been forced into it with the advent of the COVID-19 pandemic, which may have led to new approaches to research (Fetters & Molina-Azorin, 2021). Indeed, using digital tools and spaces can infiltrate every research project phase, leading to a digital workflow offering a holistic framework from beginning to end (Paulus & Lester, 2022). While technology has opened new avenues and possibilities for qualitative researchers around the world, they must also consider new methodological and ethical consequences of using digital tools to complete qualitative research (Lester & Paulus, 2023).

Thus, as promising as it is, technology does not come without cost. Researchers must learn to transfer their research skills to a new, virtual context. This shift can be difficult, as cresting this learning curve requires a certain amount of digital fluency. For example, using a qualitative data analysis software (QDAS) requires that researchers be aware of the above-mentioned concerns related to their software of choice and take steps to address them in their study design and implementation (Brandão & Costa, 2020; Costa & Moreira, 2019). With these challenges and possibilities in mind, we refer to the technical knowledge needed to use a digital tool adequately during a research project as "computational competence." Following that, researchers must transfer their research skills, methodological knowledge, and assurances of quality and rigor (i.e., trustworthiness) to their chosen digital platform. We refer to the ability

to transfer such methodological skills from face-to-face or paper formats into digital contexts as "transversal skills."

This paper considers the relationship between computational competence and transversal skills. We first discuss the benefits and complications in using digital tools and spaces for data collection and analysis, specifically examining two concerns — trustworthiness and ethics. We do so to present misunderstood concepts and practices within the context of using digital tools to complete research. We then discuss how researchers can use their computational competence and transversal skills to practice reflexivity and account for the ethical and methodological complications of using digital tools and spaces to collect qualitative data. With this focus, the paper intends to offer guidance to novice qualitative researchers, particularly students, when conducting research using digital tools, irrespective of their chosen research design. This essay problematizes questions about these dimensions based on the authors' reflections of their methodological experiences.

Some Considerations about Digital Tools and Spaces

From our experience, a researcher must have computational competence to adequately use digital tools in various stages of a research project. Many digital tools were built with technological assumptions of what the user does and does not already know (Renom et al., 2022). Luckily, there is a plethora of guidance regarding how researchers should develop computational competence before using digital tools for qualitative research projects (c.f. Dahlin, 2021; Salmons, 2022; Woolf & Silver, 2018). Computational competence of digital tools in qualitative research is built on the premise that the researcher has theoretically and methodologically grounded herself before selecting a particular tool or software. While tools and methods can be learned simultaneously, researchers seasoned in using digital tools may recommend that novices have solid methodological grounding before learning a particular tool (Paulus et al., 2014; Paulus et al., 2019).

Computational competence and transversal skills are becoming invaluable because technology has dramatically enhanced the possibilities of some data collection techniques. Thus, while researchers must critically examine the use of technology in a study before selection, there are a great deal of positive outcomes for researchers who use digital tools or spaces to collect qualitative data. For example, researchers can use online tools to conduct interviews, focus groups, and even observations. Reaching participants in different parts of the world is more accessible and expenses are reduced. Digital tools and spaces allow researchers to instantly collect and describe previously recorded audio or video data. Researchers today have wider access than ever to relevant data sources, academic documents, and publications. Social media (theoretically) provides a wealth of data researchers can analyze to understand user attitudes and behaviors.

When researchers move beyond data collection, qualitative data analysis software (QDAS) facilitate the organization, coding, and interpretation of collected data (Freitas et al., 2022). They allow researchers to process large amounts of data more quickly and identify patterns/behaviors and trends (Freitas et al., 2017). QDAS facilitate advanced contextualization and validation procedures, define analysis categories in both an inductive and deductive way, and allow for advanced data visualizations (Costa, 2016; Lage & Godoy, 2008; Spannagel et al., 2005). Moreover, online collaboration technologies enable researchers to collaborate on research projects regardless of their geographic location (Costa, 2016). Many of the previous challenges associated with collaborating on projects, sharing data and ideas, and providing feedback have been mitigated with technology.

What is more, QDAS support the researcher in creating a detailed audit trail of the data analysis process, which enables better transference of findings from one research context to

another. Memoing features allow the researcher to track analysis decisions, practice reflexivity, and describe the trajectory of the research project. They also have built in features that permit researchers to assess inter-coder reliability when collaborating with others. For projects in which this is appropriate, such measures enhance the trustworthiness of qualitative analysis for a research team by "improving the systematicity, communicability, and transparency of the coding process; promoting reflexivity and dialogue within research teams" (O'Conner & Joffe, 2020, p. 1). Overall, digital tools and spaces have dramatically impacted qualitative research and can lead to improved data collection and analysis, facilitate research collaborations (Costa & Costa, 2017), and enhance access to relevant data sources.

While these are actual benefits, researchers must take care and understand the limitations of using digital tools and spaces. Researchers cannot assume their participants have easy access to the same digital tools and spaces they do. While auto-transcriptions are more accessible than ever, researchers still must validate the transcript and, when justified, conduct member checks with the interviewees. What researchers have access to in social media is often up to that platform's algorithm if they do not have access to the Application Programming Interface (API; Housley et al., 2017; Perriam et al., 2020). While many ethical principles remain the same, such as respecting the research protocol, ensuring that all involved parties are consulted and informed about the study, and keeping progress open, transparent, and receptive to criticism, researchers must also ensure that the use of technologies does not compromise confidentiality and sensitivity (Ingleby, 2012). Furthermore, ethical considerations are specific to using software in qualitative data analysis, such as organization and data import, interpretative and descriptive codification, questioning the data, and exporting results. The principles of using software in qualitative data analysis should set new boundaries and define ethics in using software (Stahl et al., 2014). In short, researchers now need to consider different, sometimes new, ethical implications of using digital tools and spaces to collect and analyze data (Hennell et al., 2020; Kurtz et al., 2017; Legewie & Nassauer, 2018).

Regarding trustworthiness, authors such as Morrow (2005) and Lietz et al. (2006) provided early discussions of trustworthiness of data from digital tools or spaces. This dimension can be bridged with data triangulation and multiple data collection methods. With data collected digitally, researchers may have trouble comparing what is said or written with what participants have done due to the textual nature of the recorded data. It can be challenging to establish the trustworthiness of some online data, particularly big data, due to access, privacy, and other circumstances out of the researcher's control (Mills, 2018). When researching online, much of what is investigated is not directly observable (for example, if researchers are collecting data on interventions in Chat; online interviews may not fully capture nonverbal cues and data analysis tools may misinterpret patterns in the data). Thus, this data collection and analysis method may require more active cooperation between researchers than the techniques applied in face-to-face environments. Researchers must now engage through text, image, and sound in a digital medium.

For both data collection and analysis using digital tools and spaces, researchers must continue to practice reflexivity and consider their own biases. They must interrogate how using digital tools and spaces may affect how they collected the data, influenced their engagement with participants, or determined what data they were able to collect, among other complications. As is true in face-to-face research, when using digital tools, the researcher's subjectivity may influence the interpretation of the data (López & Gómez, 2006). When moving beyond data collection to using a tool like a QDAS for analysis, researchers must continue to remain reflexively aware. Specific ethical considerations arise when using such a tool, and Gibbs et al. (2002) argue software is less helpful in addressing validity and reliability issues in the thematic ideas that emerge during data analysis. Similarly, Lage and Godoy (2008) list several criticisms of software in qualitative data analysis, including the possibility of losing

control of the coding process, confusing the software with the methodology, encouraging complex and detailed coding structures, unnecessarily increasing the amount of data collected, having difficulty with the communication between systems, and leading researchers to use a particular method of analysis according to the characteristics of the tool.

Through these examples, we echo others that while technology offers many advantages for qualitative research designs, researchers must be aware of its limitations and work to mitigate its adverse effects (García-Horta & Guerra-Ramos, 2009). Yet, we argue that the advantages of using digital tools and spaces for data collection outweigh the disadvantages. It is becoming clearer that using digital tools and spaces for qualitative data analysis is almost unavoidable (Paulus & Lester, 2022). Researchers must have both computational competence and transversal skills to successfully use digital tools and spaces in research. We now discuss how computational competence and transversal skills can help ensure trustworthiness and the development of an ethical research project.

Computational Competence and Transversal Skills for Rigorous and Ethical Research

Computational competence is the ability to use digital tools and techniques effectively and efficiently to gather, analyze, and interpret data. With the increasing availability of large datasets and advanced technologies, researchers must possess computational competence to handle and process complex information. In the digital world, computational proficiency and cross-disciplinary knowledge are crucial. According to Serpa (2020), developing cross-disciplinary skills is essential for successful social integration and eradicating inequities in the digital age. The same author indicates that the teaching-learning process needs to change to emphasize learning based on a participatory research-action logic in which all participants play active learning roles.

Taslibeyaz et al. (2020) suggest problem-solving activities focus on learning environments to develop computational thinking skills. According to Yadav et al. (2017), this domain is crucial for people to succeed in today's technological society and encourage research in diverse disciplines. For researchers with various computational demands, Hertweck and Strasser (2020) suggest multiple sorts of informational resources and put up a system for classifying levels of computing expertise. The same author claims that offering numerous educational resources for researchers with different computing needs can be time-consuming. By examining the challenges of defining research skills and competencies, Zogla (2021) hopes to get doctoral students to consider the cultural context of various intellectual traditions in education and assist them in selecting the appropriate theoretical sources for their research. Thus, focusing on problem-solving activities, contextualizing generic abilities within genuine practical training, and using a universal approach to teaching computational thinking are critical to developing computational competence.

But what does this all mean for qualitative researchers? Universities and institutions of higher education often are limited concerning the technological resources they may offer doctoral students completing qualitative research. Not all students and researchers have access to a QDAS, transcription service, recording platform, or alternative device through their institution. Students and researchers may have to identify which digital tool they would like to use to complete their research and then work on their own to develop the computational competence necessary to use it effectively in their project. Luckily, many academics are well versed in using various digital tools and can train students in their use once the student gains access to the platform, software, or device. Similarly, there are a variety of virtual resources to train researchers in the use of various digital tools and spaces for research purposes.

The development of computational competence is a learning process that must occur in addition to or after learning about qualitative methodologies and methods. When students and

novice researchers learn digital tools and research methods concurrently or sequentially (within a short timeframe), we argue that research projects may have a more rigorous and ethical outcome. When students of qualitative research learn what it means to be the instrument, they learn how to be reflexive researchers who engage with the complexities of their subjectivities throughout a research project (Freeman & Muhammad, 2023; Pope & Shelton, 2023). While learning the design of methodologies and the implementation of research methods, students can be encouraged to consider the implications of their digital choices and reflexively examine how their use affected the research project's outcomes concerning design, implementation, and participant engagement.

Practically, researchers must have both computational competence and a strong foundation of methodological knowledge before transferring their methodological knowledge to a digital tool. Qualitative researchers are trained to practice reflexivity, and, when using transversal skills to translate methodological needs to a digital tool or space, they critically reflect upon a new dimension of the project. For example, when scheduling interviews face-to-face, researchers consider ethical principles such as where to schedule the interview (e.g., safe, quiet, and private locations for both the interviewee and interviewer), how and when to schedule the interview (e.g., communication preferences for planning, ensuring timeliness, etc.), and the development of rapport so the interviewee feels connected and heard. When conducting interviews using a digital tool, researchers must critically reflect upon the same issues, only now with technology. For example, researchers may have a location (e.g., Zoom, Google Meet, MS Teams, etc.), but they must ensure it is secure and will not be hacked. This often involves enabling a waiting room, using a unique room for each participant, and securely ending the meeting upon completing the interview.

Similarly, using digital tools alters the rapport between participants and researchers. Rather than meeting in person before the interview, researchers must congenially communicate with participants in a virtual environment through text and talk. The work of building rapport often occurs before data collection begins in a unique phase between recruitment and data generation. Interviewers may use their transversal skills to transfer their methodical tactics online and have virtual "coffee," chat via a messaging program, or communicate through email before interviews begin. Upon completion of a virtual interview, researchers now reflexively consider how the technology used may have influenced both the interview's quality and content. For example, researchers may think about whether there were cut-outs in connectivity, if the audio and video worked well, and if the participant had access to a safe, private environment for the interview's duration. Such reflections can lead to improvements in interviewing style and digital tool use during, rather than upon completion of, a project. And, knowing this should lead to a more ethical and rigorous research project from beginning to end.

Conclusions

Kleimola and Leppisaari (2022) identify the future competencies based in three dimensions: (1) subject development (learning literacy, self-efficacy, self-determination, self-competence, reflective competence, decision competence, initiative and performance competence, ambiguity competence and ethical competence); (2) object dimension (design-thinking competence, innovation competence, systems competence and digital literacy); and (3) social environment (sense-making, future and design competence, cooperation competence and communication competence). The authors consider these competencies necessary for higher education students and discuss how the development of these competencies can be supported with learning analytics. The same authors express that to deal with complex topics and tasks, students should acquire object-related competencies, such as changeability and digital competence. We agree with Bell (2021) that digital skills and technologies are

constantly changing in research. Due to the complex nature of doctoral research, it is difficult to draw definite conclusions about the many factors that influence research students' digital literacy practices.

Even more pressing, and something not discussed in this paper, is that we are in a digital transformation with the unbridled proliferation of Artificial Intelligence (AI). Advanced AI technologies, such as Generative AI, can self-learn and create various types of content, such as code, text, video, and audio content, that can be useful in qualitative research. However, the unique nature of Generative AI poses some concerns, including ambiguity around copyright, lack of truthfulness and accuracy, and the potential for misuse and bias. Despite these concerns, some researchers may still believe they can use Generative AI to learn something new from imperfect data (Costa, 2023). Just as word processing programs have become essential tools for increasing productivity, digital tools incorporating AI may also become standard for researchers. According to Costa (2023), these tools may be seen as a "superpower" that democratizes content creation, transforming and reshaping researchers' tasks without replacing them. Overall, Generative AI has the potential to revolutionize research by offering new ways to create and analyze data. Still, researchers must use it responsibly and with awareness of its limitations.

This essay discussed the strengths and weaknesses of using digital tools and spaces to complete qualitative research projects. We did so to encourage researchers to consider more deeply the positive potential and added complications for qualitative research projects when adding in a digital tool or space. To do so effectively, researchers must have a strong foundation in research methods and the computational competence to use a digital tool or space. They must then use their transversal skills to implement their methodological knowledge to use the digital tool or space powerfully in a research context. The brief examples provided above illustrate this process. In short, while digital tools and spaces have much to offer researchers, they must also educate themselves in their use and practice reflexivity on the outcome of such to produce rigorous and ethical research.

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