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Software Company Workplace Bias in Technical Communication

Amanda Altamirano
University of Central Florida

SOFTWARE COMPANY WORKPLACE BIAS IN TECHNICAL COMMUNICATION

by

AMANDA ALTAMIRANO
B.S. Arizona State University, 2015

M.S. Arizona State University, 2017

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Major Professor: Sonia H. Stephens

ABSTRACT

This dissertation is an interdisciplinary work that explores the intersection of humanities and technical communication by focusing on the presence and impact of software company workplace bias in technical professional communication. It focuses on workplace bias in technical communication because, when present, bias can impact the experiences that technical communicators and end-users (people who use the software) have with the software. This mixed-methods study consists of a survey, an interview, and a new diagram designed to help technical communicators mitigate biases in technical documentation. To understand better the presence and impact of bias in these workplace contexts, this study surveys and interviews technical communication professionals (TCPs) with software industry work experience.

First, I introduce key relationships and terms that connect the software industry to technical communication, discuss the significance of workplace bias in technical communication, and provide an overview of the study, including its research questions, research methods, and design. Next, I present background based on a literature review, including defining and presenting workplace bias issues in the software industry and technical communication field. I also present intersectional feminism as the theoretical framework. Thereafter, I detail research methods, which include the mixed-methods design, strategies for a feminist research approach, and a detailed explanation of the survey and interview design. Next, I present survey and interview results and discuss implications from professional and scholarly technical communication lenses. Finally, I draw conclusions about workplace biases based not only on survey and interview data but also by discussing new intersectional themes that offer new bias-based perspectives and legitimize issues of intersectional feminism and social justice in technical communication.

I dedicate this work to Conrad Altamirano.

Dad,

I hope you are singing with Elvis, dancing with mariachis, and drinking some damn good craft beer.

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LIST OF ACRONYMS/ABBREVIATIONS

ACM: Association for Computing Machinery

AI: artificial intelligence

ASU: Arizona State University

DEI: diversity, equity, and inclusion

GIT: Graphic Information Technology

IRB: Institutional Review Board

Q: Question

RQ: research question

SIG: special interest group

SIGDOC: Special Interest Group Design of Communication

SME: subject-matter expert

STC: Society of Technical Communication

SRC: Student Research Competition

TC: Technical Communication

TCP: Technical Communication Professional

UCD: user-centered design

UCF: University of Central Florida

CHAPTER ONE: INTRODUCTION

This chapter introduces concepts that are critical to this work, starting with the fundamental relationship between the software industry and technical communication (TC). It continues by providing an overview of software team structure and TC roles. Next, it defines technical communicators in the software industry. It also discusses the significance of workplace bias in TC and presents an overview of this study. Finally, it presents an overview of this dissertation's chapters.

The Fundamental Relationship Between the Software Industry and Technical Communication

Computer software plays a prominent role in the daily routine of billions of people worldwide. These computer software users access these technologies for personal and professional use (and in many cases, for both), making software a critical, impactful tool for the people that use it and those around them; "search engines, recommendation systems, mapping applications, blog tools, auction tools, instant messaging clients, and, of course, platforms which allow people to write new software—iOS, Android, Facebook, Windows, Linux—are in the center of the global economy, culture, social life, and, increasingly, politics" (Manovich, 2013, p. 7). Manovich's statement is supported by recent software company reporting. For example, one of the top computer software companies in the world, Microsoft, reported an 18% increase in their quarterly revenue that ended in March 2022, valued at $49.4 billion (2022). Companies like Microsoft are in the business of selling software as their "product." As a result, software production teams are an integral part of these workplaces. By directly supporting software development, they contribute to creating and managing technologies used by hundreds, thousands, and, in some cases, millions of people.

Technical communication is a critical focus for software production teams, as technical communication is about "creating content that is comprehendible and properly conforms to the

expected human behavior in complex situations" (Albers, 2012, p. xliii). Therefore, the technical communicators working for these companies can profoundly impact how end-users consider the usage and usefulness of the software. Because technical communicators in these workplaces can impact end-user experiences, as Albers described, it is important to understand what it means to be a "technical communicator" in the software company context. Defining technical communicators within these work contexts can vary; for additional information, see the *Defining Technical Communicators in the Software Industry* section of this chapter. However, a simplified definition stems from understanding the relationship between technical communicators and end-users. The relationship between these two groups is key because technical communicators working for software include employees who are tasked with creating and managing technical software documentation that is consumed by end-users. Therefore, I use "technical software documentation" to refer to the instructions for using the software. I also align with the definition of "software documentation" as "reference, help, or training materials about computer software" (Barker, 1991, p. 121) that are distributed in a print or electronic format. Regardless of the output type, technical communicators create and manage this information for delivery to end-users. At the time of Barker's definition, software documentation was predominately in a printed format, and electronic modalities were present but less frequently disseminated in the industry than today. While this study prioritizes this historical definition, it acknowledges today's complexities in defining software documentation, as various formats and modalities are used in the software industry. Therefore, it also uses "documentation" interchangeably with software documentation. For example, it could refer to printed instructions, electronic instructions (e.g., PDF), or other multi-media formats that software companies use to display information on how to use their software. Software documentation can be consumed using several formats (e.g., print, or electronic) or modalities (e.g., instruction book,

website, mobile application, downloadable file). Software documentation is designed to help end-users understand various topics, such as installation and use of the software.

When discussing documentation in software contexts, the term “end-users” is frequently referenced. End-users refer to the people who use the software. When discussing types of end-users, there are two subsets: internal and external. An “internal” end-user refers to those who use software for internal use only because they work for the company that creates the software. For example, a software tester (a person who tests the software to see if it is working as expected) may use the software made by company X only when they are testing it for work-related purposes. They are still end-users, but they are categorized as internal end-users. In contrast, an “external” end-user is someone who uses the software but works outside the company of the company (e.g., a customer). While documentation formats are relevant to the technical communicator and end-user relationship because they can impact the effectiveness of the documentation (Johnson, 1998) (which corresponds to important interdisciplinary areas for technical communication, such as usability and user experience), I did not design this work to inquire about specific software documentation formats. To better understand the relationship between technical communication and the software industry, the data collected for this project broadly encompasses all documentation outputs by surveying and interviewing TCPs about their experiences with biases in these workplaces, which includes questions exploring biases as they pertain to software documentation.

Internal and External End-Users

This section expands on the preceding definition of end-users and clarifies the distinctions between their respective subsets, “internal” and “external.” Additionally, it clarifies the scope of use in this dissertation. Although technical communicators working for software companies may create technical documentation for internal and external consumption, I focus on collecting data from TCPs

based on their views as internal end-users. Because I did not collect data from external end-users, when it refers to end-users during discussions of survey and interview results, it may represent one of two meanings. First, TCPs often use the word end-users with an implied meaning that they refer to external end-users. Second, this dissertation uses end-users to represent the impact and perceptions of TCPs from an internal end-user standpoint because it aims to distinguish between internal and external end-users when it is not inherently clear based on context.

It is also important to note that this study may present findings from TCPs who are not end-users of the software. This distinction is important because being an end-user was not a participant requirement. In addition, survey and interview responses may differ between participants who are end-users and those who are not. For example, consider a software company that makes point-of-sale software that their customers (external end-users) consume for retail purposes. The technical writer working for this company creates documentation that explains how to use the software. A "technical writer" is the TCP primarily responsible for writing and editing the documentation. However, in this scenario, the technical writer does not use the software. Therefore, this technical writer is *not* an end-user. In this example, the technical communicator can only speak to the documentation regarding their professional experience, but not as an end-user. On the other hand, if the technical writer working for the same software company creates the documentation and uses the software for training, this is an example of the technical writer being an end-user. This is relevant to the participant feedback I collected during the survey and interview portions. The TCP's end-user status is clarified when contextually relevant to describing methods in Chapter Three and presenting results in Chapter Four.

Another reason this distinction is important is that TCPs who are not technical writers may assist technical writers by *helping* write or edit documentation. For example, a software developer may write up an explanation of a new enhancement they created and give it to the technical writer to add to the

documentation. Even though the software developer was the technical writer for that specific, new functionality of the software, I refer to them as a "software developer" as opposed to the "technical writer." This is because the primary role of the developer is software development. The research design does include questions to determine the primary role of participants, which allows findings to be representative of individuals who perform technical writing as a primary function of their role. This part of the research design is discussed in greater detail in Chapter Three.

Structure of Software Teams and Technical Communicator Roles

This section presents an overview of the structure of software teams and the role(s) of technical communicators working on those teams. It also presents team structure and role examples that helped form my framework for the theory and research design.

Software Production

Because this study targets TCPs with work experience with companies that produce software products for external customers, "software production" refers to any team developing software for these organizations. Participants must have experience working on or collaborating with the software production team because individuals working on these teams are directly responsible for creating the software that the technical writer documents. In addition, these teams typically house most of the subject-matter experts (SMEs) and other project stakeholders that inform information communication design. Although I focus on software production teams as internal end-users, it should be noted that some software companies produce software for other purposes (e.g., nonprofit organizations, internal use only) and may also leverage technical communicators to create and manage documentation for the software. I did not specifically target data collection from external end-users (people outside of the company using the software); as previously discussed, external use of the software was not a

prerequisite for research participants. Therefore, technical communicators working for these companies may also participate in this study.

Software Documentation and Technical Communicators

This dissertation also recognizes a more detailed definition of how software documentation encompasses the work of TCPs. Specifically, Barker defines software documentation as "the design, planning, and implementation of any interface element of a software system to enhance the system's usability" (1991, p. 7). This definition is highlighted because it calls out the relationship between software documentation and usability. In other words, the TPCs creating the documentation influence the usability of the software. Therefore, Barker emphasizes "involving technical communicators in all phases of software product development" (1991, p. 7), which is supported in two ways. First, it aligns with the umbrella of TPCs included in this study's interview and survey participant research design. Second, participants must be TCPs, which includes software production practitioners. These practitioners may or may not concurrently support software documentation as technical communicators.

Defining Technical Communicators in the Software Industry

This section expands upon the definition of technical communicator roles by discussing how the literature defines the role. Considering additional definitions of a technical communicator is key to understanding both the term scope for this study and the implications of the findings of this research for the technical communication field. I provide a more in-depth analysis of the implications of the research findings in Chapter Five. However, this section will provide a brief overview of definitions found in the literature and how those definitions impact the study scope.

Technical Communicators and Technical Professional Communicators

I use “technical communicators” or “technical professional communicators” as interchangeable terms to refer to people who work in technical communication professionally. In technical communication, technical communicators are individuals who directly write, edit, and manage technical documentation for their employer (e.g., technical writers and documentation managers). For the purposes of this work, however, this dissertation expands technical communicators to include workers who support software production teams and/or contribute to software documentation directly or indirectly (e.g., customer service and software developers). Therefore, within the context of this study, I define a “technical communicator” as anyone who impacts the creation and development of software documentation. The benefit of expanding this definition is that it enables the research design to truly give a voice to all technical communicators in these workplaces who engage internally with documentation. Depending on the person’s role, they may or may not write documentation; nevertheless, they impact how software users interact with documentation because they are a part of the software production team within these workplaces. For example, a software engineer manager may not write the documentation, but they create the software that TCPs document. Regardless of their direct contribution to the documentation deliverables, they impact the software for which the documentation is written. Therefore, their individual contributions to software production legitimize including these workers as participants in this study.

For decades, the literature has debated defining a “technical communicator” (Henning & Bemer, 2016) due largely to the complexity of the role and the technical communication field. Similarly, it can be challenging to define a technical communicator working in the software industry because the nature of developing software relies on technical communication at its core. As the literature points out, software development requires that several types of project stakeholders (see the subsequent *Subject-Matter*

Experts (SMEs) and Project Stakeholders section for a definition of this term) communicate with one another, including members of the development team, such as "designers, quality assurance experts, technical writers, and managers" (Brady et al., 2006, p. 318). Whether these project stakeholders are communicating with one another individually or as cross-functional teams, they are engaging as technical communicators. For example, a documentation manager may not write the documentation, but they train and manage writers. Additional examples include when a software architect must convey their design decisions about the software to a software developer who implements the necessary changes that impact the user interface of the software. In these examples, the constant is that these stakeholders are technical communicators because their roles impact the end-users. Regardless of their direct contribution to the documentation deliverables, they are responsible for the software, which is the primary subject matter for the technical communicators. Therefore, their contributions to the software legitimize including them in the technical communicator scope of this study. Therefore, this dissertation recognizes the technical communicators participating in this research project into two main categories. The first is those who work with documentation in a more traditional, direct sense (e.g., technical writers, technical editors), and the second is those who support documentation indirectly (e.g., software developers, customer support teams, implementation specialists). This distinction is discussed in more detail in Chapter Three.

Technical Communicator Cross-Functional Relationships

Understanding technical communicator-based cross-functional relationships establishes a foundation for understanding how interactions between various teams in software production can impact the technical communication climate in the software workplace. This section highlights cross-functional relationships that collaborate as TCPs in software companies. This includes relationships between technical communicators specific to the technical communication field (e.g., technical writers

and subject-matter experts), and it also discusses relationships between technical communicators supporting various teams in software production (e.g., project stakeholders).

Subject-Matter Experts and Project Stakeholders

TCPs work with subject-matter experts (SMEs) and other project stakeholders in the software production environment. While I refer to SMEs and project stakeholders as separate teams and terms, note that technical communicators can support documentation projects as one or two or as both an SME and project stakeholder. This section highlights the distinct characteristics of each term and provides examples of overlap to establish how these relationships connect to interview participants and research findings.

In software companies, SMEs are usually people within the software production ecosystem who are experts on the software product. Software engineers, developers, and architects may serve as SMEs for documentation. In this scope, SMEs are also project stakeholders because their role is connected to the software life cycle. Use of the term "software life cycle" refers to "all the phases of a software product throughout its planning, development, and use, all the way through to its eventual obsolescence or retirement" (What Is the Software Life Cycle?, 2022). Project stakeholders, however, may not always be SMEs of the software. A project manager working in this environment, for example, typically does not work directly with the software product but they instead manage people and projects. Therefore, they are categorized as project stakeholders and not SMEs of the software.

This study focuses more on discussions about SMEs and project stakeholders working directly with technical writers because TCPs need to work with these groups effectively when producing documentation. The Society of Technical Communication lists the ability to "work collaboratively with subject-matter experts and co-workers" (Dura, 2018, p. 65) as a core competency for technical

communicators. This concept is especially relevant in the software industry because technical writers often rely on SMEs as they are learning about software for documentation purposes. For example, a software developer collaborates as an SME by explaining to the technical writer how a new software enhancement works. Therefore, technical writers use what they learn from this SME (software developer) to document the software enhancement. As previously discussed, the software developer and technical writer in this example are both technical communicators within this study's scope.

Significance of Workplace Bias in Technical Communication

Researching and combating workplace bias is critical in technical communication, as the presence of bias has social implications for all end-users (people who use the software) because when TCPs experience bias in the workplace, it can potentially impact the texts and data they create and manage. TCPs should be aware of bias in the workplace because it influences communication and information comprehension for technical communicators (Albers, 2012), and it connects to ongoing social justice issues of diversity, equity, and inclusion (DEI) (Benjamin, 2019; Gurak & Bayer, 1994). The literature points out that workplace bias, such as gender bias, impacts workplace communication (Baker, 1991). Information comprehension is an integral part of the work technical communicators do because this skill is a focal point of technical communication. Scholars contend that technical communicators are creators of procedural knowledge (Rush Hovde, 2010), and in some cases, they can become actively involved in knowledge management for their organization (Applen, 2002). Technical communicators working for software companies must communicate effectively to exchange information collaboratively in the software production environment. Researchers have also studied software development teams to gain insights into how technical communicators in these spaces communicate and share knowledge (McDaniel & Daer, 2016). As an extension of these studies, it is vital for TCPs to consider how workplace bias can impact how they communicate and collaborate with project stakeholders and SMEs because it

influences how TCPs transmit their software knowledge to documentation. I aim to draw attention to these issues by collecting data based on the opinions and experiences of technical communicators by surveying and interviewing them directly and aligning with literature that urges scholars to focus on locating the "source of the bias in individual people and specific design decisions" (D'Ignazio & Klein, 2020, p. 60).

Study Overview

This section provides an overview of this study, including a listing of each research question (RQ) and an introduction to the research methods and design.

Research Questions

This mixed-methods study has three research questions, each aligning with the focus areas. The primary focus of this study is to explore technical communicators' perceptions and experiences specific to bias in the software workplace and to determine if (and how) these variables impact their ability to author and manage technical software documentation. My primary research questions are:

RQ #1: What are TCPs' perceptions and experiences specific to bias in the software workplace?

RQ #2: Do TCPs' perceptions and experiences relating to bias impact technical software documentation, and if so, how?

A secondary focus is to determine if technical communicators can benefit from using a heuristic diagram that shows workplace scenarios and possible responses. The new heuristic diagram was designed using intersectional feminism as a theoretical framework as (1) a nod to historical studies that discuss gender-based biases in the software workplace and the technical communication field and (2) to align with intersectional issues that correlate with workplace biases. In alignment with this secondary focus, the final research question is:

RQ #3: Using intersectional feminism as a theoretical framework, can a diagram that shows workplace scenarios and possible responses be used to mitigate biases in technical documentation?

Research Methods and Design

This section introduces the research methods and design by providing an overview of the scope of the study and outlining how it connects issues of intersectional feminism and social justice to technical professional communication.

Study Scope

This study attempts to further scholarly understanding of technical communication from a humanities-driven lens by exploring workplace bias and by connecting research findings to the social impact (e.g., emotional impact on technical communicators) and documentation impact (e.g., issues with creating inclusive documentation). This work focuses on data collection derived from surveys and interviews that represent participants' perceptions and experiences related to bias in the workplace, specifically focusing on the software industry. In addition to workplace bias, the study includes data collection related to participant work experience and opinions about documentation while working in software.

It is important to note that there are two areas related to workplace bias that this study does not explore. First, it does not analyze the behaviors of specific individuals that the participants claim have projected biases in the workplace. The study only asks participants to describe and explain their perceptions of bias, which may include firsthand or secondhand experiences. Therefore, it will only use the participants' feedback to define or group biases if they specify their perceived biases during the surveys and interviews. Second, this survey and interview did not prompt participants with structured questions asking about specific examples of types of biases. Instead, the research design was

intentionally structured to only provide a general definition of bias, and then ask participants to use this definition to help them answer questions about their experiences and opinions related to bias. This method is discussed more detail in Chapter Three. During the interview portion of the study, some participants indicated that they did have experience with workplace bias. Some participants provided specific examples of types of biases, and others did not. In some interviews, I asked the participants reflexive interview questions about their thoughts on specific type of biases based on the experiences they described. These findings are explained in more detail in Chapter Four.

Connections to Intersectional Feminism and Social Justice

I attempt to further scholarly understanding of the intersections of humanities and technical communication by exploring workplace bias and connecting research findings to priorities of intersectional feminism and social justice. Also, this study connects to intersectional feminism by using this concept as a theoretical framework, as described in RQ #3. In addition, the research design was inspired by feminist research methodologies, which will be explained in greater detail in Chapter Three. By taking a deeper dive into workplace biases, this study also connects to the priorities of social justice and intersectional feminism in the technical communication field with a focus on TCPs as influencers, creators, and managers of technical documentation and, in some cases, end-users.

Chapter Two further explores connections to intersectional feminism and social justice. There are four reasons that these concepts are included in this project. First, intersectional feminist and social justice frameworks consider bias a central issue. Bias is defined as “prejudice in favor of or against one thing, person, or group compared with another, usually in a way considered to be unfair” (“The Oxford English Dictionary,” 2022). Intersectional literature presents six core ideas of intersectional frameworks: social inequality, intersecting power relations, social context, relationality, social justice, and complexity (Collins & Bilge, 2020). Therefore, bias is an issue of both intersectional feminism and social justice.

Second, bias is also a part of the framework of social justice, as it connects to issues of DEI. Collins and Bilge highlight social justice as one of the six core ideas of intersectional frameworks (2020). As software companies fall under the technology industry, the literature has well-documented historical bias and ongoing social inequity issues (Benjamin, 2019; Perez, 2019) in the technology field. Benjamin, for example, focuses on how programmers can transfer discriminatory views, such as racism, into their code, resulting in issues with artificial intelligence (AI), such as racist bots (2019). Several works discuss gender issues in technical communication and their relationship to feminist agendas in the field (Allen, 1991; Moore et al., 2008). Third, I stand with scholars who support the idea that feminism can support the interests of social justice (Walton et al., 2019). I was also inspired by other scholars who have documented their professional experiences from these lenses and used them to inform their research on female technical communicators in workplaces (Petersen, 2018). Finally, the research design responds to the call for research that helps scholars better understand data bias from a feminist lens: "data feminism additionally requires that we trace those biased data back to their source" (D'Ignazio & Klein, 2020, p. 13). The feminist lens is explained in greater detail in Chapter Two and Chapter Three.

When this study refers to social justice, it encompasses the following definition:

> Social justice research in technical communication investigates how communication broadly defined can amplify the agency of oppressed people - those who are materially, socially, politically, and/or economically under-resourced. Key to this definition is a collaborative, respectful approach that moves past description and exploration of social justice issues to taking action to redress inequities (Jones & Walton, 2018, p. 242).

This definition impacted this work in two ways. First, it inspired me to consider how this research could draw attention to the lived experiences of TCPs in these workplaces. Secondly (with specific reference to the last sentence in the preceding definition), it prompted me to consider what I could do to help

beyond exploring issues of bias. This ultimately led to me creating the heuristic diagram, for which my actions to help mitigate bias are explained more thoroughly in Chapter Three.

Study Origin: My Lived Experiences

The main objective of this project is to take a deeper dive into workplace biases in the software industry. I address the presence of biases in these workplace contexts by asking TCPs to share their opinions and experiences on its presence and impact. I chose to focus on the software industry for two reasons. First, engaging with TCPs in software companies aligns with my professional experience. While working in the software industry, I had first-hand and second-hand experiences that connected to issues of DEI. While issues of DEI in professional settings are complex in nature, they can be exemplified by the presence of workplace bias. Workplace bias in this industry is not only declared problematic from a scholarly purview (Carmona-Cobo et al., 2019; D'Ignazio & Klein, 2020; Fotaki & Harding, 2017; Heilman, 2012; O'Connor & Cech, 2018; Perez, 2019), but it is also an issue that transcends industry impact. For example, being the recipient of bias in the workplace can create a tremendous emotional strain on who technical communicators are at their core – people. These professionals are not just technical communicators; they are people. This interdisciplinary study is humanistic at its core, agreeing that "modeling knowledge in digital environments requires the perspectives of humanists, designers, and technologists" (Burdick et al., 2012, p. 10). If the presence of biases affects TCPs as people, it can also impact the work that they produce. This is part of the impetus for this study to explore bias (in part) based on the personalized, lived experiences of the people working in these contexts. Second (and in some cases more important to professional technical communicators and scholars), the presence of bias may directly impact the documentation TCPs create. For example, if a technical writer experiences bias in the workplace, whether they realize it or not, it can influence both the quality of their documentation

and the effectiveness of it. I will discuss documentation quality and effectiveness more in subsequent chapters, including a reveal of participant feedback in Chapter Four.

I acknowledge that my past experiences with DEI issues in the workplace may create a bias in this work by implying that it exists in the workplace. Therefore, Chapter Two presents additional research discussing bias in the software workplace; however, the goal of this study is not to argue about whether bias exists but to collect new data that helps further the conversation about bias in the technical communication workplace.

Chapter Overview

This section provides an overview of the remaining chapters. Chapter Two provides background on workplace bias, including literature discussing existing bias and workplace issues in the technical communication field. It also presents other technical communication workplace issues that were found during my review. It positions intersectional feminism as the theoretical framework. In addition, it discusses how this study was situated, including addressing gaps in the literature, supporting TCPs facing workplace bias, and expanding upon feminist research approaches in technical communication.

Chapter Three focuses on methods, including detailing the mixed-methods design, the feminist research approach, and connections to social justice. It introduces the heuristic diagram design, which is a visualization that was created for interview participant evaluation. The heuristic diagram design focuses on design considerations and objectives, as well as providing a visual evolution of the version history. Next, the chapter discusses survey design, which details participant recruitment and distribution of the two-part online survey. Lastly, this chapter explains interview design and recruitment, which includes an overview of the interview process and interview questions.

Chapter Four presents the results of the survey and interview portions of this study and delivers them based on quantitative and qualitative data analysis. First, results are presented for each survey question, which includes visualizations such as graphs and charts that help summarize and provide visual insights into participant responses. Next, interview participant demographic information and designated aliases are described and presented visually. I also discuss considerations regarding participant anonymity when presenting interview findings. Lastly, interview results are presented and organized primarily by prioritizing semi-structured questions and secondarily by planned-probing questions. Interview results also present themes that emerged based on corresponding survey data and qualitative textual analysis of their survey and interview responses.

The final chapter, Chapter Five, highlights how the results answer the primary and secondary research questions. It also revisits the significance of workplace bias in technical communication by reconnecting findings to intersectional feminism and social justice and calls out new, intersectional themes. In addition, it discusses the implications and conclusions for the technical communication field with specific attention to the potential application of the heuristic diagram and academic use cases. It also addresses study limitations, including issues with survey bots, cons of remote interviews, and limitations of participant sample sizes and demographics. Finally, it concludes by offering suggestions for future research.

CHAPTER TWO: LITERATURE REVIEW

This chapter presents background information on key concepts, including workplace bias and presenting existing bias and workplace issues research in technical communication. It also presents texts centered on issues of bias specific to the software industry. Next, it presents intersectional feminism as the theoretical framework for this study. Finally, this chapter situates the dissertation by discussing how bias was presented to participants, concerns about supporting TCPs facing bias in the workplace, and how I attempt to further feminist methods and social justice-related research in technical communication.

Workplace Bias

After reviewing literature that discussed the ethical implications and responsibilities of the professional and technical communication field (D'Ignazio & Klein, 2020; Gurak & Bayer, 1994; Jones, 2016; Lay, 1994), I felt bias was presented as a common thread that fundamentally hinders TCPs from maximizing inclusive communication design. This study's definition of bias (previously cited in Chapter One) was provided to survey and interview participants as a reference point for sharing their opinions and perceptions about bias in the workplace. I use the term "workplace bias" to broadly encompass two types of bias: unconscious (also referred to in the literature as implicit) and conscious bias. Implicit or unconscious biases are also defined as "unintended preferences" (Matthiesen et al., 2020, p. 23). Conscious bias (also known as explicit) is the opposite of implicit bias, suggesting that people are fully aware of their verbal and physical reactions based on their bias (Cooley et al., 2014). The survey and interview portions of this study do not include structured questions asking participants to share their opinions specific to implicit and explicit biases. However, if participants discussed perceived biases, some reflexive questions were included (added because of this study using a semi-structured interview format)

that connect to conscious and unconscious bias. In addition, during the results and discussion chapters (Chapters Four and Five), I categorize the biases based on the survey and interview data (e.g., gender bias). The goal of categorizing biases is to help aggregate and summarize the human-subject data findings derived from this study.

Existing Bias and Workplace Issues Research in Technical Communication and Software

The literature discussed in this section is relevant to this study because it serves as existing research that focuses on various types of bias in the software or technical communication workplace and shares other studies that focus on specific types of bias.

Specific Biases in the Software Workplace

Software workplace studies discussed specific types of biases found in the software production environment, many of which focused on cognitive biases as a subset bias in these professional contexts (Calikli, Aslan, et al., 2010; Calikli et al., 2010; Calikli & Bener, 2015; Chattopadhyay et al., 2020; Stacy & MacMillan, 1995), while another explored unconscious biases in software engineering (Macnab & Doctolero, 2020). I found research published as early as the mid-90s that opened discussions of the presence of biases in software engineering and its potential impact on software products (Stacy & MacMillan, 1995). While Stacy and MacMillan discussed the presence of these biases and the potential ways they could impact software products, they did not perform human subject-based testing in their 1995 work; however, workplace studies published in the 2010s expanded upon their work. For example, a study explored the presence of confirmation bias among software developers and testers (people who test the software to make sure it works as expected) (Calikli, Aslan, et al., 2010). These researchers asserted that when confirmation bias is significantly present in these software engineering workplaces, it can result in a "decrease in software quality" (Calikli, Aslan, et al., 2010, p. 3). In a similar study, researchers connect workplace-related confirmation bias to defects found in the software products

(Calikli & Bener, 2015). This literature explores how these biases impact software products, like the methods used for surveying and interviewing. Although it was not as prevalent as the literary findings related to unconscious bias, there were publications that explored implicit bias in software engineering (Matthiesen et al., 2023). Similar to studies that have investigated the perceptions and beliefs of software engineers and the implications for the software product (Devanbu et al., 2016), I asked participants about their views on technical software documentation quality and effectiveness and their opinions on whether bias has impacted these areas.

Issues of Bias in Software and Technical Communication Workplaces

The presence of bias in software and technical communication workplaces connects to issues of bias, thereby corresponding to issues of DEI (Benjamin, 2019; Gurak & Bayer, 1994; Vardeman-Winter & Place, 2017). For example, the literature discusses the presence of gender bias in technical communication work teams (Fotaki & Harding, 2017; Halterman et al., 1991). In addition, other papers point to bias as the driver of cultural and political implications found in computational textuality (Benjamin, 2019; Risam, 2018). Recognizing these issues is key to understanding the scope and implications of this research because the word was not always used exhaustively in these texts. In other words, a study discussing issues of DEI may not use the term “bias” frequently in the text or at all. For example, Menezes and Prikladnicki focus on diversity in software engineering and specifically mention issues of bias concerning diversity in these workplace contexts; however, the use of the word bias in the text is only mentioned three times on one page (2018, p. 46). I contend that diversity is a bias-related issue and intentionally uses the word bias broadly in the structured survey and interview questions.

Several previous studies have discussed issues that align with bias in software production or other workplace environments and are, therefore, relevant to my research. For example, a 2006 study explored English-speaking bias in technical communication by analyzing how cultural differences impact

documentation (St. Germaine-Madison, 2006). St. Germaine-Madison's study positioned that cultural biases in these contexts were not necessarily implicit but rather a reflection of the lack of audience awareness and translator skills that impacted the quality and availability of Spanish-translated technical instructions (2006, p. 186). This study aligns with this work in that it discusses issues of bias in technical communication and connects it to the quality of the documentation. A study published in 2018 connects to diversity by presenting findings from semi-structured interviews that they conducted with software development professionals to understand better how diversity impacts the software development process; however, the study was limited in terms of sample size because it only included a total of two participants (Menezes & Prikladnicki, 2018). While these three studies addressed various aspects of bias in the software workplace, they did not address feminist research methodologies, which is where this study is positioned. However, I found Petersen's 2019 publication to be the most notable workplace study that aligned with exploring issues of bias in the technical communication workplace, as it presented interviews based on conversations with TCPs and leveraged a feminist research approach to address gender issues in technical communication (2019). This study aligns with my methodology in that it is also a workplace study that engages directly with TCPs using semi-structured interviews and feminist theory. My decision to interview software company employees is similar to Bhattacharyya's 2020 study that examined issues of patriarchy and gender through interviews with female employees at a Japanese software company (2020). Bhattacharyya's focus was "interpreting how patriarchal norms and associated subordination is internalized by these women and how it operates their social life" (2020, p. 126). While I did not ask participants about how workplace bias affected them socially, patriarchal norms were discussed by some participants as a bias-related issue. Relatively few technical communication studies with a focus on intersectional feminism or other social justice issues have employed interviews to

directly collect data about bias from technical communicators in software companies (Bhattacharyya, 2020; Maji & Dixit, 2020; Menezes & Prikladnicki, 2018). I seek to further research in this area.

Other Workplace Issues in Technical Communication

This dissertation has established workplace bias as an issue in technical communication. While bias in the software workplace has not been extensively studied, there is more extensive literature examining other workplace concerns. A study published in 2018 interviewed over 200 technical communicators to learn about "what issues they believed were the most important of the past five years in order to better understand the technical communication workplace and its demands" (Lanier, 2018, p. 66). Lanier's study yielded almost 700 individual entries that researchers sorted into four broad categories: technology, information design, the technical communication field, and approaches to writing and designing information. While these categories did voice the concerns of TCPs from a workplace issue lens, the findings were predominately based on technologies and process-based methodologies; Lanier's publication did not mention workplace bias. I also found select works that took an issue-driven approach to discussing workplace issues by collecting interview data to help overcome process-oriented challenges in software production (Khan & Quraishi, 2014; Meng et al., 2018) or attempting to give technical communicators better insights into applied skills and knowledge that may be useful in the workplace (Whiteside, 2003). A 2014 study examined the successful completion of projects for software development project teams and discussed using the RACI Matrix on software projects to help "minimize project delivery challenges and improve the chances of successful outcome of business critical software projects" (Khan & Quraishi, 2014, p. 177). To achieve this goal, researchers interviewed only 32 individuals, including project managers, senior team members, and project management office staff, who were "related to the projects selected for detailed study" (Khan & Quraishi, 2014, p. 181). The review of the studies that discussed other workplace issues in technical communication also served as a

catalyst for this study's research methodology. Because there was an abundance of studies that focused on the processes and skills of the technical communicator role, my review presented an opportunity for the field to generate new interview research that intentionally explores issues of workplace bias and its impact on technical software documentation.

Theoretical Framework: Intersectional Feminism

Similar to studies that target intersectional feminism and its relationship to computers and technology (De Hertogh et al., 2019; D'Ignazio & Klein, 2020), this study uses intersectional feminism as a theoretical framework, leaning on the premise that it: "looks at issues of social power related not just to gender, but also, race, class, ability, sexuality, immigrant status, and more" (D'Ignazio & Klein, 2020, p. 215). As the focus of this research relies primarily on workplace bias, my goal when selecting the theoretical framework was to ensure that it could accomplish two things. First, the theoretical framework needed to correspond to literature findings on this topic. Specifically, the intent was to consider aligning with literature that explored workplace bias in the software industry and technical communication. Second, the framework needed to embody the humanistic goals of this study. Similar to works urging for humanistic approaches to technical communication (Miller, 1979), I intentionally selected this framework to represent the humanities-based genres of technical communication studies with a specific emphasis on feminism and social justice. Therefore, the framework answers the call from scholars who recommend feminist methodologies, including responding to those urging for a greater body of research considering feminist theory (Bosley, 1994) and perspectives in professional communication (LaDuc & Goldrick-Jones, 1994). It also responds to those asking for more research-based theories that add to the body of work focusing on social justice scholarship in technical communication (Petersen & Walton, 2018; Walton et al., 2019) by aligning with Hass and Eble, who explain the intersection between social justice research and technical communication:

> Social justice research and technical communication investigates how communication, broadly defined, can amplify the agency of oppressed people – those who are materially, socially, politically, and/or economically under-resourced. Key to this definition is a collaborative, respectful approach that moves past description and exploration of social justice issues to taking action to redress inequities. (2018, p. 242)

In addition, it stands with scholars who argue that software company work environments have little interest in "initiatives to make the work environment more female friendly, or to encourage more women to go into or stay in computing" (Perez, 2019, p. 109).

The feminist approach of this study was partially inspired by existing research that talked about gender bias not only in technical communication but also in the software industry workplace. For example, previous research in the software industry discusses the gendered experiences of technology professionals working for software companies (Dias Canedo et al., 2019; Lin & Besten, 2019; Maji & Dixit, 2020) and the imbalance of women working in software communities (Bhattacharyya, 2020; Hyrynsalmi & Sutinen, 2019). During the literature review, findings documented both lived experiences and research-driven data that indicated that TCPs experienced either first-hand or second-hand bias in the workplace. Emily January Petersen, for example, has published works focusing on women's experiences in the technical communication workplace, including a study about how the cultural dynamics within these contexts presented power differentials for women and minorities (Petersen, 2019). Another inspiration for examining bias through a feminist lens was in response to researchers questioning how feminist technical communicators can point out bias (Frost, 2015).

It was also important that this study not just take a feminist approach but also that it centered on intersectionality as a core value associated with the theoretical framework. There are three reasons why intersectionality was prioritized. First, intersectionality connects to bias. The literature states that

intersectionality focuses on individual experiences, including biases. Collins and Bilge point out that "intersectionality recognizes that perceived group membership can make people vulnerable to various forms of bias, yet because we are simultaneously members of many groups, our complex identities can shape the specific ways that we experience that bias" (2020, p. 15).

Second, it was necessary to couple intersectionality with feminism after finding extensive research that discusses gender-based digital divides in the software industry and technical communication. These divides affect the technology industry's culture, including software companies. The issue here is not just the "culture of digitality that is presumed to be gendered male" (Davis, 2019, p. 133), but there is also special attention to how this impacts our technology. Davis also points out that this culture negatively impacts the "usefulness or usability of digital tools" (Davis, 2019, p. 133). This is relevant to TCPs in these workplaces not just because their employer produces software as a digital tool, but because TCPs create documentation that also impacts the usefulness and usability of the software. Therefore, intersectionality connects to problems of bias against women as technical communicators and as end-users of the documentation. The literature states that "intersectionality positions race, class, gender, and the researcher's mediating identities at the center of the research process" (Esposito & Evans-Winters, 2021, p. 64). Therefore, this framework design aligns with intersectional points of interest discussed in the literature, including social inequity and social justice approaches (Gurak & Bayer, 1994; Walton et al., 2019), scholarship that discusses related intersectional theories in technical communication such as race (Nakamura, 2008), and cultural usability (Haas, 2012). It also highlights recently published works that discuss feminist theory and gender theory or provide gender-based examples of workplace bias in various technical communication contexts (Dias Canedo et al., 2019; Hyrynsalmi & Sutinen, 2019; Maji & Dixit, 2020; Matheson & Petersen, 2020; Petersen, 2019). The framework also supports pointed intersectional works (e.g., (Collins & Bilge, 2020; Crenshaw, 2015;

Davis, 2019; Hancock, 2016) to provide a foundation for why intersectionality was intentionally used in tandem with feminism.

Third, intersectional feminist issues are essential in feminist research projects. Intersectionality is a crucial concept in feminist research projects, as researchers working on these types of projects "are frequently concerned with the intersections of gender with other identity standpoints, such as sexual orientation, race, ethnicity, class, or nationality" (Hesse-Biber, 2013, p. 3). In addition, intersectionality can also be used as an analytic tool for social problems, where it views categories of race, class, gender, sexuality, nation, ability, ethnicity, and age – among others – as interrelated and mutually shaping one another (Collins & Bilge, 2020, p. 2). Furthermore, intersectional feminist issues align with feminist social justice research. This relationship is important because it encompasses workplace research on feminist social justice issues within the technical communication field. These issues bind feminism to technical communication in that "social justice and inclusion are foundational to technical professional communication and should imbue all topics and areas in the field" (Walton et al., 2019, p. 4). I expand upon the belief that we can further this social justice turn by contributing new knowledge that supports the importance of intersectional feminism (Collins & Bilge, 2020; D'Ignazio & Klein, 2020; Walton et al., 2019) and connecting research findings to the impact it has on the creation and management of technical software documentation. An additional goal of the framework design is to enable scholars and professionals in communication to consider how they might use it (1) as a tool to mitigate bias in technical communication and (2) to redefine workplace communication to foster a culture where inclusion works alongside expertise. Using intersectional feminism as a tool to mitigate biases is discussed more in Chapter Three, and fostering a workplace communication culture of inclusion coupled with expertise is expanded during Chapter Five.

This dissertation also looks at the survey and interview portions of this work from an intersectional lens by recognizing issues of biases that participants experience in the workplace as problematic in technical communication and corresponding interdisciplinary fields because “these questions catalyze entering into discussions about racial and gender discrimination academic discourse, epistemic apartheid in academic discourse, and debates about whose knowledge is of value” (Esposito & Evans-Winters, 2021, p. 20). As TCPs in these workplaces create technical documentation for diverse audiences, technical communication research should help foster an understanding of workplace issues that impact the people who make these documents and the documentation's target audiences. As both groups include women participating in document creation and consumption, understanding intersectional feminism issues can help workers and external end-users in these environments.

Situating the Dissertation Study

This study aims to address a gap in the literature by offering the study of *any* potential workplace bias. Therefore, this section includes some studies that focus on multiple types of bias and others that only focus on one type of bias. The studies found in the literature review research differ in that they exclusively target technical communicators working in the software industry. While some studies have presented research indicative of gender-based bias in these settings (Bhattacharyya, 2020; Maji & Dixit, 2020), they have not interviewed professional technical communicators using a feminist approach to interviewing and presented a heuristic diagram to interview participants that uses intersectional feminism as the theoretical framework. This study does so.

This study is also predicated on the belief that when TCPs face workplace bias in the software development context, the literature can offer insights to help them overcome these challenges. Technical communication literature that offers ideas for tools or presents heuristics as solutions to complex problems can be helpful for TCPs who are looking for ways to overcome challenges in their workplace.

For example, in an experience report based on Proceedings of the 41st ACM International Conference on Design of Communication, the author discusses how they decided to integrate content audits as a part of the content strategy for creating and managing documentation for an open-source software company to help drive a "user-centered approach to planning and improving content" (Hardin, 2023, p. 243). Hardin also discusses leveraging literature to support the mixed-methods approach design that they created to overcome documentation obstacles in this workplace (Altamirano, 2021; Bloomstein, 2012; Land, 2014), which included a publication that offered a heuristic for conducting a content audit in a complex website design environment (Altamirano, 2021). During my literature review, I could not find a heuristic specifically designed to address bias issues for technical communicators in the software industry. In the spirit of how Hardin leveraged the experiences of other scholars to overcome issues in the technical communication workplace, I wanted this research to offer, in part, a solution specifically designed to support technical communicators facing workplace bias. Therefore, I created a heuristic diagram designed to help TCPs mitigate biases in technical documentation. I provide a detailed description of the heuristic design phases and uses in Chapter Three.

This mixed-methods study uses survey and interview findings to expand upon workplace bias research in technical communication while using existing literature to further feminist research approaches in technical communication, thereby connecting its approach to social justice issues (discussed further in Chapter Three). This work is rooted in the belief that furthering research in these areas will also help grow our understanding of intersectional feminism in technical communication, including the challenges women in these environments face, such as projecting themselves as experts of subjugated knowledge. Subjugated refers to “positions structured by gender, race, nation, and class” (Haraway, 2013); therefore, subjugated knowledge connects to this study. In part, it connects to my research method, a mixed-methods study that uses semi-structured interviews as a feminist research

approach. Feminist approaches to mixed-methods research can help researchers obtain subjugated knowledge (Hesse-Biber, 2013). In Chapter Three, I discuss further how and why it investigates using a feminist approach to mixed-methods research to strengthen empirical evidence within these scholarly areas.

CHAPTER THREE: METHODS

This chapter describes the survey and interview design methods for the dissertation. This section presents an overview of its methods. This dissertation examines workplace bias that impacts technical communication (both the TCPs themselves and the technical software documentation they produce) in the software production workplace, specifically focusing on intersectional feminism and social justice issues. This section follows up on the discussion in Chapter Two that presented intersectional feminism as a theoretical framework by providing an overview of how intersectional feminism and social justice issues later connect to the dissertation Methods. The subsequent *Feminist Research Approach* section discusses this relationship in more detail. This study was submitted to and reviewed by the University of Central Florida (UCF) Institutional Review Board (IRB) and deemed exempt from regulation (see *Appendix A*). The survey and interview participants were TCPs with current or previous work experience (employee or owner) in the software industry.

The dissertation uses a mixed-methods approach that includes three types of research strategies. The first method was based on my literature review, which developed a theoretical framework for navigating bias in the technical communication workplace. In this context, "navigating" refers to helping TCPs recognize and address workplace bias to mitigate its impact on their technical communication deliverables (e.g., documentation). The primary categories of texts (previously discussed in *Chapter Two: Literature Review)* centered on (1) applied technical communication texts and (2) feminism and feminist theory. These were also the primary categories used to create subcategories corresponding to the methods discussed in this chapter. These subcategories include, but are not limited to, themes of social justice, intersectionality, software documentation, supporting end-users through usability and user-centered approaches to documentation, workplace bias, gender studies in the

workplace/technical communication, and feminism in software development and technical communication. The secondary categories discussed in the literature review relate to workplace bias and gender in technology. While the exploration of these texts was not exhaustive, they proved useful during interviews specifically, as some participants expanded upon survey responses related to workplace bias and provided examples of their experiences that connected to gender in technology. The results presented in Chapter Four analyze the findings from surveys and interviews, including themes corresponding to subcategories within the literature review. Note that the sample size of this study is not fully representative of the broader population of TCPs in the technical communication field and the software industry.

As this work is an interdisciplinary study, I explored the literature through the two primary reading lists: technical communication in software and feminist theory. I also added a third list of general areas I was interested in exploring and connecting to this dissertation. While reviewing the literature, I broke down these lists into subcategories. Table 1 shows the reading lists and topical subcategories.

Table 1: Literature Review Reading Lists and Topical Subcategories

Reading List	**Subcategories**				
User-Centered Technical Communication (TC)	Technical Writing & Professional Communication: Approaches, Processes, Management, & Style	Usability & User-Centered Design (UCD)	Documentation & TC Supporting Users		
TC in Software	Technical Software Documentation & Technical Documentation	Software Project Development & TC in Software Development	Software Production Biases	Software Project Documentation	
Feminist Theory	Feminism Methods in Tech & TC	Feminism in TC & Software Development	Feminist Research	TechnoFeminism	

General Areas of Interest	Social Justice Approaches in TC	Intersectionality	Bias: Data, Gender & Workplace	Gender in Technology & Technical Professional Communication

The next section includes an extended discussion of how the categorical approach to my literature review impacted the research design. The second and third methods are human subject research-based surveys and interviews. The subsequent *Interview Design and Recruitment* section of this chapter discusses the survey and interview methods in detail.

Mixed-Methods Design

This dissertation takes a mixed-methods research design approach that includes conducting surveys, interviewing participants, and presenting a new heuristic diagram for interview participants to evaluate. The heuristic diagram was designed before surveys and interviews were performed, and only shown to interview participants. I explain this process and the evolution of the heuristic diagram in the subsequent *Heuristic Diagram Design* section. During the recruitment phase of this project, potential participants were asked to participate in a survey. Survey participants who answered all required survey questions and indicated interest (during the survey) in participating in the interview were invited to the interview portion of this project. Semi-structured, individual interviews were conducted to better understand participant perceptions and experiences by expanding on their responses to survey questions.

The strategy for selecting surveys and interviews relied heavily on my decision to take a feminist research approach. I chose to include a survey in this research project for three reasons. First, from a strategic research perspective, the survey would allow me to collect quantitative data to better supplement the qualitative aspects of the literature review and interview portions of this study. Second, I

thought the survey would be a more thorough approach to this research because surveys were described in the literature as "structurally different from the interview, the survey can play an important role in feminist research projects" (Hesse-Biber, 2012, p. 20) and because "survey research can put a problem on the map by showing that it is more widespread than previously thought" (Reinharz & Davidman, 1992, p. 79). Third, considering the intimacy associated with including bias questions in work, I thought I would obtain more diverse data by presenting bias questions in two different formats. A survey, for example, is less intimate than an interview and could be a way to answer more broad, preliminary questions about bias. Also, I intentionally designed the interview to follow the survey and positioned it as a follow-up to survey questions. Part of my reason for doing this was to help participants feel more at ease about the topics and what may be asked by positioning that many of the questions were simply an expansion of survey questions. I chose to perform in-depth interviews because interviewing plays a vital role in understanding the human condition (Hesse-Biber, 2012) and because they are used to "discover shared understandings of a particular group" (DiCicco-Bloom & Crabtree, 2006, p. 317). Therefore, I decided to take a reflexive approach to interviewing by using a semi-structured format.

Feminist Research Approach and Connection to Social Justice

This section explains how the dissertation takes a feminist research approach, which includes how this approach connects to social justice. This study uses a feminist research approach not just for the theoretical framework but also takes a feminist approach to interviewing. This interview approach in this study's scope collects data from participants that helps us better understand the "diversity of women's realities that often lie hidden and unarticulated" (Hesse-Biber, 2013, p. 184). By interviewing participants with work experience in these technical communication contexts, this study offered a platform for women to share their thoughts and opinions about working in these environments. In

addition, it also presented an opportunity for marginalized groups to present their lived experiences as a representation of the workplace realities that TCPs face, with special attention to workplace bias.

Workplace bias is complex in that if it is present, it can impact one or more areas of a technical communicator's identity (e.g., gender, race). Issues of bias that relate to someone's identity can connect to themes of social justice. Gender, for example, can be categorized as a social justice issue. When scholars discuss issues of gender bias in professional and technical communication (Baker, 1991; Gurak & Bayer, 1994), they call out a bias that can impact TCPs that assimilate gender into their identity. Therefore, the feminist research approach is tied to social justice by "fostering social justice and social change on behalf of women and other oppressed groups" (Hesse-Biber, 2013, p. 365). Intersectionality, which is at the core of the theoretical framework, is a focus on connecting social justice (in theory and practice) to TCPs because "intersectionality has meaningful implications for understanding how power works in the construction of social inequity and, therefore, how it can work in the construction of social justice" (Walton et al., 2019, p. 18). Social justice also connects to intersectional feminism by "studying across differences in terms of race, class, gender, and so on" (Hesse-Biber, 2013, p. 365). Even though the research design connects to social justice, the survey and structured interview questions did not inquire about specific types of bias. Instead, participants were provided the definition of bias (previously defined in Chapter One) and asked about their beliefs about its presence and impact based on their workplace experiences. In some interviews during which participants indicated that bias was present in these workplace contexts, a reflexive interview approach aligning with the feminist research approach to conducting interviews (DiCicco-Bloom & Crabtree, 2006) was implemented. During some of these interviews, reflexivity led to discussions about specific biases. This approach is discussed in more detail in the subsequent *Interview Design and Recruitment* section, and findings on specific biases are shared in Chapter Four.

Heuristic Diagram Design

My decision to integrate a new heuristic diagram into the research methods of this study stemmed from my literature review and professional experiences working as a TCP in software. After learning that workplace bias was believed to influence communication and comprehension for technical communicators (Albers, 2012), I wondered if there was existing research that explored how this impacted their work. The majority of the existing research focused on bias in software companies seemed to focus on software engineers and software developers (Calikli, Aslan, et al., 2010; Calikli, Bener, et al., 2010; Calikli & Bener, 2015; Devanbu et al., 2016; Stacy & MacMillan, 1995) and their impacts on software product, which mainly connected to bias to software product effectiveness and quality. Effectiveness and quality are important criteria for TCPs who work on documentation; several publications present research on how to maximize documentation effectiveness and quality in the technical communication field (Hackos, 2007; Jansen, 1994; Schultz et al., 2014; Strimling, 2019) and how software documentation, specifically, should be presented to internal and external end users (Jeyaraj, 2004; McBurney et al., 2018; Meng et al., 2018; Rico et al., 2009; Rüping, 2005). This gap made me wonder if workplace bias in software companies impacted the quality and effectiveness of its documentation. This led to my decision to add RQ #3 and three research design strategies: creating a heuristic diagram for this study, adding questions about documentation effectiveness and quality to the survey, and asking survey follow-up questions during the interview about documentation effectiveness. These survey questions are presented in the *Survey Design and Recruitment* section of this chapter, and the interview questions are shared in the *Interview Design and Recruitment* section. This section continues discussing how my professional experiences influenced the heuristic diagram design.

In my professional experience, TCPs who are creating documentation for a software company work in a fast-paced environment. Several factors can affect the pace and completion of documentation

(e.g., the number of technical writers and challenges with getting information from SMEs); however, timely documentation must align with the pace of software development because it needs to be published when the software is released. Software is constantly changing; new versions are in software production, fixes for bugs are rolled out, and developers are working on solutions for clients that asking for new features and enhancements. As a result, technical writers are tasked with balancing all the documentation updates that follow these changes in software production and making edits to improve the quality and effectiveness of existing documentation. If a section of the documentation does not communicate information clearly, it can impact various business areas. When end-users do not understand the documentation, for example, they may contact software support teams asking for clarity. When this occurs, the technical writer may be tasked with documentation revisions to fix this issue. Balancing all these documentation priorities can be challenging for technical writing teams. While project management skills are critical in these scenarios, technical writers often rely on the documentation manager and company goals to help them prioritize documentation development tasks. In addition, they may use internal and external reference material to ensure they are achieving all their documentation goals, including meeting deadlines. Internally, technical writers may use style guides, wikis, or other collaboration and project management tools to ensure they meet all their documentation needs. External references may include consulting books, journal articles, conference presentations, and heuristics. Internal and external references can help documentation teams by offering visualizations (e.g., heuristics) that they can leverage when creating their documentation strategy or during the technical writing process. Therefore, the gaps in the literature and my professional experience led me to consider creating a heuristic diagram for this study.

Design Considerations, Objectives, and Version History

My research design aimed to dive deeper into TCPs' perceptions regarding the presence and impact of bias in these environments. The literature indicated that bias was present in software companies; therefore, a heuristic could be useful for TCPs who experienced bias in these workplaces. While the literature discussed the presence of bias in AI and software (Beltran et al., 2022; DiCicco-Bloom & Crabtree, 2006; Macnab & Doctolero, 2020; Metz, 2021; Noble, 2018), the underrepresentation of women in the software industry (Hyrynsalmi & Sutinen, 2019) as well as in engineering (Carmona-Cobo et al., 2019), and male gender bias in software companies (Dias Canedo et al., 2019), workplace bias is not limited to the software industry. Research on gender-based stereotyping and bias in work teams (Halterman et al., 1991; Heilman, 2012; Perez, 2019), for example, is an issue present in software companies and other industries that employ technical communication teams. Therefore, a heuristic would be useful not just to TCPs working in software but to any TCP working in documentation. This study presented an opportunity to create the heuristic diagram and collect feedback from those for whom it was designed. In addition to providing their opinions on usefulness, participants were also allowed to give more comprehensive feedback. This part of the research design is discussed more in the *Interview Design and Recruitment* section of this chapter.

After deciding to incorporate a heuristic diagram for this study, I drew upon my experience creating a content audit heuristic for publication (Altamirano & Stephens, 2022) and my professional experience using heuristics in technical writing to help me decide how to create it and add it to the research design. Specifically considering RQ #3, I wanted to transform the theoretical framework as a potential tool TCPs could use in the workplace. In my experience as a TCP, whether inside or outside the software industry, is heavily project-managed, and the documentation subject matters are often complex. In addition, I place personal emphasis on the importance of bridging gaps between academia

and industry because I have been in the industry during the entirety of my graduate-level research. Being in that position has allowed me to benefit from the parts of academia that align with the industry, both as a graduate student and as a TCP. For example, I could leverage my professional experience when I had assignments related to technical writing. Conversely, many of the technical communication concepts discussed in the literature can and should be situated in industry. For example, while researching web-based accessibility features during my Graduate Research Assistant work, I learned more about designing for those with color vision deficiency. When I worked in the industry after this research project ended, we redesigned our documentation and sent a survey to our internal staff that asked for their feedback on the redesign. While we were analyzing the results, we discovered that our hyperlinks were hard to read for a coworker living with color vision deficiency. Even though I had knowledge about designing for color vision deficiency for web-based communication, it wasn't a consideration during our documentation redesign project. Reflecting on this later, I realized that no one on our technical communication team lived with color vision deficiency. I then realized we didn't consider this accessibility issue because we were not living with it. I believe this was an example of bias in documentation. In addition, I think if I had noted somewhere that this was important to remember, I may not have missed suggesting it during the redesign. That became the key to the heuristic diagram design; I wanted something to help us think about potential biases and avoid them.

Design Process and First Version

The heuristic diagram design was a three-part process. The first part was creating a condensed textual model explaining how to mitigate biases in documentation, the second was designing a heuristic that visualizes the textual model, and the third was creating a visual example of how the heuristic would be carried out in the workplace. For the first part, I thought about how we could evaluate documentation for biases. I felt that we needed a system to remind us about biases in documentation.

One of the keys to identifying biases is getting perspectives from different people, so I wanted the first step to entail collecting feedback. This could be done as a form of usability testing, in consideration that "reader feedback can be very useful for professional writers" (de Jong & Lentz, 2001, p. 388). Readers of documentation in these workplaces typically include internal and external end-users. After receiving the feedback, the TCP may need to decide what changes to make to the documentation to remove the bias. So, if we consider the color vision deficiency example that I mentioned previously, that specific documentation bias could be identified and fixed by changing the color palette for the documentation to values that are legible to individuals with this impairment. Next, it is important to prioritize what needs to be done. The last step is determining who will fix the issue (e.g., technical writer). This is specifically relevant for TCPs that work on a team with more than one writer, editor, etc. After deciding on this workflow, I wrote it out into a list of a series of steps:

1. Collect documentation and feedback from internal and external users.
2. Suggest changes designed to better support underrepresented groups.
3. Organize changes starting with the most immediate priorities.
4. Task out priorities to individuals on the documentation team.

After listing these steps, I felt that although each step explained what to do at each stage of this process, it was a bit lengthy to remember. So, I tried to summarize each step using one keyword as (1) collect, (2) recommend, (3) prioritize, and (4) execute. I thought the one-word summary was helpful; however, I didn't think it was sufficient to explain the process. To ensure the heuristic diagram had enough context, I decided the keywords and steps needed to be represented visually. When considering the infographic design, I aimed to use vibrant colors to make the steps clear and make the keywords stand out. The first version of the heuristic is shown in Figure 1:

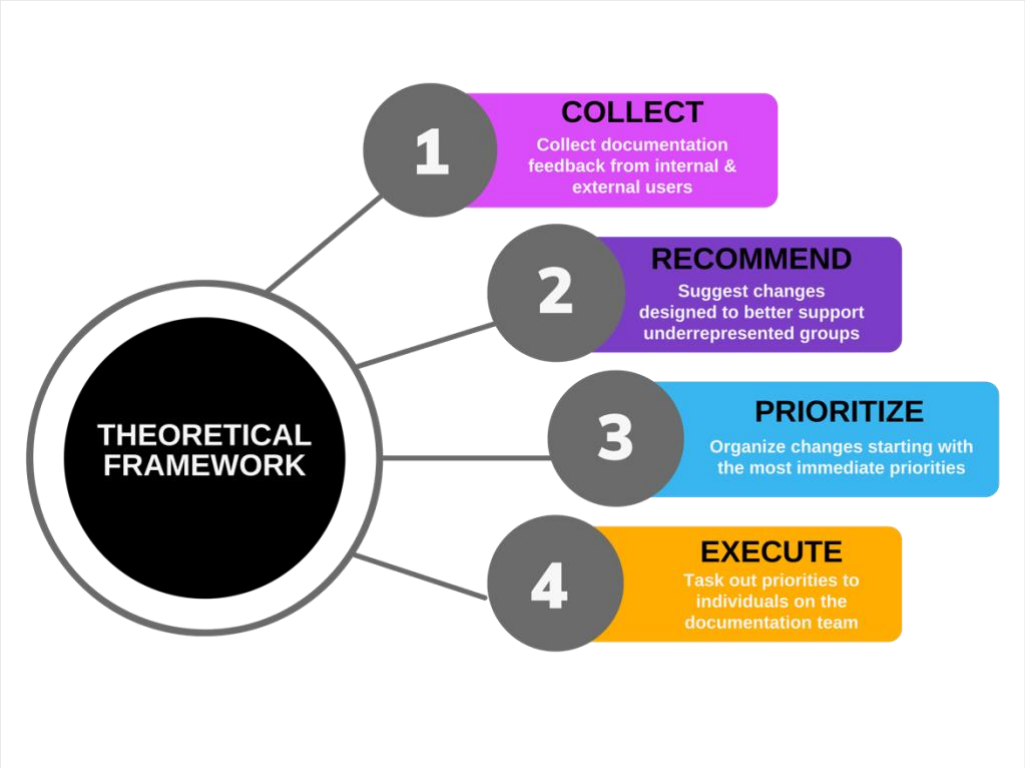

Figure 1: First version of the heuristic diagram design based on the theoretical framework.

For the second part, I began listing examples of biases. Then, I separated them into categories of the groups they affected, specifically relating to issues of social justice. Using my color vision deficiency story as an example, this would be a bias against color vision deficiency, an accessibility issue. The items listed in this table were based on a combination of my personal experiences as a TCP and issues of bias that I read about in the literature. Table 2 below shows my list of categories and examples (examples inspired by discussions in the literature include citations):

Table 2: Documentation Biases Listed in Heuristic Diagram Example

CATEGORY	EXAMPLE #1	EXAMPLE #2
ACCESSIBILITY	We have images in our online documentation that are not designed to support people using assistive technology	One of our designers that is color blind cannot differentiate parts of our documentation that use blue and green text
CLASS	Our users need to login to an online portal to access software instruction manuals	
GENDER	Our documentation uses "he" when talking about user actions (de Jong & Lentz, 2001)	
RACE/ETHNICITY	All of the documentation writers are white (Benjamin, 2019)	We need to document an enhancement about improving facial recognition for people of color (Tham et al., 2022)

I felt that using intersectional feminism as a theoretical framework was not only important to this work, but the spirit of it could be transferable to a visualization. The impetus for creating a heuristic diagram was to take the theoretical framework a step further by making it into something that could be visually shared and applied in the technical communication workplace. In the technical communication workplace, documentation is typically the priority for technical writers and editors. Therefore, I decided that this heuristic diagram should not only embody the intersectional components of this work but be considered as a tool for mitigating potential biases in the documentation. Since the heuristic diagram would be shown to TCPs, it was thought that adding another visualization as an example would better help participants consider how the steps would be carried out in the workplace. When considering the design for the example visualization, I had two goals. My first goal was to use short, concise wording to make the intent of the steps clear. My second goal was to balance concise wording and convey what must be done for each step. After considering various formats (e.g., flowchart, process map), I decided to create an infographic to represent the steps and use an affinity diagram to depict the example because "an affinity diagram (sometimes known as an affinity map or affinity chart) is a visual tool that helps you organize information from a brainstorming session" ("What Is An Affinity Diagram And How Do You Use It?," 2019). Furthermore, using an affinity diagram aligned with the practice of the steps in

terms of aggregating the feedback as a technical communication team. Using this format allows the team to compile the feedback in one place and sort it by types of biases (e.g., accessibility). By examining the feedback in one place, technical communication teams can discuss how the feedback impacts different audiences, allowing them to think critically about addressing issues of bias in the documentation. Finally, specific team members would be assigned updates to resolve the feedback, helping to ensure that all steps to mitigate biases in the documentation would be completed. I used Lucidchart (a software that allows users to create flowcharts and diagrams), to create the heuristic diagram example (see Figure 2).

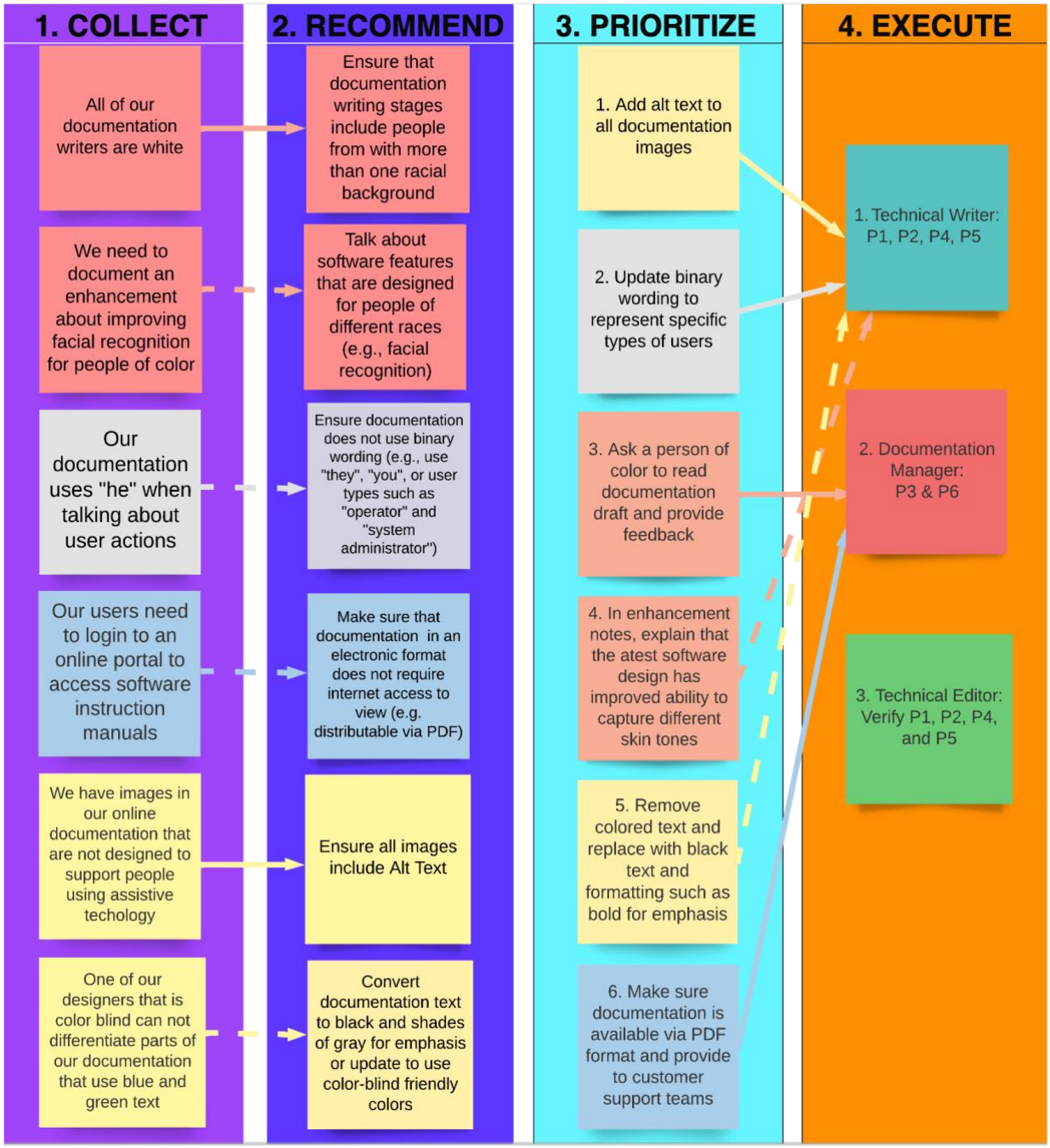

Figure 2: First version of the heuristic diagram example created for interview participant evaluation.

The example visualization shows how the heuristic diagram steps would be carried out on a documentation team by presenting the steps in a four-column format. To mirror a brainstorming session,

the squares in each column represent a Post-it note of written information that explains what is happening in each step. The first column, “Collect”, represents the feedback that the team received about the documentation. The notes in this column are colored by the type of bias, which correlates to who may be facing bias based on the feedback. For example, the black notes with the white text in the Collect column may correspond to gender bias. Each note has an arrow leading to the second column, representing the second step, “Recommend.” This is where the team makes a recommendation based on the feedback. The third step is the “Prioritize” column, and this is where the team looks at all the feedback they have collected and prioritizes it with the first one they are going to change at the top. Each task is numbered as a quick reference for the fourth step, which is the “Execute” column. The Execute column lists all the tasks and people on the documentation team who will make changes to the documentation based on the feedback. The notes in the Execute column are different colors from the previous columns because the notes in the last step represent the people on the documentation team who are assigned specific tasks from the Prioritize column.

Second Version

I created a second version of the heuristic diagram and heuristic diagram example after presenting the first versions of the heuristic diagram and example as a part of a poster presentation at the ACM SIGDOC (Association for Computing Machinery Special Interest Group Design of Communication) 2022 Conference as a participant in the Student Research Competition (SRC). I received feedback from SRC judges and conference attendees that prompted updates for the heuristic diagram and example. For the heuristic diagram, I replaced “theoretical framework” with “steps” to make it clear that it was showing the steps for mitigating biases in technical documentation. I also added a title to the heuristic diagram. It was also recommended that the text on each step be one color to make it easy to read and that the colors for each step on the heuristic diagram and heuristic diagram example match.

While I wanted to keep similar vibrant colors chosen for the first version, I used IBM's accessibility design recommendations (2024) to update the color palette to be designed for color vision-deficient individuals. I also used IBM's contrast recommendations based on W3's Web Content Accessibility Guidelines (2008) to ensure that the text would be legible for those with color vision deficiency. These updates were applied to develop the second version of the heuristic diagram, which was the version shown to interview participants (see Figure 3).

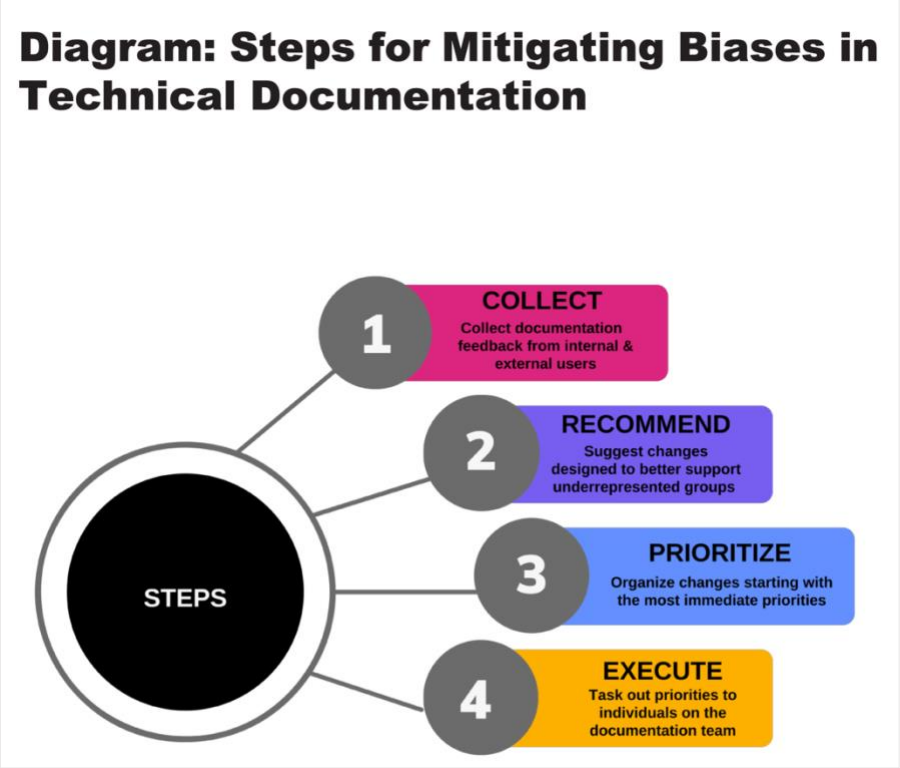

Figure 3: Second version of the heuristic diagram (shown to the interview participants).

I used the same color vision deficiency methods that I used for the heuristic diagram to update the background colors and text on the heuristic diagram example. For the first version of the heuristic diagram example, I received feedback that the lines having different styles (solid or dashed) were

confusing, so I made all the lines solid. I was also told that the culmination of all the colors was very bright, so I neutralized some of the Post-it note colors by changing one group to a white background and another with a black background to tone down the overall look of the example. To make the example format consistent for the heuristic diagram, I added a title above the visualization. These updates were applied to develop the second version of the diagram example, which was the version shown to interview participants (see Figure 4).

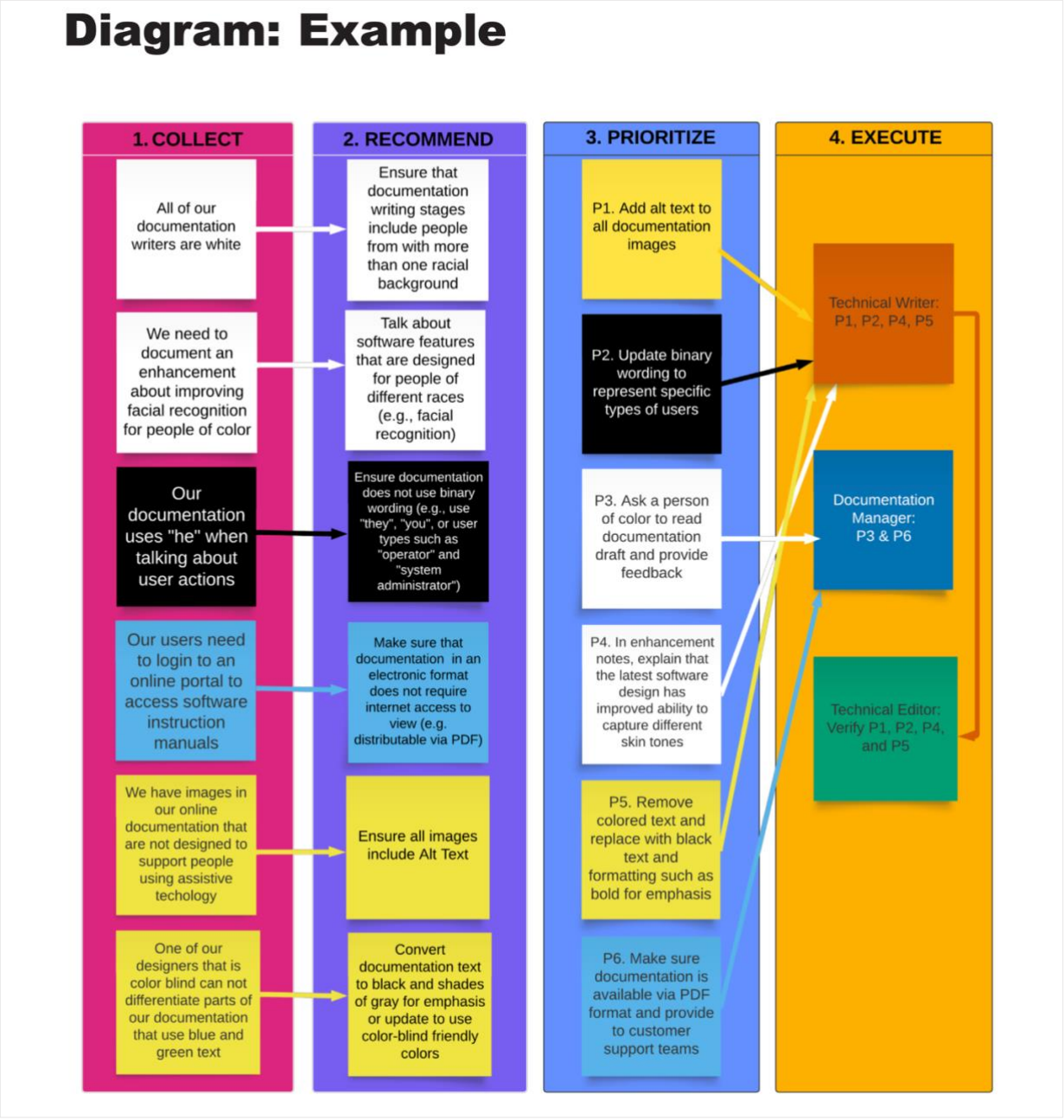

Figure 4: Second version of the heuristic diagram example (shown to the interview participants).

Survey Design and Recruitment

This section discusses the survey design and recruitment methods. During the recruitment phase of this study, participants were asked to take a survey. The next section of this chapter details how survey participants were recruited. The survey was made up of two parts. Part One consisted of prescreening questions designed to confirm that the participant met the eligibility requirements for the survey portion of the study. The next section explains the eligibility requirements for the survey. The subsequent *Part One: Prescreening Survey Design* section elaborates on this part of the survey. Participants continued to the second part of the survey if they met all the requirements for study eligibility. Participants were not offered compensation for completing Part One of the survey. Participants who answered all the required questions in Part Two of the survey were offered a $5 Amazon e-gift card. The *Part Two: Qualified Participant Survey Design* section elaborates on the second part of the survey. During Part Two, participants were asked if they were interested in participating in this study's interview portion. I contacted those who indicated that they might be interested and provided them with more information on the interview portion of this study and for scheduling. This is explained in more detail in the subsequent *Interview Design and Recruitment* section.

Survey Participant Recruitment

Potential participants were recruited primarily via my professional network and social media (Facebook and LinkedIn). After IRB approval, I posted a brief description of this study and a link to the survey my Facebook and LinkedIn accounts. After obtaining permission from group administrators, I also posted in two LinkedIn private listed groups for which I was a member: the ASU (Arizona State University) GIT (Graphic Information Technology) Alumni and the STC (Society of Technical Communication) Technical Editing SIG (Special Interest Group). In addition, one of my contacts from the STC Technical Editing SIG created a post with a link to my survey on the SIG's website. Some of my social

media contacts also reached out to me to let me know that they shared my posts or survey information with other professionals as they felt appropriate. In some cases, my contacts sent me instant messages asking me to email them more information about my research. I emailed them a brief study overview and attached a PDF flyer explaining its details. I also recruited participants when I attended the 2023 SIGDOC conference after speaking with them during the SRC, where I participated in a poster presentation about this study's preliminary results.

Part One: Prescreening Survey Design

The survey was distributed to participants digitally using Qualtrics, an online survey software. As per recommendations from the IRB, four security features were enabled. First, Prevent Multiple Submissions was turned on to prevent people from taking the survey multiple times. Second, Bot Detection was used to flag responses that could be bots via an embedded data field, Q_RecaptchaScore. Security Scan Monitor was also added to prevent security scanners from starting surveys during link testing for CAPTCHA. Third, RelevantID was also enabled, which analyzed a respondent's browser, operating system, and location to help prevent fake responses. Qualtrics includes a Data Table section, which allows users to filter and analyze response data. As an added layer of security, I reconfigured this section to display the Q_RecaptchaScore, recorded date, and duration (in seconds) for each respondent.

Even though these security settings were implemented, the survey was penetrated by bots within the first week of distribution. Bots are defined as "computer programs that complete online forms automatically (and often repeatedly) at a faster rate than would be possible for humans" (Yarrish et al., 2019, p. 235). Bot-based responses were flagged via the Q_RecaptchaScore and were apparent during my review of the data, which was based on batched sequenced recorded dates, nonsensical fill-in-the-blank answers (e.g., N/A), and short survey duration times. Bot-based responses were exported and purged from the data set, the survey link was updated, and an additional security feature was added.

After following a link to the survey, a CAPTCHA question was added to the survey flow. This did help for a few days; however, the survey was penetrated by bots again. Therefore, Password Protection was added, which required respondents to enter a password to take the survey. I also made my LinkedIn posts with survey links only viewable to my connections. I only shared the password when potential participants contacted me and asked for it so they could take the survey.

After the participants clicked the link to the survey, they were first presented with the Explanation of Research page (see *Appendix B*). After viewing this page, the first survey question (for Part One) was displayed. The Prescreening Survey included five questions, shown one at a time (one per page). These questions were designed to determine if the participants met the criteria for the study scope. To be eligible to participate in the survey, potential participants needed to meet the following four criteria: (1) be 18 years of age or older, (2) be able to read, speak, and write English, (3) have access to a computer or mobile device (e.g., tablet) with an Internet connection, and (4) be a technical communicator (any employee or owner impacting software production or documentation) with current or former work experience as an employee or owner in the computer software industry. The last criteria listed was separated into two questions; one asked the participant to confirm that they had work experience in the computer software industry, and the other asked them to confirm that the provided definition of a technical communicator matched their software industry work experience. If they met the criteria based on their responses to all five questions, they continued to the second part of the survey. If any response negated the study scope, the survey session was immediately terminated, and the participant was shown the following message, “We thank you for your time spent taking this survey. Your response has been recorded.” By asking questions to confirm that the participant met the criteria for the research scope, Part One not only served as a prescreening tool to help qualify if participants were eligible to continue to Part Two, but it also helped validate that those participants met the criteria for the

interview. Every participant who completed both parts of the survey would not be selected to be interviewed. This is discussed in more detail in the next two sections.

Part Two: Qualified Participant Survey Design

When creating questions for Part Two, I drafted my questions and then presented them to three people for feedback on whether the questions were easy to understand. These people had technical communication experience but were not eligible to participate in the study. I adjusted the survey questions based on their feedback. Part Two of the survey consisted of 24 questions: 19 required questions and five optional questions (see *Appendix C*). Part Two survey questions were separated into six sections: (1) Work Experience, (2) Software Documentation, (3) Workplace Bias, (4) Interview Interest, (5) Survey Compensation, (6) Optional Demographic Questions. Participants were shown a brief statement introducing each section, which was displayed above the first question for the section. The introduction statement for the Work Experience section, for example, read, "The following questions focus on work experience in the software industry." Note that when discussing question display logic for Part Two, use of the term "all participants" or "participants" refers to the participants that moved on to Part Two of the survey (it does not refer to participants that only completed Part One).

The Work Experience section consisted of five questions, which aimed to collect information on the participant's work experience in the software industry. Focusing on their professional experience in the computer software industry, participants were asked to share specific workplace teams that they worked with, their present and past positions held (e.g., full-time, consultant), present and past physical work location (e.g., on-site, telecommute), and the number of years of work experience in the industry.

The Software Documentation section included nine questions focused on two areas: how participants impacted the software documentation during their time in the software industry and their

opinions on quality and effective documentation. Of the seven questions in this section, two were only shown to participants based on their responses to the first question in this section. The first question asked if they supported the creation or management of documentation. Possible responses to this multiple-choice question were: “Yes,” “No,” or “Unsure.” The next two questions in this section asked more specifics about how participants supported this area, so participants who responded “No” were not shown these questions. As previously discussed in the *Heuristic Diagram Design* section, all participants were presented with the questions in this section about quality and effective documentation. The first question related to this area asked if participants believed the most recent software company they worked for had effective documentation for all users. Effectiveness was measured as an indirect (perceived) method. Next, participants were presented with four multiple-choice/short-response questions centered on their opinions about quality and effective documentation. Each question addressed quality and effective documentation independently. Participants were provided with options describing either features or characteristics for each. They were asked to select the feature or characteristic most important to them and to provide a brief statement explaining why. The options related to documentation quality in this section were modeled after Strimling’s documentation quality research (2019). The options related to documentation effectiveness were modeled after Rush Hovde’s research on technical communicators creating procedural knowledge and transmitting technical knowledge to software users (2010). Documentation quality was centered on Rush Hovde’s findings on “users’ routine and nonroutine uses of the software” because it was the “most common audience-based reason for discourse decisions” in this study (2010, p. 179). Using these existing frameworks for documentation quality and effectiveness also helped streamline the data analysis that is detailed in Chapter Four.

The Workplace Bias section had two questions. After being provided a definition of bias, participants were asked if they or a coworker experiences bias in the workplace. They were also asked if they believed workplace bias impacted the effectiveness of documentation. The Interview Interest section consisted of three questions. The first question in this section asked if they were interested in being interviewed. Possible responses to this multiple-choice question were: “Yes,” “No,” or “Unsure.” Participants who chose “Yes” were automatically sent a follow-up email one hour after completing this survey. The follow-up email thanked them for completing the survey and explained that they would be contacted regarding the follow-up interview within the next one to three business days. The next two questions in this section related to their availability and contact preferences for the interview, so it was not shown to participants who selected “No” to the first question.

The Survey Compensation section had one question, which asked if they were interested in receiving survey compensation. Participants who opted to receive compensation were emailed a $5 Amazon e-gift card to their preferred email address within five business days of completing the survey. After the e-gift card was sent, they were sent a Post-Survey Follow-Up: Gift Card email (using the same email address for which they requested the compensation be sent) that read, “Hello, thank you for completing my survey this week. I have processed your $5 Amazon e-gift card and sent it to this e-mail address. Please let me know if you are still waiting to receive it.” This additional step was added as an additional notification to the participants of the gift card being sent, an opportunity for them to notify me that they had not received the gift card and another form of appreciation for their participation in this research.

The Optional Demographic Questions section had five questions to collect demographic data from survey participants. This section differed from most of the preceding questions in Part 2 because responses to the questions in this section were not required. They were asked the following questions:

(1) “How old are you?” (2) “What is your gender?” (3) “What gender pronouns do you use?” (4) “What race do you identify as?” (5) “What is your household income?” I added this section to collect self-perceived participant identity and demographic information and use it during data analysis to connect to participant opinions and experiences.

Interview Design and Recruitment

This section details the dissertation interview design, including an overview of participant recruitment and the interview process. Interview participants were recruited primarily through the survey. Participants who indicated they were interested in being interviewed during Part Two (by responding with either “Yes” or “Unsure” to the first question in the Interview Interest section) of the survey were contacted via their preferred contact method (e.g., email, phone). To ensure a timely follow up to schedule interviews with interested participants, I set up two processes. First, I set up a Survey Response Workflow in Qualtrics, which was useful because “Workflows allow you to trigger tasks based on various events” (*Workflows Basic Overview*, 2024). For example, researchers can add a workflow that sends them an email after a participant has completed a survey. I created a workflow for this study that was triggered based on the participant response to question 16 in Part Two of the survey. This question asked, “Would you be interested in being interviewed for this research using Zoom video conferencing software?” When the participants selected “Yes” for this question, they were automatically emailed one hour after completing the survey. The subject line for the email was “Survey Follow-up Interview” and the body of the email read, “Hello, thank you again for completing the survey supporting my dissertation work. I am excited to see you would like to participate in a follow-up interview! I will reach out to you via your preferred contact method within the next 1 to 3 business days.” I also sent participants in this group a second, more detailed email. The subject line for the email was “Post-Survey Follow-Up: Interview Scheduling,” and it was sent within five business days after they completed the survey. This email

thanked the participant for taking the survey, and it included additional information about the interview process. The interview process information consisted of the estimated time the interview should take, a general timeline for the next available interview slot (e.g., next week), a link to schedule the interview online, and the flyer detailing the project scope. After a participant scheduled their interview, they were sent a Scheduled Interview Confirmation email within five business days.

Interview Process

Interview participants were sent the Explanation of Research page (see *Appendix D*) via email prior to the interview and asked to read it beforehand. At the beginning of each interview, I verbally asked the participant to confirm that they read and agreed with the Explanation of Research. All participants confirmed they read it and consented to its terms. As a semi-structured interview, the interview design consisted of three types of interview questions. The first type consisted of structured interview questions asked to all interview participants except the first interview participant. When I conducted the first interview, the participant I interviewed was the only person who had completed the survey, so technically, a top response did not exist for the survey question. As a result, this participant was instead asked to expand on their response. This was listed as a follow-up question because the original interview design did not consider the possibility of this scenario. The second type was comprised of planned probing questions that were asked based on participant responses to the structured questions. The last types were reflexive, additional follow-up questions. These questions were not planned but asked as needed to help participants to clarify their responses. Table 3 lists interview questions by type:

Table 3: Interview Questions by Type

TYPE	QUESTIONS
STRUCTURED	1. You may remember one of the questions I asked you in the survey was what you thought was important for making effective documentation. Most of our respondents said the characteristic most important to them was <INSERT TOP ANSWER> and the feature most important to them was <INSERT TOP ANSWER>, do you agree with this as a top response, and tell me why?
FOLLOW-UP	a. Can you expand on your response?
STRUCTURED	2. During the survey, I gave you the Oxford English Dictionary definition of bias, which was "prejudice in favor of or against one thing, person, or group compared with another, usually in a way considered to be unfair.". When asked to consider this definition to indicate if you believe you or one of your coworkers have experienced bias in the workplace, you stated that you <insert participant response>. Can you expand on your response?
PLANNED PROBING	a. Can you provide an example?
FOLLOW-UP	b. "It seems to me like there's a misalignment between what was happening in terms of assignments and what the goal of the documentation was, right?" c. "So, you think that potentially, there's a bias in terms of people's preferences for modality, for documentation?" d. "And would you say that you didn't feel comfortable or in a good place to ask to say, 'I don't really understand how explaining this to me' or something along that line? Do you think that would have been not received well, or you didn't feel like you could do that?"
STRUCTURED	3. In the survey, you indicated that you <insert participant response> regarding supporting the creation or management of technical software documentation. Do you feel workplace bias has impacted the effectiveness of technical software documentation?
FOLLOW-UP	a. "Did you feel like it would be looked down upon if you said, 'Hey, I need some more guidance'?"
STRUCTURED	4. Based on your perceptions and experiences working in these environments, can you think of a time when workplace bias has hindered a technical communicator, including your own, in terms of creating quality and effective documentation?
PLANNED PROBING	a. Why? b. Can you provide an example?
FOLLOW-UP	c. "Those people were not a part of the documentation team?"
STRUCTURED	5. After your initial review of the visualization, which response best describes if you think this tool will be useful for technical communicators facing workplace bias: a. yes, it would be useful, b. no, it would not be useful, or c. unsure if it would be useful?
PLANNED PROBING	a. Can you explain why you chose this response?
	b. For participants that responded with "Yes": What do you think would be the best way to share this visualization with technical communicators in these environments (e.g., coming from a manager, peer, publication, or conference presentation)?

TYPE	QUESTIONS
FOLLOW-UP	i. "So, you you're saying for the first part, when you mentioned a higher level outside Tech Comm, do you mean a team that's focused on diversity, equity, and inclusion?"
PLANNED PROBING	c. For participants that responded with "No" or "Unsure": i. Do you have suggestions for revisions? ii. Do you think there is another tool or method that would better serve technical communicators in this scenario?
FOLLOW-UP	d. Did you have anything else that you'd want to go over before I stop sharing the screen with you? e. "I know that you said you think it would be useful, do you see any room for revisions or a way that you would do it differently? Do you have any thoughts on that?" f. "Do you have any other things to say about the diagram before I stop sharing?"
STRUCTURED	6. Is there anything else you'd like to share that we didn't already cover about workplace bias and its impact (if any) on technical software documentation in software production?

Many follow-up questions consisted of me asking participants to clarify, expand on, or give more detail about their earlier responses, which makes it difficult to interpret all follow-up questions without seeing the entire conversation. Therefore, I did not include all follow-up questions in Table 3. Chapter Four provides additional information about the context of the follow-up questions and results based on an analysis of all question types.

CHAPTER FOUR: RESULTS

This chapter synthesizes and presents survey and interview results using a mixed-methods approach, including quantitative and qualitative data analysis. This dissertation is based on 28 surveys and 15 qualitative, semi-structured interviews with TCPs who have worked for at least one software company.

Participant Overview

The survey and interview solicited participants from multiple U.S. locations. Twenty-eight participants took Part One (Prescreening) of the survey, and 25 participants completed Part Two (Qualified Participant). Of the three participants who did not complete Part Two, one answered only the first seven questions for Part Two and abandoned the survey, and the other two did not meet all the criteria to continue to Part Two (based on their responses to Part One). Qualtrics provided location data for participants; estimated locations for participants that completed (successfully submitted all required questions) Part Two: one in California, five in Colorado, seven in Florida, one in Mexico, one in New Mexico, two in North Carolina, one in Pennsylvania, four in Texas, one in Utah, and two in Washington. The interview consisted of 15 participants.

Part One Survey Results

Twenty-eight participants took Part One of the survey; 26 moved to Part Two after successfully indicating that they were eligible for the study based on their responses during Part One. All participants responded “Yes” to the first three questions: (1) “Do you read, speak, and write English?” (2) “Are you age 18 or older?” and (3) “Do you have access to a computer or mobile device (e.g., tablet) that has an Internet connection?” For question four, which asked, “Do you have work experience as an employee (or owner) in the computer software industry?” 24 participants chose “Yes, I am a current employee or

owner," three chose "Yes, I am a former employee or owner," and one chose "No". The participant who chose no did not meet the study criteria and, therefore did not continue to question five. Question five provided the study's definition of a technical communicator and asked, "does your work experience in the software industry make you a 'technical communicator'?"; 26 participants responded "Yes," and one participant responded "No".

Part Two Survey Results

Twenty-six participants answered questions for Part Two of the survey. One participant answered the first five questions and then abandoned the survey. The first four questions were in the Work Experience section and the fifth was the first question in the Software Documentation section; therefore, question six and preceding represent results based on a maximum of 25 participants. As previously explained in Chapter Three, select questions were not shown to all participants (questions were not shown when logic parameters did not apply). Text is italicized and enclosed in quotation marks when direct quotes from participants are used.

Work Experience

Each question in the Work Experience section yielded 26 responses. The first three questions asked participants to select all employment statuses representing their present and past work experience in the software industry. Question (Q) 1 asked them to indicate which workplace teams best represented their work experience. The top response was technical communication/documentation, with approximately 75% of participants indicating work experience on this team. In addition, about half of the participants had experience in Software Development/Implementation. There were three responses for the "Other" fill-in field: Commercial/Sales, Software Design and Architecture, and COO. Figure 5 charts the workplace teams and response count.

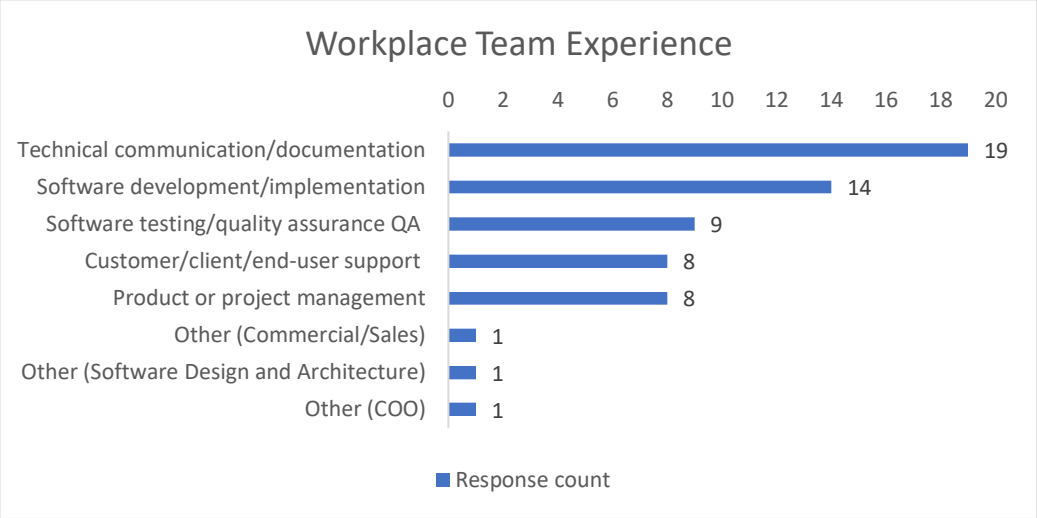

Figure 5: Chart of workplace team experience of survey participants.

Q2 asked about employment statuses for present and past positions held. The top response was full-time employee, a status held by all participants. The second most popular response was contract employee, a status held by almost half of the participants. Figure 6 charts the workplace teams and response count.

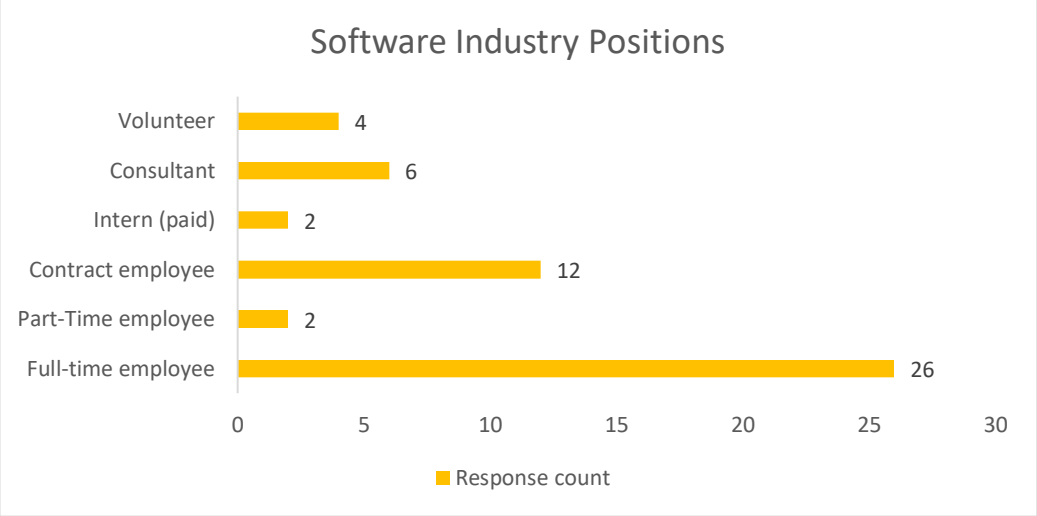

Figure 6: Chart of software industry positions of survey participants.

Q3 asked about their employment status regarding physical location when working in the industry. Telecommute was the top answer, selected by approximately 85% of participants. The next most popular answer was on-site, which was the location for about half of the participants. About 40% of participants had experience working in a hybrid work environment. Figure 7 visualizes the physical location results listed by the number of responses.

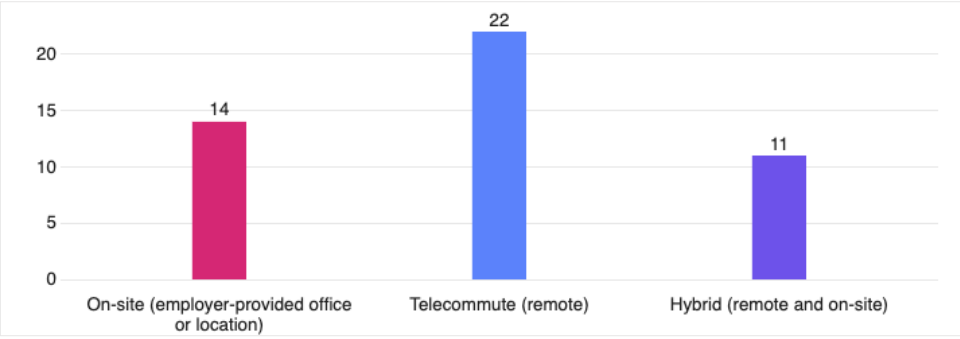

Figure 7: Chart of the physical location of survey participants when working in software.

Q4 asked them to indicate their total combined work experience working for (or owning) a software company, and to round to the next year if over six months. Zero participants indicated they had been in the industry less than a year. The top response was 11-15 years, chosen by about 31% of respondents; however, the next two top answers were statistically close, with approximately 27% selecting 20 years or more and 23% choosing 1-5 years. Figure 8 charts the time ranges that best represented their total combined work experience (rounding to the next year if over six months).

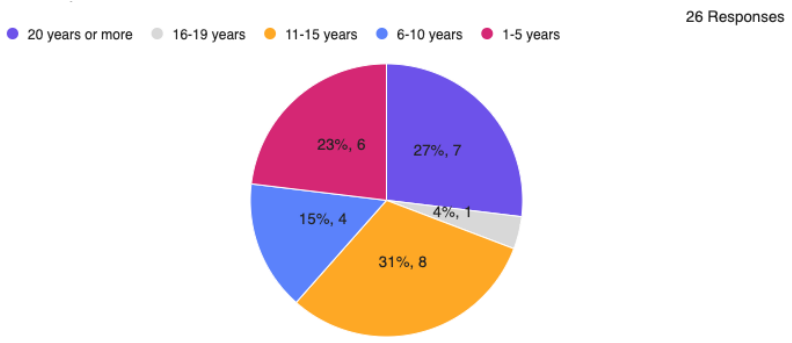

Figure 8: Chart of the years of software industry work experience for survey participants.

Software Documentation

The first question in this section, Q5, asked participants if they supported the creation or management of technical software documentation; 25 chose "Yes," and one chose "No." The 25 participants who answered "Yes" were shown questions 6 and 7. Q6 asked them to select all applicable responses that indicated how they supported the creation and management of the software documentation. The top two responses were about 92% wrote documentation and 88% edited documentation. In addition, 72% collaborated with documentation writers and provided subject-matter expertise. There were four responses for "other" support: (1) providing project management/content strategy for the software documentation, (2) working with SMEs to create new and accurate instruction, 3) developing training, and (4) managing the product documentation department. Figure 9 charts how survey participants supported software documentation by response count.

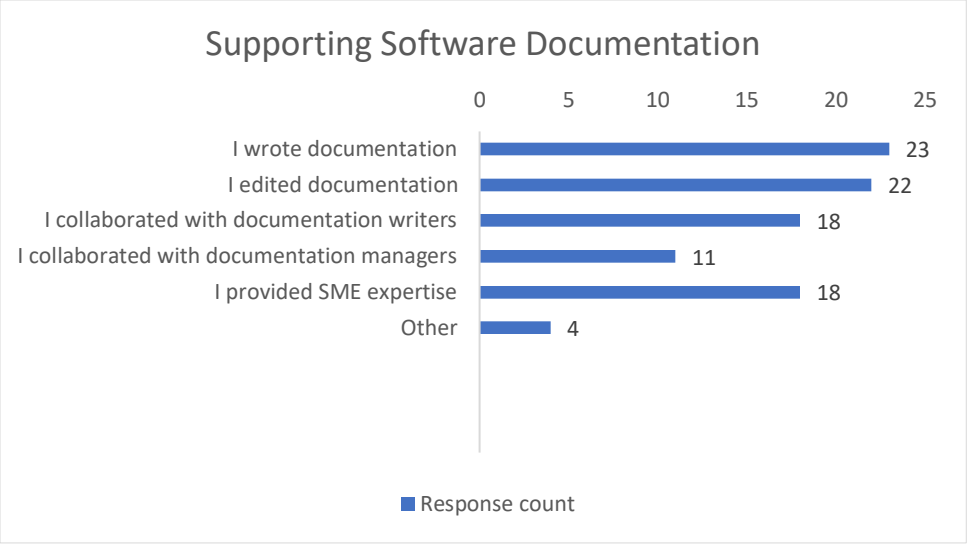

Figure 9: Chart of how survey participants supported documentation.

Q7 asked participants to select applicable roles they worked in when they supported the software documentation. Responses were technical communication/documentation = 14, software development/implementation = 12, product or project management = 11, customer/client/end-user support = 9, software testing/QA for end-users = 8, testing for internal use only = 7, and two responses for other. The other responses were "*COO*" and "*leadership/management.*" Q8 and Q9 asked participants questions specifically focusing on the most recent software company for which they have worked. Figure 10 charts the roles they were working in when they supported documentation.

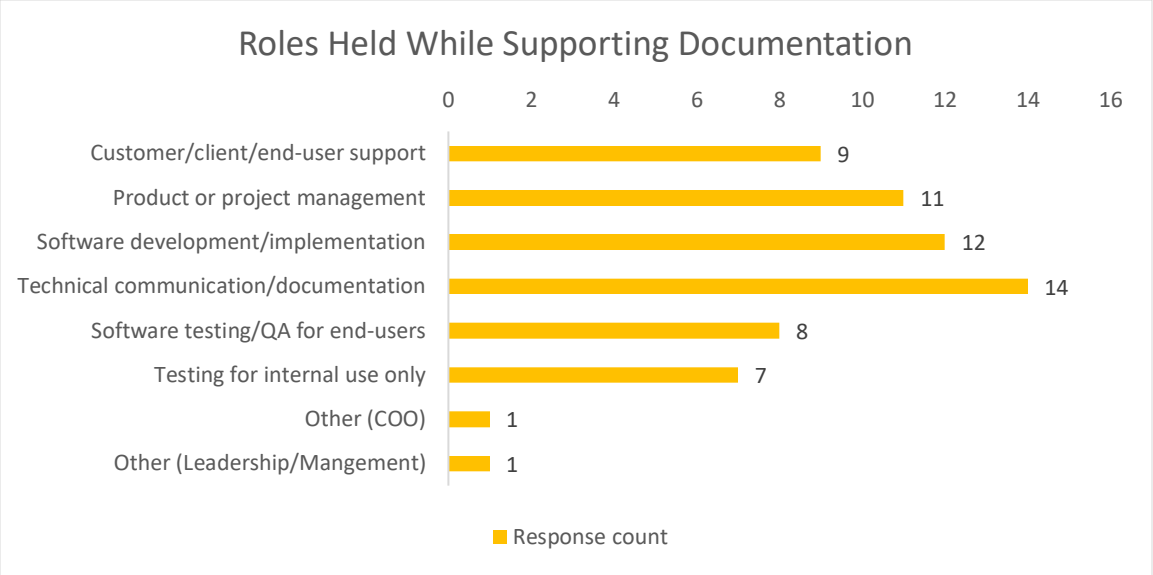

Figure 10: Chart of roles survey participants held when they supported documentation.

Q8 asked participants if they read any of the documentation produced by the most recent software company for which they have worked. 84% indicated that they had read the documentation. Responses were: “Yes” = 21, “No” = 3, and “Unsure” = 1. Still focusing on the most recent software company for which they have worked, Q9 asked participants if they believed that their company’s documentation was effective for all people who used the software. 36% of respondents indicated that it was effective, while 28% were unsure. Responses were: “Yes” = 9, “Unsure” = 7 “No” = 6, and two responses were “other”. The other responses were: “*they have videos which I found unsuitable for documentation*” and *“some documentation is effective, some is not.”*

Documentation Quality and Effectiveness

The remaining questions in this section focused on participants' opinions about the characteristics and features of documentation effectiveness and quality. Participants were given four

options for each question (except for Q11, which had three options) and were asked to pick the characteristic or feature most important to them for each and briefly explain why.

Quality Documentation: Characteristics and Features

Questions 10 and 11 focused on quality documentation. Q10 asked about the characteristics of quality documentation. Of the four options, the top answer chosen by 40% was “clearly represented,” followed by 36%, who chose “Contextually appropriate for the task.” The “Intrinsically (naturally) good” option yielded zero responses. For the top answer (“Clearly Represented”), there were three key themes provided in the explanation (fill-in) responses. (1) Six participants associated their answer usability and helping end-users find and understand information, (2) two mentioned user advocacy or appealing to a wider audience scope, (3) and two mentioned how it impacts customer or technical support teams. Table 4 shows the results for the most important characteristics of documentation quality and participant explanations for their responses.

Table 4: Responses to the Most Important Characteristics of Documentation Quality and "Provide a Brief Statement as To Why"

Choice Count	Characteristics of Quality Documentation
10	Clearly represented. 1. *For a broad audience to understand, the writing must be clear.* 2. *Clear documentation is hopefully also going to be indirectly more accessible and helpful. Allowing it to be the most useful.* 3. *Clearly represented quality in documentation makes it adaptable to a wider scope of users.* 4. *Software documentation should be straightforward, on point, and easy to understand.* 5. *Advocating for the user requires ensuring that the documentation is clear and representing the information being explained.* 6. *If users can't use the info, it's useless.* 7. *I believe this is the most important characteristic of quality when it comes to documentation due to the fact that if the information is accessible and appropriate but not clearly represented it would not be easy to understand the information being presented.* 8. *This is the most important because all reader levels must be able to use this software readily or understand how to explain it to the customer.* 9. *Having clear, precise information for an end user is critical to reducing other technical support.* 10. *If the documentation is complete, but no one can follow or understand it, it loses all value.*
9	Contextually appropriate for the task. 1. *It's easier for and users to follow instructions for a specific use case than theoretical information.* 2. *It should be short enough info for the user to do the task. No more.* 3. *Clear instructions lead to proper implementation.* 4. *The documentation needs to be appropriate for the constraints and affordances of the user environment.* 5. *There was documentation on how to emulate a user. Very helpful.* 6. *I believe this characteristic incorporates the other ones.* 7. *The content needs to be what the client is looking for and provide all the details they need to properly use the software.* 8. *Technical documentation is primarily task-based for the user's context. If the user cannot perform the task documented, the documentation is of insufficient quality.* 9. *It was written with actual end-users using work scenarios.*

Choice Count	Characteristics of Quality Documentation
6	Accessible to the reader. 1. *If the person trying to access the documentation cannot access it or use it as intended then nothing else matters. That is the gate of entry.* 2. *Not making assumptions about our diverse audience and constructing documentation that is accessible to all.* 3. *Centrally located, accessibility options when reading, easy to find, clearly labeled or named, and easily understandable by the target audience.* 4. *If the documentation isn't accessible to the reader, it might as well not exist.* 5. *I've seen documentation with a million links requiring the user to go to multiple places to get a basic question answered. The order to read isn't clearly defined and you get lost on page 5 and hunt again for where you need to go next period the flow should be easy for the user with accessible information on each page.* 6. *This. Accessibility. We have gone through many many documentations schemes. I believe that the most effective was also the simplest for the user - but surely painful for the writer. If the docs are not easily accessible and easily searchable, it doesn't matter what the quality is - no one will read it.*

When participants were asked to choose the most important feature of quality documentation, of the three options presented, 60% chose “concise, consistent, easy to understand and interpretable.” For this top answer, there were three key themes provided in the explanation (fill-in) responses: (1) seven connect these features to making a document more useable, understandable, or clear, or being most helpful to end-users, (2) five participants said that this feature helps save the readers time or they prefer documentation that’s short, easy to digest or skim information, and (3) three mentioned it considers all end-user and audience levels (e.g., beginners and experts). Table 5 shows the results for the most important features of documentation quality and the explanations that participants provided for why they chose their responses.

Table 5: Responses to the Most Important Features of Documentation Quality and “Provide a Brief Statement as To Why”

Choice Count	Features of Quality Documentation
15	Concise, consistent, easy to understand (information is clear), and interpretable (definitions are clear). 1. *Most readers have a very short time span when it comes to information gathering and problem solving. Efficient writing that is clear, accurate and concise will allow for the continued use of documentation over time.* 2. *I have found the documentation that is bloated or full of technical jargon, even for people who understand that jargon, makes it much harder to use. Examples and repetition of difficult concepts is important as is not to explain things in a run-on fashion.* 3. *Many end users are not able to take a general concept and apply it to their situation the more clear and concise, the better.* 4. *Simple and straightforward are most helpful to end-users.* 5. *Users want to do the task and get on with their day, not read documentation. The set of features best matches or enables that concept.* 6. *We are all flooded by information. The most likely things to consume are easily digestible. I'd rather have the important bullet points than a huge block of text that I'm more likely to skip or not pay full attention to.* 7. *Instruction should be clear for all levels of users, beginners to experts.* 8. *Conciseness and ease of access ensure usefulness to the largest audience possible.* 9. *Ensuring the documentation is clear and easy to understand reduces friction.* 10. *I like short and to the point information. Show code first, then documentation.* 11. *In my experience, state workers do not want to do the wrong thing period it's imperative that the documentation I create is clear and comprehensive. It promotes trust for the user.* 12. *The other two are subjective (bias per who, trustworthy per who, valuable per who, relevant per who). Most people also typically skip over lots of writing. I want clear, easy to skim data that defines clearly.* 13. *This is hard - I like some characteristics of the other features - I think a grouping that would make me happy is: Accurate, Relevant, Concise and easy to understand. I chose this one since it had two of my criteria. Conciseness without accuracy seems dumb. Completeness without accuracy is likewise. If the docs are not concise and read like a scholarly academic paper no one will read it (well, except maybe PhD candidates :) I feel that you can't choose only one of these.* 14. *This quality is most critical, because even against targeted audiences, there are technical variations of their skill sets. Clean, concise, and consistent messaging is critical for success.* 15. *The majority of the docs had to be exact for replication during testing.*

Choice Count	Features of Quality Documentation
8	Complete, relevant, timely (not outdated), and valuable. 1. *I find most frequently if there is existing documentation it is out of date and not kept up with as a priority in the overall software development cycle.* 2. *It's important to only provide relevant information with focus on context and why users should care (value to the user).* 3. *Tough choice here but relevant and timely are crucial for technical documentation and software development where there can be many versions that risk being behind the current state of the solution, esp for in-house use.* 4. *Outdated information generates more bugs being filed. The content should be complete so the client reads the document and understands exactly what needs to be done.* 5. *This is important to me because I value information that is relevant and timely. I've seen in the past how our organization has accurate and interpretable information but severely outdated. Timely is the most important feature in my opinion.* 6. *This is most important because software, by its nature, is constantly changing. It is important to have all of the facts and be able to use them effectively.* 7. *A relevant information does not help a user and could actively cause harm. Users don't necessarily need concise documentation as long as it is complete and relevant to their goal.* 8. *Documentation needs to be living documents and must be modified as things change period if failure to do so results in misinformation, confusion, and inaccuracy in the documentation.*
2	Accurate, credible, unbiased, and trustworthy. 1. *Untrustworthy documentation can lead to users avoiding documentation entirely.* 2. *The software is an integral part of high-risk operations. It is imperative that the information is accurate.*

Effective Documentation: Characteristics and Features

Questions 12 and 13 focused on effective documentation. When asked to select the characteristic most important to them for effective documentation, about half of the participants chose "Help users find information quickly." For this top answer, there were three key themes provided in the explanation (fill-in) responses: seven connected finding information to making the document useful or effective, four said that this feature helps save the readers time, and two mentioned it helps keep the

end-user's attention. Table 6 shows the results for the most important characteristics of effective documentation and the explanations that participants provided for why they chose their responses.

Table 6: Responses to the Most Important Characteristics of Effective Documentation and "Provide a Brief Statement as To Why"

Choice Count	Characteristics of Effective Documentation
13	Help users find information quickly. 1. *Again, in a software environment it is key that user find what they need quickly, or you will lose their attention.* 2. *This saves everyone time, which also saves everyone money. Providing documentation for the user to find the answers they need is critical. Especially for growth of a product or service you are offering.* 3. *Users normally go for a tech document because they need some info quickly. I believe documentations that are easy to search and navigate through are effective.* 4. *It is often reported that our users want to "get in and get out" of the docs.* 5. *Easy access, centrally located, searchable, appropriately named and labeled. Efficiency is efficacy in my book.* 6. *Common solutions should be easy to find.* 7. *People generally do not want to spend a lot of time looking through documentation. The faster they find what they need, the more effective the documentation.* 8. *Good documentation should be well organized and allow the user to choose the information they are searching for.* 9. *Developers are pressed to produce, so, we need to find answers fast to keep the pace.* 10. *Users have a very short attention span. People USE documentation; they don't read it.* 11. *I believe the documentation that is easily identifiable and easy to find is key period I've read plenty of documentation that was simply disorganized and hard to navigate, which made it difficult to find the relevant information I needed to find.* 12. *This. If you can't find topics for your keyword searches, it's useless even if well written. You can't read what you can't find.* 13. *This is the primary directive.*
9	Guide users in completing common tasks. 1. *This minimizes basic training needs if the most common activities are clearly explained.* 2. *Task completion is the goal, and effective doc helps the user do their job.*

Choice Count	Characteristics of Effective Documentation
	3. *The purpose of the documentation is to aid the user in completing a task; procedures are tailored for various roles and tasks.* 4. *This seems crucial regardless of audience of documentation (stakeholders reviewing requirements, developers following designs, reviewers of unit tests, QA testers executing test plans, and end users of the software itself).* 5. *If I'm there show me a high level summary of what you will explain and how to do it. Keep fluff out and don't give me only a title or summary.* 6. *Users need to know at least the basics of using the software. If they can't even complete basic tasks, then documentation has failed to provide effective instructions.* 7. *Majority of integrators, implementers, and users have a common ideal of what they need out of the documentation. Having a quick "how to" is helpful.* 8. *The more that users can be guided through common tasks without involving a customer service representative, the more useful and effective it becomes.* 9. *Having a large team of testers replicating a week's worth of jobs correctly required detailed guidance.*
2	Assist users who might not use all the software documentation. 1. *Usually when I go to documentation it is for a specific issue. I don't necessarily need all of the basics of a tool I already know how to use or that is intuitive but I should be able to find and use a piece of documentation that I need without spending lots of extra time finding background information.* 2. *This is important because the documentation may be used by different roles.*
1	Show processes outside the normal flow of tasks. 1. *Flows outside normal tasks are more likely to provide insight and extra value to the documentation.*

Table 7 shows the results for the most important features of effective documentation and the explanations that participants provided for why they chose their responses.

Table 7: Responses to the Most Important Features of Effective Documentation and “Provide a Brief Statement as To Why”

Choice Count	Features of Effective Documentation
11	Information is organized by user tasks. 1. *Typically users will look for the major subset of the problem or the desired area of information.* 2. *Typically this makes it easier to find the information I am looking for quickly and hopefully contains all of the information on a subject that I am looking for.* 3. *This makes it easier to find the content you need as well as additional information that might be relevant.* 4. *This helps users to practically apply what they read to their day-to-day tasks.* 5. *In large doc sets like ours, it is important to map what our content organizations to the user tasks and workflow so that they find information quickly.* 6. *This helps users find the info they need. When they access help, it is usually because they're trying to do something--not because they're curious about other background info.* 7. *This would help me find what I need depending on the task at hand. Keeping information organized improves the likelihood of users using the documentation, and returning in the future for other tasks.* 8. *If information is organized, then it is easy for users to find and follow.* 9. *Task based organization isn't always the best approach but it is very common. If a user can't find what they're looking for by the task they are trying to complete, the documentation is ineffective.* 10. *Well organized documentation will allow for more efficient locating of topics and will therefore increase adoption and use by customers.* 11. *Due to using work based scenarios required various user tasks and to enter work orders and completions in concert and exact order.*
8	Formats are standardized. 1. *Information is what users would look for in technical documentations. Having standardized formats would eliminate the need for learning how to use the documentation.* 2. *Standard formatting lends credibility to the material and ensures ease of access/interpretation.* 3. *Standardized formatting eliminates visual distractions, allowing the user to focus on content and find the information they need in a timely manner.* 4. *My company had defined document standards for ISO certification that really matters when you've got decades of material in the knowledge base. Nothing worse than multiple historical documentation systems and processes.*

Choice Count	Features of Effective Documentation
	5. *Consistency and simplicity are crucial to readability.* 6. *It is important to realize where to find what is needed quickly.* 7. *This is weird. I'm not sure I get the differences between a "feature" and a "characteristic" - they seem synonymous to me. In any case, in this group - standardized seems helpful - but it can include other features in here. Use standardized doc can also be organized by tasks, and have information in side-bars. I think a set of docs that behave similarly within the set is helpful - it makes the consumer more comfortable with the system, and aids in their ability to use the system.* 8. *Allows for visual cues to easily bypass sections of documentation.*
3	Information is repeated across multiple sections and documents. 1. *Users may not have read other sections or documents. Putting relevant information together, even with duplication assists and understanding.* 2. *You shouldn't have to cross reference multiple documents to find the stop you need, though linking to appropriate resources defined elsewhere can be acceptable.* 3. *Scaffolding information allows the user to build their knowledge and gives the user the option to seek out the information they need without needing to jump around the documentation.*
3	Supplemental information is placed inside bars and call-out boxes. 1. *Highlights additional information is good.* 2. *Yes, if this is the case it is usually standardized which is my first choice. I also want to be able to access other pages and see relevant information to what I am reading. It may help me expand my knowledge quickly or see information that I did not know to hunt.* 3. *This is exciting to me when I am reading documentation. It gives me a glimpse of additional information the writer thought would be useful to the subject being discussed but not necessary to actually understand the basic concept.*

Workplace Bias

The workplace bias section consisted of two questions about participants' opinions of the presence and impact of bias in the workplace. As previously discussed, participants were provided a definition of bias and asked if they believed they or one of their coworkers experienced biases in the workplace. Approximately 75% of participants chose "Yes," three participants chose "Unsure," two participants chose "No," two participants chose "Other" and added the following fill-in responses:

- *“Yes - and anyone that says otherwise is lying or completely clueless.”*
- *“The unfair aspect seems to suggest intent when what I consider bias is more accident of individual/group norms and lack of training on consistent processes when producing documentation. Simply put, documentation facing QA testers or end users often looks more appropriate to internal software development team members.”*

The participant who discussed *“the unfair aspect”* later explained during the interview that they were unsure of the question's parameters and, therefore, wrote their response from the scope of bias in the documentation. This is discussed further in the subsequent *Workplace Bias Experience* section.

The second question asked if participants believed workplace bias impacted the effectiveness of documentation. Even though “Yes” was the top answer, the responses were split closely: 40% “yes,” 32% “unsure,” “no,” 24% and one “other” response that said, “Again, downplaying unfairness and just acknowledging the unreflective technical writing practices leaves much documentation geared toward particular internal group that wrote it.” With such a minor variance between these responses, it seems more representative of the data to say that results are inconclusive rather than to point out that many of the participants believed that workplace bias impacted the effectiveness of documentation.

Interview Interest and Survey Compensation

The Interview Interest section consisted of three questions, focusing on participants’ desires and contact information for follow-up interviews for this research. Of the 25 participants who were asked if they were interested in being interviewed, 17 chose “Yes,” six chose “Unsure,” and two chose “No.” The 23 participants who chose “Yes” or “Unsure” were asked about their availability to meet in the next one to four weeks and to provide their preferred method of contact for scheduling an interview. One participant chose “I prefer not to be contacted, " so I contacted the remaining 22 participants to

schedule an interview. Twenty-five participants were asked if they were interested in receiving a $5 Amazon e-gift card via email for their survey participation. Thirteen participants opted to receive a gift card, and twelve declined.

Optional Demographic Questions

Twenty-five participants answered all five questions in the Optional Demographic Questions section. These participants ranged in age from 25-64 years of age; about a third were between 35-44 years of age. Eight participants were 35-44, 6 were 25-34, 6 were 55-64, and five were 45-54. When participants were asked to choose their gender, over one-third of participants surveyed indicated that they were female; sixteen participants chose "Female," and nine participants chose "Male." When participants were asked what gender pronouns they use, over one-third of participants surveyed indicated that they used "She/her"; sixteen participants chose "She/her," and nine participants chose "He/him." When asked what race with which they identify, almost 90% of participants chose "White," two chose "Asian," and one chose "Other," with the fill-in response, "Latin American." Figure 11 shows a breakdown of the percent and values for each race selected by participants.

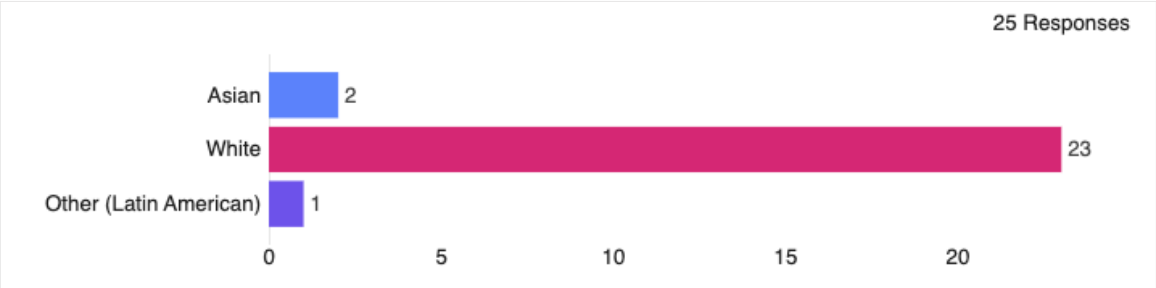

Figure 11: Chart of races of survey participants.

When asked to indicate their household income, three out of 25 participants chose "Prefer not to answer." Twenty-two participants provided a range from $40,001 - $100,001 or more; however, zero

participants fell in the $60,001-$80,000 range. Over 70% of participants who provided an income range stated that their household income was $100,001 or more. Figure 12 shows a breakdown of the percent and values for each household income range response and the number of responses for each.

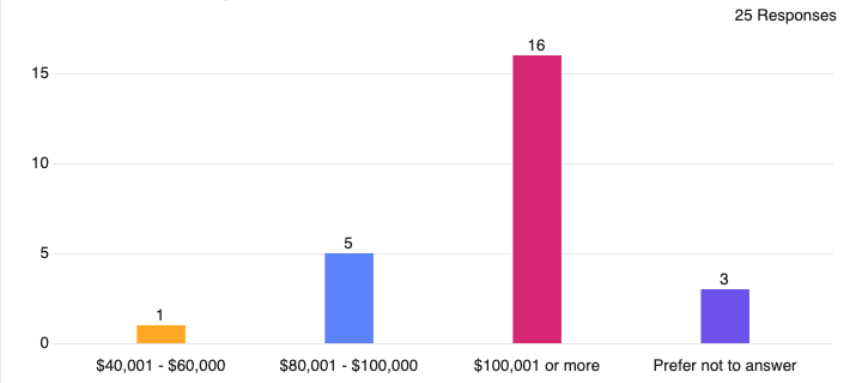

Figure 12: Chart of household income of survey participants.

Interview Participant Demographic, Alias, and Anonymity

This section details demographic details for each interview participant (based on their survey responses), including an alias that I assigned to each to protect their identity. To help recognize the voices of all participants, especially those from marginalized groups, the subsequent *Interview Results* section sometimes refers to participants by alias. However, when the context of the participant data being shared is too specific, the alias was replaced with a brief demographic descriptor of the participant. In addition, any mention of specific individuals or company names is omitted from direct quotes. My decisions regarding disclosing individualized participant demographic information were aimed at maximizing critical analysis of the data and ensuring anonymity for all interview participants. Table 8 lists interview participant demographic data for the fifteen interviewed participants, listed alphabetically by alias.

Table 8: Interview Participant Demographic Data Listed by Alias

Alias	Age Range	Gender	Pronouns	Race	Income
Ana	35-44	Female	She/her	Other: Latin American	$80,001-$100,000
Bob	25-34	Male	He/him	Asian, White	$100,001 or more
Cara	45-54	Female	She/her	White	$80,001-$100,000
Eva	35-44	Female	She/her	White	$80,001-$100,000
Jack	45-54	Male	He/him	White	$100,001 or more
Jane	55-64	Female	She/her	White	$80,001-$100,000
Jill	25-34	Female	She/her	White	$100,001 or more
Joe	45-54	Male	He/him	White	Prefer not to answer
Lily	35-44	Female	She/her	White	$100,001 or more
Liv	35-44	Female	She/her	White	$100,001 or more
Lucy	45-54	Female	She/her	White	$100,001 or more
Mia	55-64	Female	She/her	Asian	Prefer not to answer
Rose	55-64	Female	She/her	White	$40,001-$60,000
Ruby	35-44	Female	She/her	White	$100,001 or more
Sam	55-64	Male	He/him	White	Prefer not to answer

The interview participants ranged in age from 25-64 years of age. Approximately one third of participants were between 35-44 years of age. Five participants were 35-44, four were 45-54, four were 55-64, and two were 25-34. When participants were asked to choose their gender, approximately one-fourth of the interview participants surveyed indicated that they were female; eleven participants chose “Female,” and three participants chose “Male.” When participants were asked what gender pronouns they use, over one-fourth of participants surveyed indicated that they used “She/her”; eleven participants chose “She/her,” and three participants chose “He/him.” When asked what race with which they identify, approximately 86% of participants chose “White,” one chose “Asian,” one chose both “Asian” and

"White," and one chose "Other," with the fill-in response, "Latin American." Figure 13 shows a breakdown of the percent and values for each race selected by interview participants.

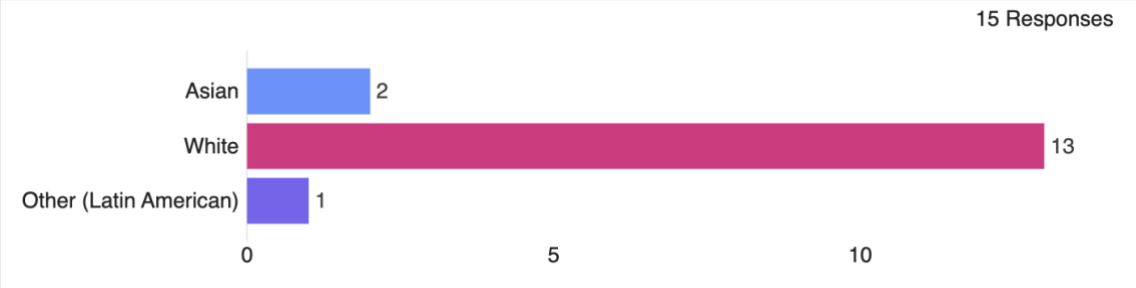

Figure 13: Chart of race of interview participants.

When asked to indicate their household income, three out of fifteen participants chose "Prefer not to answer." Twelve participants provided a range from $40,001 - $100,001 or more; however, zero participants fell in the $60,001-$80,000 range. Approximately 60% of participants who provided an income range stated that their household income was $100,001 or more. Figure 14 shows a breakdown of the percent and values for each household income range response and the number of responses for each.

Figure 14: Chart of household income of interview participants.

Interview Results

This section details the results of the interview portion, which includes fifteen participant responses for structured, planned probing, and follow-up questions. The results in this section are organized primarily by structured questions, which include findings for corresponding planned probing and follow-up questions. Structured and probing questions and specific survey wording used during the interviews are displayed using quotation marks. Text that is italicized and enclosed in quotation marks indicates it is a direct quote from an interview participant.

Documentation Effectiveness

This section discusses the results of the first structured interview question, which compared the participant's survey responses with the top survey responses (based on when the interview was conducted) for two documentation effectiveness questions asking participants to choose the most important characteristic and feature for effective documentation. Participants were told what the top answers were for the most important characteristics and features and then asked, "Do you agree with this as a top response, and tell me why?" As previously discussed, the first interview participant was not asked this question and was instead asked to explain why they chose their response. When some of the interviews were conducted, there was a tie between the two top responses. In these scenarios, I explained that there was a tie and presented both top answers to these participants. This resulted in one participant discussing effective characteristics and seven participants discussing effective features.

Effective Documentation: Characteristics

During the survey, participants were asked to select the most important characteristic for making effective documentation and then provide a fill-in response briefly explaining why they chose their answer. When asked about the most important characteristics of effective documentation, there were

three groups of top survey answers: nine “Help users find information quickly,” five “Guide users in completing common tasks,” and one considered both “*equally important*.” Of the nine participants who chose “Help users find information quickly,” six people chose the same characteristic as being the most important during the survey and agreed with it being the top survey response. The three participants who did not have the same top survey response chose “Guide users in completing common tasks,” Sam agreed with the top survey, Eva did not agree, and Cara claimed they were “*equally important*.” Of the five participants who chose “Guide users in completing common tasks,” during the survey, four chose the same response during the survey, and three of those four agreed with it as the top survey response. Two of the three that agreed said they chose to agree because this characteristic aligned best with the type of work they were tasked with doing. The third participant, Liv, connected her choice back to company objectives; she stated,

> *“For me, from working in the software industry, from multiple fronts, having something that can support your customer base while reducing your required staff, or to allow a user to participate without additional cost associated, such as staffing. That's very important to the longevity and the growth of the company*.”

The participant who disagreed was the first participant interviewed, and as previously discussed, they only elaborated on why they chose the answer, explaining that it aligned with their work. The last interview participant in this group did not provide a response because I only asked them about features of effective documentation by mistake. The tie for the top survey answer was between “Help users find information quickly” and “Guide users in completing common tasks.” When asked if they agreed with the top response, Jack said,

> *“I actually had a bit of trouble choosing between those because I think, you know, the end goal with affected documentation is to help the end user. Well, it's not only to help end users but also*

to help the support people that would be supporting a user and kind of offload a lot of that work onto the documentation and free up the customer service representatives to do more complex stuff."

Effective Documentation: Features

During the survey, participants were asked to select the most important features of effective documentation and then provide a fill-in response briefly explaining why they chose their answer. There were three groups of top answers when discussing the top answers for the most important features of effective documentation: two "Formats are standardized," five "Information is organized by user tasks," and a tie between eight for "Formats are standardized" and "Information is organized by user tasks." Joe was one of the two who chose "Formats are standardized." He chose the same answer and agreed with it being a top answer, saying that it should be "*prioritized*." The other participant in this group did not provide a response about agreeing with the top answer because I gave her the answer for the feature of quality documentation question by mistake. Therefore, her response corresponded to a different selection of choices related to quality documentation. Of the five participants with "Information is organized by user tasks" as a top response, three chose the same answer and agreed with it being the top response. Liv and Jane did not choose the same answer chose "Formats are standardized." Liv ultimately agreed with the top answer but still recognized that she chose her response based on her personal perspective, stating,

"For me, I have a hard time focusing on the technology that's in front of me or the documents that I'm reading If it's not formatted in a friendly way. Having too many blurbs or pop-ups on the side, those are distracting and forces me to actually step away from reading it. So, while I don't think either answer is wrong, I can see that a larger customer base would prefer something that I necessarily don't."

Jane, however, did not respond definitively. Jane thought organizing by user tasks was important and stated,

> *"Especially when it comes to knowing where to look for information, or where to start, where to end, where to go from one section to another, I think standardization is really important for formatting; especially when you're looking at steps to use the software*."

Of the five participants who chose "Information is organized by user tasks," three chose the same answer; two agreed with it as a top answer, and the remaining participant was the first to be interviewed (not asked if they agreed). Of the two that agreed, both credited what they had learned about technical writing. Lucy, for example, talked about being taught to organize user tasks and calling it "*logical.*" Lily credited her decision on what she learned about information architecture, discussing the five different ways to organize content according to the "*Latch Model."* Wurman created the LATCH model as an information architecture method for organizing information by location, alphabet, time, category, or hierarchy (2001). Lily said organizing by user tasks is a "*catch-all*" for aligning with LATCH. Of the eight participants with the tie answer, all of them had chosen one of the two answers that were tied; two chose "formats are standardized," and the remaining three chose "information is organized by user tasks." All but three of the eight participants agreed with those answers being tied; two did not agree, and one said he was also conflicted between the top two answers. The two that did not agree, Mia and Eva, stood by their original responses. Mia explained that although she could "*see why there's a tie*," she cared more about how easy and quickly the information was to find than "formats are standardized." Eva said her original selection of "formats are standardized" was more important because information may not need to be organized by user tasks because "*different users may have different needs.*" Bob, who was conflicted between the tied responses, explained that he also had difficulty choosing between those two because he's a "*stickler for format*," but he also thought both top answers were both equally

important. The five participants who agreed that there could be a tie between these two answers each agreed but reiterated why they chose their initial response. Only one participant, Jill, chose "formats are standardized," and the other four chose "information is organized by user tasks." Jill said that she chose to standardize formats over the other option because it helps with "*ease of access*" for technical communicators. One participant, Sam, originally chose to organize information by user tasks, but after thinking about his answer and the tied answer, he preferred formatting consistently by stating that it helps people find information more quickly. Jack, Ruby, and Cara all had different reasons for prioritizing the option to organize information by user tasks. Jack said that the technical writer should determine the best way to organize a document. Jack explained,

> *"I think the reason I didn't use the formats or standardize was because it depends on the question being answered. There might be a better way of explaining things in a different format based on the task that's being explained. So, you know, I kind of felt like it really is up to the documentation person to determine the best way to communicate what needs to be done… sometimes there might be a table, sometimes it might be a bullet point… And not just conforming to a standard format for the sake of conforming to a standard format, but they're using the right tool for the job*."

Ruby discussed the importance of mapping the flow of information for structuring content to "*make sure it's mapped to what you think that the user's mind map is going to be"* and for the technical writer to consider the user by asking "*what is [the user's] workflow*?" Cara stated that she agreed that standard formatting is good, but she'd prioritize having the information available because the formatting is secondary to the information being available.

Workplace Bias Experience

During the survey, participants were provided the definition of bias and were asked if they believed they or their coworkers experienced bias in the workplace. This section details the results of when interview participants were reminded of their responses and asked, “Can you expand on your response?” During the survey, eleven interview participants responded with “yes,” two chose “unsure,” one chose “no,” and one chose “other.” Joe, who had the “other” fill-in survey response, stated that he confused the question about bias to be documentation specific. After I explained that it was centered on the presence of workplace bias in general, he stated that he had experienced it first-hand in the workplace. Table 9 lists quotes from interview participants when asked to expand upon their survey responses (sorted alphabetically by survey response type).

Table 9: Interview Participants' Responses on Workplace Bias (Expansion on Survey Response)

Alias	Survey Response	Interview Response
Bob	Yes	*"I think we all have biases even if you were working through them, or that's how we're raised, or whatever, and challenging those thought processes and things."*
Jack	Yes	*"Well, I think the truth of the matter is that everyone has biases. I mean, just based on their life experiences. It could be, you know, where they live, where they grew up, their gender, their religion, their sexual orientation… I think it's impossible to completely eliminate the bias from, I mean, anything we do, including documentation. I think the only right answer is, yes, there is bias because everyone has bias. And it's just how much can people be aware of that bias, and how much can they filter that out based on, you know, their job and their customer base."*
Jane	Yes	*"I always felt that IT companies, especially software-specific companies."*
Lily	Yes	*"But even the best companies, whether they mean to or not, I think, are just generally have some bias because humans are humans and humans have biases; conscious or not. And managers manage people, and... I don't think a lot of it is done maliciously, I just think it just is. It's just something we have to accept. But that doesn't mean we can't push back on it and try to change it, which is what I've tried to do."*
Mia	Yes	*"Yeah, it's not just in software industry, it's everywhere. Especially when you are a woman and when you are an Asian."*
Rose	Yes	*"Well, there is obvious biases from people who are actual employees and of people who are contractors… And we had some people from different backgrounds, so, I don't know how that played into stuff. I don't know. It was just, sometimes it felt biased, sometimes it didn't."*
Eva	Unsure	*"So, at first, I wanted to say yes, but the more accurate answer is, I don't know. Statistically, I assume that somebody has, but I haven't heard anecdotal evidence or witnessed it myself."*
Cara	Unsure	*"I think I'm very lucky, because my previous company, Company X, just was very inclusive… but I just felt like we all supported each other in our strengths, regardless of politics, skin color, or any of it, right? It was just such a wonderful experience, so I think I'm rare in that. That being said, I have no doubt that coworkers have experienced that. It's just that I don't have concrete examples to tell you, so that's where I'm kind of like, I'm not sure."*
Joe	Other	*"But the question you ask is general experiencing workplace bias. Yes, certainly, I have… And, you know, I would say, certainly I've experienced bias and that's part of the reason I actually maybe decided to leave my company eventually."*
Ana	No	*"I am pretty lucky to work with the people that I work with, and honestly with the close people that I work with, I have never felt any type of bias in any way."*

In addition to the responses listed in Table 9, Jack shared general examples of potential biases that he saw in the workplace but was hesitant to call them biases. Jack stated that he never saw specific examples of bias, explaining, *"As far as, like, race, religion, gender, I haven't seen any overt bias for those things. At least, not that I've been aware of."* However, he also gave some general examples of the types of biases he thought were possibly present in the workplace. He discussed potential bias in three areas of technical communication: gender-based language in documentation and correlations between technological experience with documentation modality and age. When exploring gender-based language in documentation, he referred to as *"he/she where documentation often much more patrilineal with "he" instead of a more gender-neutral term."* When explaining perceived age-based biases related to documentation modality preferences, he shared his views that these biases could have more to do with technological experience than ageism. Jack explained,

> *"I think even one of the biases is like age, and you know, you're doing technical communication and the digital era versus the printed, you know, what's available online, how do you search for it online? How, you know, Wiki, feeding all the documentation into AI, you can use much more, you know, large language models in order to query the documentation that instead of trying to look for the, you know, in the documentation. So, I think, like, at my company, we were doing much more standardized like PDF documentation, but then other people took it upon themselves to start doing it much more in a wiki form and kind of constantly bypassing the documentation person, which was their bias to say, well, this is the way we should be doing it and not the traditional PDF format that people could download and print, and you know, search online."*

While Jack mentioned in his example that these biases impacted the technical writer, he attributed the behavior more to the individual's technological experience than to bias. Jack elaborated,

> *"And I think it's like, depends on the person. There, I mean, even due to, it may not be an age thing as much as how familiar people are with technology. I mean, you know, at which, of course, nowadays young kids, the young bucks, you know, they're, you know, always on their devices, and that's much more familiar, and it's much more comfortable to them. You know, somebody who, you know, works a much more like blue-collar job that doesn't ever use a computer at work, you know, having them look up something in a manual it might be a lot easier to do on a printed version that they have accessible. Like, you know, auto mechanic, repair manual. Where they can take it to the car and be, you know, page in three type thing instead of with the greasy hands trying to use technology to… but it depends on the person and what their job is in their familiarity. I think a lot of it could be age as well."*

Jack's views in these areas aligned with some participants who were unsure if workplace bias was present. However, he differed from them in that most of his examples were generic; unlike the participant findings discussed in the subsequent subsections of workplace bias interview results. Thirteen participants discussed examples of workplace bias; the experiences fall into three types of purviews: self-aware personal, firsthand, and secondhand bias.

Self-Aware Personal Workplace Bias

Three participants provided examples of their own biases for which they were self-aware. The examples ranged in topics and affected groups, including age, the social aptitude of developers, technological preferences, end-user advocacy, native speaking language, and stigmas affecting people during recruitment and onboarding. Table 10 lists the personal examples of workplace bias shared by participants and categorizes them by perceived bias, which summarizes the groups, persons, or things facing bias based on the participant's response during the interview. Due to the specificity of the provided examples, participant aliases were substituted with their demographic description.

Table 10: Interview Participants' Examples of Self-Aware Personal Workplace Bias

Participant Description	Interview Response	Perceived Bias
Age 25-34, Asian/White Male	*"… when I'm doing an onboarding, and I have somebody who's older, I can have that bias of, oh, okay, if there's somebody who is gonna struggle through this onboarding, it may be this person, because they've either been on a PC for their whole life, or are not as tech literate, and that's certainly whether that's true or not, that's certainly not even an unconscious bias that I have, but just based on my experience, it's something. But I try to combat that by being open-minded and being patient, regardless of who it is I'm training or writing the documentation for."*	Onboarding: Age and technical literacy
Age 35-44, White Female	*"One example of my bias is when I interviewed for project managers, I thought, 100%, woman project managers would be better. I actually ended up hiring two male project managers. They're slaying the job, and nothing has surprised me more."*	Recruitment: Gender
Age 35-44, White Female	*"I find women pay a lot more attention to detail and are also more organized on that detail level, whereas men, you know, you've heard you may have heard the expression where men are really big picture, and women are really good at small picture, and sometimes depending on the role you need that high level or that small level. And so, you naturally gravitate towards one or the other as initial thought as long as you're still interviewing outside of your bias and being active in those listening's."*	Recruitment: Gender
Age 35-44, White Female	*"I know when I interview with some people if I have a difficult time understanding them, I can't listen to their answers as actively as I do with someone who speaks English naturally better. And so, it's hard to be as engaging with that same interviewee. So, it's hard not to bias against someone else or be biased against in the natural way of growth. And it's being cognizant of that bias so that you can try and micro correct."*	Recruitment: Native speaking language
Age 45-54, White Female	*"And I guess I worked in tech enough that I just understand that it's rare to find very social developers, I guess. But then there's my bias right? Like, oh, you're a developer. I'm gonna assume you're awkward, right? Or stereotypes, which isn't exactly true, because again, I've been blessed with working around people that are not only brilliant developers, but they're super fun people."*	Social aptitude of developers
Age 35-44, White Female	*"… we have to make sure that we're not assuming anything of the audience that we're writing for, and not letting the engineering and management perspectives drive our documentation set, and we have to put the user first. So, a lot of it's our engineers, if they were to write certain tasks a lot of times, they assume basic knowledge of what the users have, but we need to work really on developing content that is foundational first and then build from there. I think a lot of times it's easy to gloss over the foundational content and I try to put myself in a user perspective and be that user advocate to make sure that we're not just glossing and assuming knowledge."*	Tech Writer advocating for documentation usability for end-users

Age 25-34, Asian/White Male	*"I strongly am biased towards Mac versus PC, in my world. Not even to mention Linux. But I think I'm biased because I used to work for Company X, but also our company is like 85 to 90% Mac versus Windows, so, not only my personal preference for our company's preference is that, so, I think that there's a bias."*	Technological preferences

Firsthand Workplace Bias

Eleven participants provided examples of firsthand workplace bias experiences. When describing the source of the bias they experienced (person or group that projected the bias onto the participant), seven examples discussed leadership or hiring teams, three examples mentioned developers, two the workplace in general, two either the software or technology industry, two experiences with IT-based customers, two company-specific issues, one the culture of people outside of the technical writing team, and one engineers. These examples impacted various parts of participants' identities, gender being the top response; eight examples discussed gender issues for females, and one discussed gender issues for a male. Six examples discussed issues by their role as technical communication writers, two discussed issues of race, and two discussed biases based on physical appearance. Issues mentioned only once included bias based on education level, division levels within a company, country-based culturalism, religion, age, nationality, family status, and organizational culture within a specific company. Table 11 lists the firsthand examples provided by interview participants, the source of the bias, and categorizes the component of the participant's identity that was impacted by or discussed in their bias example. Due to the specificity of some examples, company names and specific details provided by the participants' examples were anonymized. Anonymized text is contained in brackets. Participant aliases were substituted with their demographic description. Table 11 is sorted alphabetically by source.

Table 11: Interview Participants' Examples of Firsthand Workplace Bias

Participant	Interview Response	Source	Identity
Age 55-64, White Female	*"I just have always felt that especially being female. Well, for one thing, coders are mostly males. People seem to have certain personality traits that work at certain positions in IT software companies. And I always felt that trying to go and especially to get information to document a certain process or to put things together was always difficult. I always felt like it could be my own perception, but I always felt that it was, there was a feeling like it was too complex that I wouldn't understand, or something like that."*	Developers	Gender (female), Technical Writer
Age 45-54, White Female	*"Marketing, writing, proposal management. Any of these teams that are administration. Like, Salesforce administration; all of these people… I honestly believe those of us in these roles, you can be as intelligent as the developer sitting next to you, but they're gonna treat that person a little differently because there's an intellect difference, they think."*	Developers	Proposal Manager
Age 45-54, White Female	*"… there are developers in this company that will treat you like crap, because they think that you're just doing, like, pretty busy work."*	Developers	Technical Writer
Age 35-44, White Female	*"I think on the receiving end of experiencing bias, I mean, a lot of times, it has to do with my role. I'm embedded into engineering teams, and when I first established relationships, not all the time, but sometimes with engineering teams, and they're not either used to working with a writer or content strategist or somebody from a documentation role. They make assumptions about my assumed knowledge, or no matter how long I've been with the organization, or, you know, with the company and the bias I received is, you know, 'oh, you're just a Docs person,' or you know, they might assume that I have no technical knowledge."*	Engineers	Technical Writer
Age 35-44, White Female	*"I think women, especially any woman of color, is going to experience bias whether they know it or not."*	General workplace	Gender (female), race
Age 55-64, Asian Female	*"You can see biases about people, and they say it without even thinking. Like, you are Asian, you must be good at math… even though that may be a compliment to thing to say, it's not, because it's like you got singled out from the crowd that you are Asian, you must be good at something. So, it's not nice, and people don't realize that when they make comments like that."*	General workplace	Race (Asian)

Participant	Interview Response	Source	Identity
Age 35-44, White Female	*"When I was the Director of Solution Engineering at [Company X] previously, in working with some customers, when I would work with their technical resources, there is a lot of bias against women with them. They'd be like, 'Okay, great. Well, why don't you get your technical person online?' I'm like, 'I am the technical person. I know what we're talking about,' and it would be dismissive until the male came on the phone and said everything, I said. And then they're like, 'Okay, cool, let's proceed'. So yeah, there's definitely bias."*	IT-based customers	Gender (female)
Age 45-54, White Female	*"And I was just like, I'm gonna start wearing that when I go on-site just to be like, something to break the ice, because, like, you know, again, my [44-54]-year-old self probably doesn't have those problems anymore, but again, my spry little 30, 5 foot 2 blonde coming into an IT room, you know, of a science center or a, you know museum, you have to earn your stripes with them because they just assume that you're not just B team your C team, you know."*	IT-based customers	Physical appearance
Age 25-34, Asian/White Male	*"A time that I feel that I experienced some bias is when I moved from [Company X] Retail to [Company X] Corporate. My team was primarily highly educated, powerful women, which is one thing that I loved, but as an employee coming from retail, and only having an associate's degree, I was often relegated to, like, more menial tasks, or even the categories that I managed were treated as less important, even though my category drove the highest revenue within the [department].*	Leadership	Education level, division level
Age 55-64, White Female	*"Well, there is obvious biases from people who are actual employees and of people who are contractors and the sense of how we were approached in jobs of… there were clear lines. There would be some personal bias, who they liked, or… I mean, outwardly, 'step on toes or not step on toes,' … I heard those things… So, I paid attention to those things, and it was outward. I don't know; that, to me, that felt biased."*	Leadership	Full-time employee, and contractor in the software industry
Age 25-34, White Female	*"I was told that my manager… was surprised at how angry I looked in the termination meeting. Three other people were terminated that day because of budget cuts… The other people who the roles were eliminated that day were men, and I reached out to them personally, and I said, 'hey, has manager's name been saying this about you guys like I would like to know.' And I reached out to other people on the team, and they said 'no,' and it was just me, the only woman whose role was eliminated, and that I was the only person who looked so angry that it was objectionable*	Leadership	Gender (female)

Participant	Interview Response	Source	Identity
	enough to gossip about. So, that really put a damper on a day that was already terrible."		
Age 45-54, White Female	*"I'm dealing with it right now where the tasks I'm given are being dictated to me in a secretarial way… So, the bias here was, I think, in my opinion, if I'mma be honest, it's a man who thinks he knows better because I've already talked with him. The situation is super complicated because it is not someone I work with regularly. This is a new to me person and there's also an international barrier there. So, I feel like, and maybe that's bias on my part, I don't know. I'm trying to give the benefit of the doubt; maybe this is a cultural thing."*	Leadership	Gender (female), Country-based culturalism
Age 25-34, White Female	*"…the manager thought that the best way to break the ice at this particular meeting was to ask us what our favorite Christmas tradition was, and what Christmas gifts we were looking forward to giving and receiving. So, I do not celebrate Christmas. I'm not Christian. I'm [Religion X], and one of my really close friends on the team is also not Christian, she is [Religion Y]."*	Leadership	Religion
Age 45-54, White Female	*"Conversely, you have these other people in this company, in positions of leadership, mind you, that you say something is a valid point and they shoot it down because you're not in the position that they respect. And that for me is the bias as well."*	Leadership	Technical Writer
Age 25-34, Asian/White Male	*"I also saw lots of promotions and hiring trends that I was just not given opportunity to. I know that I am in the vast minority of experiences like that; it's usually the opposite where women will have a really hard time breaking into a tech company. So that's one that like, even though I experienced the bias or what I consider to be, it's like, well, I mean, I'm a man, so, for every other aspect of life, I get the benefit of the bias. So, it was eye-opening to see what women can often experience in a tech environment."*	Leadership & Hiring Teams	Gender (male)
Age 45-54, White Female	*"And there's diminishing pieces of respect the whole way through, like, early on tech writing. There's this bias that it again, it's easy, or there's a perception of 'I don't even know what you do.' And then, when you explain all the stuff you do. They're like, 'Oh, my God.'*	Non tech writing teams	Technical Writer
35-44, White Female	*"And, I have experienced bias due to my age, my gender, my nationality, my family status, and my weight. And most of that was in the same company, so, and it was very direct, and it was extremely obvious that they didn't want me there and were trying to push me out by any means necessary."*	Software Company X	Gender (female), age, nationality, family status, physical appearance

Participant	Interview Response	Source	Identity
Age 45-54, White Female	*"I mean, I definitely had a couple of very minor experiences. But again, I think that that had more to do with organizational structure, you know, and having certain people who have very set boundaries around their job versus your job. Not necessarily giving me a hard time because I was a woman, or a certain age, or it was just more, I gotta say, insecurity on their part of somebody else doing what they perceived as their job… I mean, the experiences that I had when the larger company purchased the smaller company that I worked with, I think it had a lot more to do with just a lack of understanding of each other's sort of culture in a way. So, when I say culture, I don't mean, like, an African American versus a Canadian, right? Like we were focused on [customer base X], and they were focused on [customer base Y]. And we were all snotty about [customer base Y]. And they're all like, [customer base X] are weird, you know. And so, it's like it was more of a lack of understanding of each other's businesses and lifestyles than, like, the true bias that you're talking about."*	Software Company X	Organizational culture
Age 55-64, Asian Female	*"And also, for women is historically not easy for any woman to work in big industries like software. And software has become a lot broader and in big company, big corporations, there are so many groups of different types of people. Even though where I'm working right now, the leadership has been really trying to include a lot of training for inclusion, equity. And you know, it's really helping, it make people aware more, but it's still there. You cannot help by the real number because you really don't know, but when you talk with your friends, you know that somebody would know the information that women normally get paid less. And that is true, even though, you know, if you really want to know you have to do research and have reliable resources to get the information or the data to back that up."*	Software Industry	Gender (female)
35-44, White Female	*"…since the question specifically stated about me, myself, as a woman in technology… When performing interviews we're looked at more critically. We tend to think of interviews that meet with customers are gonna be more woman-friendly, whereas technic, solution engineering, or developer, we tend to think male by default. So, right there is a situation of bias."*	Technology Industry	Gender (female)

Exceptions to Firsthand Workplace Bias

Even though participants provided firsthand examples of workplace bias, they also provided additional examples to counteract issues of bias. This included examples of one person or small groups of people in the larger group not projecting bias or examples of a broader group not projecting bias. After sharing an example of a male coworker treating her like she wouldn't understand work-related concepts based on what she felt was gender bias, Jane shared an example of one male coworker who did not make her feel that way. Jane said,

> *"He was very good. He would always explain things and go into a lot of detail. But now, I just found that people wouldn't try to simplify things or try to ask questions, to know how to explain things to me."*

Lucy discussed issues of firsthand bias that she experienced with developers; however, she also shared two examples of when someone on those teams was not biased against her. In one example, she called out three developers in the company with whom she always felt treated her respectfully, stating,

> *"I'm lucky and fortunate enough to have worked with them, so I understand their personality; I understand, like who they are, and they've always treated me very well. They're like super respectful of me, which I always appreciated… Those three people are incredibly intelligent people, and they treat others with a level of respect regardless of their position."*

She also discussed an interaction she had with another developer who helped answer questions she had, stating,

> *"So, like I met with him, he took extra time. We talked through it, and then he said, 'Well, like, is there a way for us to like, standardize this?' So, it wasn't just me asking questions, it was him invested in, like, what I was doing, too, which, that's mutual respect. That's like, I respect that*

you're trying to get it right, and is there a way moving forward that we can make this better? That I respect."

In contrast to her firsthand bias example that intersected gender and nationality. She described issues of gender bias stemming from male coworkers based in the U.S. offices. However, Lucy shared she did feel gender bias when working with male coworkers based out of Canada. She explained,

"And I also have some Canadian colleagues now, who I don't feel that way at all from. So, I don't know if that's if again, maybe it's an American or European culturalism, that if you're there's a competency there. Whereas, like, my interactions with these Canadian individuals has been one of very mutual respect; right off the bat. Which, and again, that might be my bias, I don't know, but, like from an anthropological perspective, I think it's really fascinating that I have one person that's treating me like a secretary and another person who is treating me with the utmost respect and like, 'Wow, you're really knowledgeable. This is awesome. Any way we can do to help you.' It's so vast."

Ruby discussed some team-based bias between engineering and technical writing teams but also pointed out that though she was on the receiving end of that bias as a technical writer, she tried not to impose bias onto people outside of her team. Ruby explained,

"But I think, unfortunately, in a lot of organizations, there's a lot of othering that happens of you're gonna work in your silo, and I'm gonna work in my silo, and that's where I've been on the receiving end of it. And I try not making those same assumptions when I'm working across different groups. And, you know, for example, I don't want to assume that the engineering team has the best answer, or that program management has the best answer. I have something to bring to the table as well. So, I try to remove all of the insecurities around, defining each of our

roles, and try to remove those barriers and remove those assumptions and remove those biases as much as I can."

Ruby's example was unique in that she used the bias she experienced firsthand as a motivator to not project biases similarly in the documentation she was responsible for creating and managing.

Secondhand Workplace Bias

Three participants provided examples of second workplace bias experiences. When describing the source of the bias they witnessed, technical writers were the source of two examples, and software teams outside of marketing were the source in the other example. Six examples discussed issues they faced as technical writers, two discussed issues of race, and two discussed biases based on physical appearance. Issues mentioned only once included bias based on education level, division levels within a company, country-based culturalism, religion, age, nationality, family status, and organizational culture within a specific company. Perceived bias included one against females, one against people outside of the male American group, and one affecting an Asian female who held a contractor position. Table 12 lists the secondhand examples provided by interview participants, the source of the bias, and perceived bias.

Table 12: Interview Participants' Examples of Secondhand Workplace Bias

Participant	Interview Response	Source	Perceived Bias
Lucy	*"I also work closely with marketing, and there's that bias phrase of, 'you'll just pretty it up,' and it's a female team and that makes me very uncomfortable."*	Non marketing teams	Gender (female)
Joe	*"And again, a lot of those terms in the software documentation that I've encountered are terms that make a lot of sense to men, especially American men, but might not make a lot of sense to other users from other countries."*	Technical Writer	Gender (non-male), nationality (non-American)
Sam	*"One company I worked at, there were a team of us writers and several of the other workers were contractors, and so they were of different nationalities. And I noticed that they just weren't treated as well as the rest of us who were full-time employees… So, I can think of one experience, one conversation actually, with another of the full-time writers, and the contractor who was of Asian descent, wasn't there, but this other person, it seemed like she didn't even really know the contractor's name. Like, when she was talking about the work she was doing, and she ended up saying, like something, 'or whatever the hell her name is.' I mean, I just, I couldn't quite believe that because I had already gotten to know this contractor pretty well and she was doing fine work."*	Technical Writer	Software industry position (contractor), race (Asian)

Workplace Bias Impact on Documentation Effectiveness

This section details how interview participants responded after being asked if they felt that workplace bias impacted the effectiveness of technical software documentation. Before each participant was asked this question, they were reminded of the survey answers they provided when asked to specify how they supported the creation or management of technical software documentation. The intent was to remind them of all the areas for which they engaged with documentation before asking them the question connecting bias to documentation effectiveness. All interview participants, except one, had experience writing documentation. All interview participants had more than one documentation role, except one participant who only had experience writing documentation. Only two interview participants

did not have experience editing documentation. Table 13 specifies the documentation roles held by each interview participant.

Table 13: Interview Participants' Documentation Roles

Doc Role	Ruby	Eva	Anna	Mia	Cara	Jack	Jane	Jill	Joe	Lily	Lucy	Liv	Bob	Rose	Sam
Wrote	X	X	X	X	X		X	X	X	X	X	X	X	X	X
Edited	X	X	X	X	X		X	X	X	X	X	X	X	X	
Collaborated with doc writers	X	X	X	X		X	X	X	X	X	X	X	X		
Collaborated with doc managers	X	X		X			X	X			X	X	X		
SME	X		X	X	X	X			X			X	X	X	
Other	X					X	X								

The “other” documentation roles listed by interview participants included Ruby providing project management/content strategy for the software documentation, Jane had experience developing training, and Jack had experience managing the product documentation department.

When interview participants responded to this question, four themes emerged. Five participants discussed specific issues between SMEs and technical writers that they felt impacted documentation effectiveness: five discussed how technical writers need to be aware of their impact on documentation effectiveness, one connected effectiveness to the software company’s priorities, and six shared their opinions but stated they could not provide examples. Jack initially responded that he could not provide an example but later he discussed a generic example between SMEs and technical writers, so his responses are listed in two tables (Table 14 and 16). Table 14 provides details of interview responses from participants who discussed issues between SMEs and technical writers.

Table 14: Interview Participants' Responses on Workplace Bias Impact on Documentation Effectiveness – Issues Between SMEs and Technical Writers

Participant	Interview Response
Eva	*"Okay, so I haven't seen anything or heard of anything that I would label bias in the more traditional sense, like against gender or ethnicity or, but it has… it seems like the developers are slow to share information with the technical writers. And yet, if we don't have the information up to date because we didn't know that it was changing, then sometimes it feels like we're being thrown under the bus… We go to the customer, who is also talking to the developer, so, they see the newer software. But then they see our documents, and so then it gives them a bad impression of us. And so then, that could strain the relationship between our department and the customer. So yes, I think it affects us."*
Jack	*"I think that a lot of it depends on, you know, who was giving the example, who was going through, like, because the technical writer may not have all the details of the steps to do these things, so they have to rely on some of the technical experts, the subject matter expert, to provide these things, and then it just depends on how complete and accurate and thorough and, you know, the examples they give are. You know, and that may depend on anything from how much time they have, what else do they have on their plate, but also, how much do they like the technical writing person. It's like, well, you know, I really like this person, I'm gonna go the extra mile for them, or, you know, I can't stand this person, they're bugging me, I'll give them the bare minimum. So, the quality of their work may depend on that. So personal bias, like, for or against that person, may affect how accurate, and complete, and effective the documentation is. And, you know, that bias can be anything it can be, you know, side - just race, religion, you know, gender, any of those the standard biases that people may or may not have."*
Jane	*"I do. I hope that it's getting better. But and I have to say, in the company that I'm currently working for, I haven't seen that, but I'm not writing technical documentation per se. I'm doing communication specifically, but it is about, you know, software and hardware and technical subjects. Yes, I do think it impacts that the bias impacts that because if you're not having something explained to you, if you are getting told what you should understand that is clear to everybody, then that that's impacting how effective you can be; what your writing is ultimately going to end up being."*
Jill	*"I felt that as, you know, one of the only women on the team, I had exclusively male subject matter experts, and I feel like they really nitpicked my drafts in a way that I did not really see happen to my male colleagues. I did not have any nonbinary colleagues that I knew of, so I don't know about any genders beyond the binary and their experience, but I know that every single time I turned over a draught to my SMEs, I was on the security technology team. So, it's cybersecurity, it's a pretty male, dominant field. They always had a problem with whatever I did. So, it really slowed down my work. So, I don't know how much it impacted the end product, but it threw off my timelines every single time."*
Lucy	*"Yes. A hundred percent… I think that's what it becomes for a lot of writers is, you have safe people, and you know, those are the people you can count on to help you."*

Table 15 provides details of interview responses from participants who discussed how technical writers need to be aware of their impact on documentation effectiveness.

Table 15: Interview Participants' Responses on Workplace Bias Impact on Documentation Effectiveness – Impact from Technical Writers

Participant	Response Summary
Bob	Writing documentation for all reading levels. *"I think in my world and working within IT, documentation specifically, I have to write documentation as plainly and as simply as possible. So, I have to break it down in the most simple way, include images, things like that… Whereas within IT, you kinda have to write documentation for all levels. So, an engineer reading my documentation may be like, well, this is really really rudimentary concepts, or whatever like, let me scroll down till I get to, like, what I actually need. I don't know if that's a bias, necessarily, but I'm trying to avoid confusion when people are coming to us from all walks of life in order to get support… I'm trying to write documentation to avoid anyone feeling biased against; where they can read the documentation and be like, oh, clearly they are only writing this for experts, and I'm a beginner."*
Cara	Writing inclusively for technical documents. *"So, I mean, personally, I try to be conscious about writing in an inclusive manner, even though, you know, I'm writing just technical documents."*
Joe	Cultural jargon in the documentation. *"I can say to some degree, but not in an overwhelming manner. And just like I mentioned that there's a lot of the industry terminology sort of derives from - they call it a cowboy culture, you know, the Texas oilmen kind of lingo. And even so the terms could be offensive, probably. But I don't think that that's a major impediment to the usability of the documentation."*
Rose	Writing effectively when bias is present. *"Effectiveness is the keyword because what I think of as, like, overall, I think we were effective… We did everything as best that I think that could have been done… So yeah, we did, so it was effective despite some of that bias."*
Ruby	When technical writers make assumptions about end-users. *"When you're assuming knowledge about the end user, I think then you can hit a lot of pitfalls there. And sometimes we don't mean to, right? It's an unconscious bias of assuming certain knowledge about a user. And especially if you're not a subject matter expert on every little thing that you're writing about, you can, you know, fall prey to that… Just trying to avoid assuming knowledge at all; wanting to make sure that you have the foundational pieces in place."*

Table 16 provides details of interview responses from participants who shared their opinions and stated they could not provide examples.

Table 16: Interview Participants' Responses on Workplace Bias Impact on Documentation Effectiveness – Opinion Only, No Examples

Participant	Response
Ana	*"I don't know if I have ever pieced those things together. I don't think so. I mean, maybe, I guess in the sense of if someone will say, well, why is she reviewing this? If she's not that smart, maybe, right... I have never gone through a situation like this honestly, and everything that I have edited, or any documentation that I have created has always been used or considered, you know, good documentation, thankfully."*
Cara	*"I mean, in my current position, it's an Austrian company, right? And so, everything's done in German initially and then translated. So, it's just so hard to know. It's like, is this a language thing? Yeah, I just don't know."*
Jack	*"That's a good question. And I guess my answer is, I'm sure it has. I just, I'm trying to think of a concrete example of how I've experienced that. And specifically, how bias has affected the effectiveness. I don't know that I have a really good concrete example of that."*
Liv	*"I would say no, but… I don't have any examples."*
Mia	*"I don't see that, or maybe I don't see it clearly, but I don't think that when things are written on the paper, especially for technical purpose, you can tell the bias there. So, no. I would say no to that."*
Sam	*"It probably has, but I couldn't give an example."*

Lily was the participant who connected effectiveness to the software company's priorities. She explained,

> *"I think company culture in general, affects effectiveness of documentation. I think it's really hard to care more than your company cares about the end product. So, if you're a writer in a high-stress environment, and you have very strict GA deadlines, GA being general availability when your software is released, and there's no QA process, there's no editor, there's no definition of done that docs must be done before the project for the product can be released, right? Documentation is not part of the culture. I think that your documentation, in general, is going to be less effective, whereas good documentation is part of the ethos of the company as opposed to*

a box they have to check.…But I think that you, as a writer, cannot force effectiveness when your company doesn't value it."

Workplace Bias Hindering Technical Communicators

This section details how interview participants responded after being asked if they could think of a time that workplace bias hindered a technical communicator from creating quality and effective documentation. Seven participants said yes and provided examples, six said no, and two were unsure. Table 17 provides a summary and quotes of responses from participants who stated yes and provided examples.

Table 17: Interview Participants' Responses on Workplace Bias Hindering Technical Communicators

Participant	Response Summary
Bob	Bob talked about how writing to avoid bias can take extra time for the technical writer and make the length (e.g., page count) of the documentation longer. Bob stated, *"I think if there's any impact, it affects the amount of time it takes us to respond to something. Like, if I have to break something down into 60 steps instead of 10, like, that just makes the length of documentation longer. Well, I think during the survey, like, being concise was one of the features of effective communication. Like, I would like documentation to be bulleted, like, super, super concise, and that's what I try and do, but when you're breaking it down in order to avoid bias, it can take more time or more space, or whatever that case… I'm in no way advocating cutting out those steps. They are important steps. They're there for a reason. But, making sure that we're covering our butts, you know, can take time."*
Jack	Jack talked about a time when two people who were not on the documentation team chose not to collaborate with the technical writer and come up with a documentation solution independently. They also openly criticized the quality of the existing documentation with internal and external customers. Jack explained, *"The two people went off and did their own version of the documentation, and then didn't involve the documentation writer and then was, you know, they were saying, oh, in the public forum that, "oh, our documentation sucks!" and it wasn't a collaborative thing… And so, where their bias came from, you know, it may have been technology. Like I said, there's a different mode of documentation. I don't know. But then the question is, why didn't they involve the documentation person in bringing all the documentation forward rather than doing it on their own? And I don't know if that was a bias against her, or I'm not sure. I'm not sure what the root of that one was. It also could have been that the bias of they worked closely together. And so, it was, well, we don't really work with this other person, so, we're just gonna take it upon ourselves to do it, and not involve her because she's not part of our team, you know."*

Participant	Response Summary
Jill	Jill discussed how SMEs impacted her documentation efforts by not providing timely and accurate information. She explained, *"So, I'll say that I always delivered the content and I felt confident about the final product, but I felt that I was hindered in that it didn't get done as expeditiously as it would have if my SMEs responded to me in a timely fashion, and took my work seriously. They would provide me with outdated collateral that I was supposed to build coursework and documentation on, and then, when I would turn the product around for the draft. The product being the documentation, they would say, 'Oh, why did you include all this out-of-date information?' and I would say, 'Well, that's because this is what you provided me. I'm not on the product team. I am on the technical documentation team. I do not have access to the product's most up-to-date documentation. You are supposed to provide that to me.' And they would say, you know, 'I can't believe that you put this out-of-date stuff in there. The whole thing needs to be redone,'*
Joe	Joe provided three examples. One about technical writers using biased language in the documentation: *"The company I worked for has an American presence and a European presence, and it was common that terminology and jokes even that seemed perfectly normal to one group, was strange to the other… But I do recall, you know, that's certainly a case where the two groups are kind of scratching their heads, wondering what the other one was saying, and it definitely could hinder the actual task at hand, which was to develop, you know, some technical product. Instead, it got lost in competing terminology, or, you know, things like that."* The second example was about sexism in software development: *"…this place I worked mostly men, so, there were only a handful of female software developers, and there were certainly times in meetings where again the off-color jokes, and just you know your stereotypical, sexist remarks. I think really hurt the work getting done because it belittled the women in the room."* The third was about a company that openly grouped employees based on their performance reviews. *"The different categories of employees based on your performance management metrics, and some people are A Team people that you know, they get the highest ratings in their performance review. Then there are other people that are, you know, they're the B Team people, and of course the C team people are the people that get laid off, but I always felt that there was this bias in the company. … if you're put on a team, then you were sort of marginalized… So, that was one of the things that nagged at me, and I thought was unfair, and you know the company is talking about diversity and inclusion, but they seem to ignore that it takes all sorts of people to make up the company… if you want to call that bias, maybe a bias against the lower-performing or perceived lower-performing employees, although, you know, they have value too. And they, you know, you can't make up a software team with all, you know, top players."*
Lily	Shared an example of bias between white-collar and blue-collar workers. She explained that the white-collar workers in her company cared more about saving money than the use case of the blue-collar workers. The use case was they used printed, spiral bound, laminated manuals because the use case was a construction site and road paving.

Participant	Response Summary
	"It was imperative to me as the user advocate that we maintain this output exactly the way it was because we got really good user feedback, and it just made sense for the environment." The white-collar worker decided the manual was too expensive to print and that the company should deliver the documentation on a CD. Lily explained how changing the modality gave an advantage to competitors that printed manuals and how CD-based documentation didn't make sense for the user. *"I was like, this is the worst experience, and to me it felt like bias, because these people were not thinking about blue-collar workers. I think that they were just in their own white-collar tower, just looking at spreadsheet numbers and not thinking about the blue-collar workers, undocumented workers on the streets, literally building the streets. They drive their Cadillacs to work, or whatever they were driving, and not giving a damn about them… Maybe it's not the definition of bias. Maybe it is more privilege. But I think they go high in hand. I don't think you can separate them."*
Lucy	Provided an example of where she was trying to get help writing up note for an online web application, but there was no story or information to explain the issue and she couldn't install the software to be able to learn about it. *"What bothered me was when I would reach out for help and that help was seen as like a pestering… But it felt impossible, and it felt like I couldn't get any help either. So how do you write about something if you don't have good notes and you can't do it yourself?"*
Ruby	Stated bias occurs when technical writers make assumptions about what information their end-users know, calling it "*assumed knowledge*."

Eva was one of the participants who said no when initially asked the question. Thereafter, she provided an example of what she thought could be a bias but disassociated it from the question by saying, "*The more I think about it, that's not a bias thing. That's another issue*." The two participants who were unsure, Cara and Liv, each gave examples but were not sure that they could link them to bias. Cara discussed that the hindrance for her was waiting for the technical writers to review documentation before it was allowed to be shared with external end-users. She stated,

> *"I don't know if it's bias that's hindered me. Again, it's just more of the need to get documentation that is user-friendly in front of our customers ASAP, and constantly being told that I can't do that because it needs to go through a formal process. And for me, I'm just like, but that formal process is gonna take six months if I'm lucky*."

Liv talked about some criticism she faced when providing documentation information to the technical writer as an SME. Liv explained,

> *"Well, I guess when I have been a contributor to documentation as a subject matter expert… I don't know, maybe I'm biasing myself, but maybe we're all biasing ourselves. I tend to feel women can be a lot more verbose in their descriptions because they want to make sure that there's a clear outline of this is what's happening, whereas men want to state the facts, and make it factual. So, sometimes I feel like when I would work to explain a subject matter, even trying to maintain the technical aspects of it, I would get a lot of, 'well, that part's not necessary. This is what's important.' But I felt enough to say all of it, so I felt all of it was important, so I would argue about it, but I wasn't owning the documentation at that time. So, if that was biased, maybe, I don't know for sure, but I know we had to argue slightly about it."*

Heuristic Diagram Feedback

This section details the results of participant responses when they were shown the heuristic diagram steps and examples. This includes findings from when all interview participants were asked about the heuristic diagram's usefulness and how it could be shared in the workplace. It also presents results from select interview participants who were asked about other tools or methods that could be useful and provided additional feedback on the heuristic diagram.

Heuristic Diagram Usefulness

After the interview participants reviewed the heuristic diagram and example, they were asked if they thought it would be useful for technical communicators facing workplace bias. All of the interview participants agreed that it would be useful. Their explanations as to why they chose their response fell into three categories: six discussed how technical writers could use it to prioritize and audit biases in

documentation, four discussed the simplicity and easy-to-understand format of the heuristic diagram, and five gave other feedback on how it could be used. The interview participants who discussed the usefulness of the format and design provided feedback about the simplicity of the workflow, straightforward presentation of information, clear structure and steps, and easy-to-follow examples. Table 18 lists responses from interview participants who discussed the simplicity and easy-to-understand format of the heuristic diagram design.

Table 18: Interview Participants' Responses to Heuristic Diagram Usefulness – Format and Design

Participant	Response
Jill	Gives straightforward information to those to address issues of bias in the documentation. *"I think it would be useful because it provides concrete steps to mitigate common bias missteps. So, I'm just from my own experience, recognizing some of the bias issues that I felt have come up throughout my career. And it has, like a specific remedy that goes with the common issue. Like using 'he' excessively, and instead, something like subbing that out for 'system administrator.' And those are, like, best practices that I incorporate into my documentation. So, I like that. I mean, it sounds like, I like it because it's reinforcing what I already do, but it's bringing this to an audience that might not already do it in a really straightforward way."*
Mia	Thinks the structure and steps are clear. *"I think it would be very useful; especially the structure is clear about the steps. And, you have the first diagram where you have the four steps summarized, and here it with the examples, it makes it very easy, and it explains a lot about those steps. So, that is good documentation already that you are showing me."*
Ruby	Thinks the four steps and workflow are simple, and the examples are relatable. *"I think it's simple. You know the 'collect', 'recommend', 'prioritize,' 'execute,' you know, four easy things to consume. And then just the workflow if it makes sense. And I think the examples that you have here are, you know, they could be relatable to folks. Examples of certain things that could be examples of bias that could happen. Which is funny, because the examples here do not map to how I saw bias. It's really funny."*
Sam	Thinks the examples are easy to follow and straightforward. *"I think it's a great set of examples. It's not too prescriptive. It's easy to follow, like, once you know what the columns are, and how their color notes link to the next step, and then progress, and then assigns responsibilities in the execute step. I think it's pretty straightforward. It has a lot of arrows, and just looking at it at first, it can seem confusing. It just seems busy, but once you went through the scenarios and explained it, it really makes a lot of sense to me."*

The interview participants who discussed how technical writers could use the heuristic diagram shared their recommendations for topics including driving awareness about biases in documentation, improving audience awareness, and using it to address and prioritize removing biases from documentation. Table 19 lists responses from interview participants who discussed how technical writers could use the heuristic diagram to prioritize and audit biases in the documentation.

Table 19: Interview Participants' Responses to Heuristic Diagram Usefulness – Technical Writer Uses

Participant	Response
Cara	Drives awareness and creates a roadmap for technical writers to address biases in the documentation. *"So, I just feel like awareness, like I didn't even think about color-blind… So, I think, having a bit of a roadmap that calls out specific examples, not just like a general loose term, even a well-defined term just calling out examples and saying, here's what we need to be conscious of, you know. Here's how to mitigate that. And you know, here's how to make it so."*
Jack	Helps technical writers take a step back from their work to address biases in documentation. *"Well, I think one of the initial hurdles to overcoming bias is awareness. And I think, step one of collecting all the, you know, actually analyzing the documentation and determining what groups are being under-served. What - where is the bias?... I think it's really easy enough to write documentation from your own bias… But taking a step back and understanding what the different biases are and what groups you're underserving and then going to step two of, like, okay, so what can we do about it? And you know, without a process like this, you're just not aware of it. You're writing it, and then you're pushing it all along. But like, I said, I think this actually does bring the awareness to some of the biases that you may need to consider and resolve*."
Jane	Helps technical writers focus on their audience more because they are checking for bias. *"Well, because just looking at it would prod someone to actually look at what they're editing or writing and think if there is any inherent bias in it. Or if they haven't thought about all the users, the audience, that they would generally be looking at. I mean, if we were developing training, we would be looking at the audience and we'd be looking at these different aspects. But I think in a lot of technical writing, you're not looking at it in the same way. So, this is a great way of forcing people to focus on their audience more and to look at every kind of situation."*
Lily	Offers a framework to help technical writers prioritize looking for bias without feeling overwhelmed.

Participant	Response
	"Well, I like the framework. I'm a framework person, and I think that a lot of us know that, you know, these biases probably exist and probably need to fix them but approaching them can feel very overwhelming. And they could feel very like, 'Oh, what am I gonna do? I'm just a writer,' you know, like, 'I can't just single-handedly fix bias in the human race,' right? That's how overwhelming it feels a little bit. So, I think this framework is useful to show that, like, hey, you don't have to fix the world, but you can prioritize what is most important to your users, to your user base, you know, and help facilitate buy-in from other groups, so you don't feel alone. Like, it at least makes the problem a little more approachable. Especially with the examples, right?"
Liv	Gives technical writers examples of how they could rephrase and be more inclusive when writing documentation. *"That's a common way of phrasing things for people in everyday language, and just throwing the changing the verbiage in the "recommend" column to design for people of different races… And then stating in the 'enhancement software design to improve the ability to capture different skin tones' that also meets the same need while sounding more professional. So, it gives basically two examples of how you could rephrase verbiage in a better way to support the demographics you're going for."*
Rose	Helps technical writers track responsibility and execution of addressing biases in documentation. *"And I think that you know, the idea of having these things as examples, and who is actually responsible for executing it is, is helpful, because sometimes it's really difficult… But then, all of a sudden, you're like, who's gonna do it? That's like the biggest leap I think we end up always having the problem with. It's like, oh, there's all these priorities and everything, but who's responsible for what? And I think if you have something like that, I think that's helpful."*

The participants who provided other feedback discussed a range of topics, including sharing the heuristic diagram with a company's diversity team, getting documentation bias feedback from people outside of the documentation team, using the heuristic diagram to help companies be more socially aware, training people on how to look for biases in documentation, and using stoplight colors in the heuristic diagram example. Table 20 lists responses from interview participants who provided this feedback and briefly summarizes what they discussed.

Table 20: Interview Participants' Responses to Heuristic Diagram Usefulness – Other Feedback

Participant	Response Summary
Ana	Already finds it useful because she thinks it is something that she could share with the diversity team at her company. *"Honestly, it has already been useful to me because I feel like I can take this feedback as well. Cause I am actually part of our Diversity Committee."*
Bob	Thinks it could be helpful for new or more established companies to be more socially aware. *"I think this would be useful. Especially for teams who are in maybe companies that have been in place for a long time, set in their ways, or something or newer organizations who are trying to figure out how to write technical documentation. And we're all living in current times, so being socially aware is really important. So, I think this would be really helpful. Like we've mentioned, I already learned one thing to look out for is everyone's access to Internet."*
Eva	Technical writers may need to have customers or other departments review the documentation for step one (collect) to get feedback on documentation biases. *"I think a lot of it depends on how much in the 'collect' phase how familiar people are with accessibility and bias… So, I'm thinking of, okay, we're developing a software, we give a prototype to the customer, and in addition to asking for feedback about maybe the layout or the functionality, we're also asking about accessibility and bias and getting their feedback… Internally, I think it might be hard for the writers themselves, you know, sometimes, if you're too far in it. Could be done by the writers? Absolutely. It could also be something where maybe you pass it through to a different department and get another department's feedback."*
Joe	Thinks there should be a "*pre-step*" or "*step zero*" in the heuristic diagram design that focuses on training people on how to identify biases in documentation. "*I think that people need to be trained in order to recognize, you know, cause it's kind of like, well, the first one, collecting it, how are people gonna recognize these biases in the documentation without some kind of training upfront? So, otherwise, it's the luck of the draw who reads it. Although maybe that's a good thing, too. If more people read it, you'll get lots of feedback… like I said, a pre-step would be having some training for your folks so that they know what they're looking for."*
Lucy	Recommended using "*stoplight*" coloring to make the priorities stand out more. *"I get what you're doing with the color pattern, but maybe if you could do a color palette that was more of like a stoplight scenario for the push boxes here… And the reason I say that is because there are ones that are, like, red ones that should probably, like, if I'm looking at what the prioritization is of this, like, I know this is a super big problem. It's a red to me, and I know that's going to go up towards the top. And I want to prioritize those higher. Whereas if it's like more of a yellow or an orange, it's probably towards the middle, and if it's something that can ride, it's more of a green or a blue color, right?"*

Heuristic Diagram Sharing

Interview participants were asked what they thought would be the best way to share the heuristic diagram with technical communicators in their work environments. Their responses fall into seven categories: nine said it should come from someone in leadership (including a manager or director), five said it should be presented at a conference, four said it should come from a peer (in technical writing), two said it should be a part of a company initiative or mantra, two said it should be published from a peer-reviewed journal, two said it should be shared as an internal (including in a company knowledge base) or external document, and four participants gave other recommendations. The interview participants that gave other recommendations, which were unique compared to other responses, included storytelling, delivering a hands-on workshop, coming from a professional organization (e.g., Society of Technical Communication), and conducting an interview study test-run of this method that would be later presented at a conference. Table 21 lists the responses from interview participants when asked how the heuristic diagram should be shared and includes a summary of their recommended sharing methods. Summary information was written in the order discussed by the participant, and the table is sorted alphabetically by summary.

Table 21: Interview Participants' Responses to Heuristic Diagram Sharing

Participant	Summary	Explanation
Lucy	Conference and peer-reviewed journal	*"So, I think it could be twofold, like, if you did a presentation at a conference, but it was also published into some kind of peer journal, where you can reference that later… When it's presented that way, I think people are more open to adopting something like that. If they feel like it's collegiate or scholastic, because they're like, oh, this is a proven method."*
Rose	Conference, manager, director	*"Surely a conference is helpful because it gets put in those kind of management best management practices concept. But I think, you know, it's definitely a feeling of being on the cutting edge, it would probably come from the managers of the directors to say, hey, we're taking this on and using this particular format."*
Ruby	Documentation manager, people manager	*"I think it might be presented maybe, like from a top-down approach. So, you know, documentation manager or a people manager, you know, would say, 'Hey, we're going to try something out.' You know, and then encourage individual contributors to use this."*
Joe	Hands-on workshop	*"I imagine, like, you know, you or someone went in and helped train a team to use this methodology through a workshop where, ahead of time, you know, you actually got concrete examples, not just the examples you made, but concrete examples in the existing documentation and help people go through these steps… I think that IT people or programmers are gonna need some training in recognizing bias in the first place… So, I think to be effective, it needs to be hands-on and customized so that it's meaningful and uses examples from the actual company's products or documents."*
Jane	Internal or external document, manager (e.g., style guide or brand guide)	*"Oh. I think a combination could be, you know, maybe a document, but also the manager… It could be just a published document about technical writing, or it could be an internal document."*
Sam	Interview study and conference presentation	*"Kind of brainstorming here, it'd be cool if you could run it through a small department, like as a test, run and look at the documentation before and then after. And interview them, or ask them how the experience was, how much effort it took them to do it, and then present all of that at a conference. That would be fascinating."*
Liv	Manager	*"There should be a higher level outside of the technical documentation component identified as part of any company's work policy and standards of the workplace. That's the first place that you need to have support to engage in this type of communication as well. And then definitely, the manager should be very much included in promoting this to the team and having easy access to documentation for the team members when reading and reviewing that they can go through and note. It also may be worthwhile to schedule, if not annual, biannual meetings to support reviewing.*

Participant	Summary	Explanation
		'Hey? We've started noticing some old patterns coming back in. Let's work on removing these habits, or 'let's work on being more cognizant of how we're making our writings.'
Ana	Manager	*"I think it should come from a manager."*
Jill	Manager, conference	*"I think it should come from a manager. I find that when you're trying to introduce ideas of inclusion and bias mitigation as pure that a lot of the time it's not taking seriously. So, my first choice would be a manager because of their appeal to authority. My second would be a conference presentation because it could be framed as industry expertise."*
Jack	Peer, manager, company initiative, conference, publication	*"Is D, all of the above an option? I feel like really it's getting the word out is really the important thing, and having people champion that, and that could be a peer, that champions. It could be a manager that champions it, it could be a corporate initiative. it could be, you know, like said, getting the word out at a technical conference or a publication. You know, we use a for our diversity, equity, and inclusion, we use a company called Inclusively to do presentations, and, you know, like, partnering with companies that do that to get the word out with, because, you know, there are the more common or more well-known biases out there. But I… you know, how much are they looking at technical documentation or documentation of any form, you know? But just sort of getting that awareness out there and then having people champion it."*
Cara	Peers, company mantra (unified company message)	*"I think it has more impact if it's coming from peers working in the same industry that this is this is a standard that you should strive to achieve… I think, including something like this from your company culture and saying our company culture adheres to doing everything in our power to remove bias from our writing, you know, having that as sort of part of the company mantra. And then and then providing the tool to the writers to say, for example, here. This is what we need to think about… It's gonna have more impact if it comes from peers that you respect or that are at least in the same boat as you."*
Bob	Post to knowledge base, leadership	*"There's a lot of ways to get this adopted, but I think ensuring leadership buy-in, and then, once you have that buy-in, making sure that this exact reference is posted anywhere that you're creating content and documentation will help it get adopted and seen easier."*
Eva	Professional organization, peer, manager	*"Sharing it through like, a professional organization. But yeah, having it like hearing about it from a peer and then hearing about it from a manager."*

Participant	Summary	Explanation
Lily	Storytelling	*"What would be most effective for me is storytelling. When you have a user talking on a video that says, 'Hey, you know, I'm not a nonbinary person of size who uses they them pronouns, and I'm not reflected in your documentation as a user'… like, explaining the impact to them and humanizing that is so much more powerful than, like, this is how we add alt text, right? …when you humanize it, and have a real person, explain how, not having their representation in your documentation actually affects them as a customer, because if it affects the bottom line, then it's now important to your company. And you cannot make these changes unless it becomes important to your company, too. So, to me it would be a story like that; preferably a video."*
Mia	Technical writer or manager	*"I think there, there should be several approaches. It depends on who you talk to. I think If a tech writer just purely do tech writing and when you present this, that person may feel like, okay, I like it a lot. I don't know if my boss would like it… So, when you present this to a tech writer, it may be very appealing because that is a very near and dear to their work; daily. And that they may be very excited, but when you present to the manager, you may not get the same reaction because the manager has to think about the priorities, and how they can fit this in a timeline of whatever they already have on their plate... And you know, it's not just priority. Maybe priority is a thing that all managers would need to keep in mind all the time, but it's overall, the vision of the company. For example, if you present it to an [Company X] documentation director, you may get very, very good reaction because the company's vision right now is inclusive."*

Other Tools or Methods Beyond the Heuristic Diagram

Six interview participants were asked if they thought there was another tool or method that would better serve technical communicators in this scenario. Four of them stated that they could not think of anything. Jane recommended doing a training based on the heuristic diagram. She explained, *"I think that training would be good. I think some kind of scenario-based training would be great… You could create scenarios from this from these bits of information."* Lucy recommended that another tool could be available in an academic, technical communication setting but was unsure if such a resource existed. She said, *"I don't know if it's something that's taught like when you take, like, communications*

and stuff in school like, I don't know if that's something they're teaching in the curriculum now. I don't honestly know."

Treated Unfairly

The question about being treated unfairly was not asked to all participants because I added it as a planned probing question after sharing my preliminary results at SIGDOC 2023. Nine interview participants were asked if they could think of a time in the workplace when they thought someone was treated unfairly. Seven participants said yes and provided an example or summary of their opinion, one participant said yes and provided advice, and one said no. In the group of participants who said yes, five firsthand examples and three secondhand examples were provided. Table 22 lists the firsthand examples provided by interview participants, the source of the bias, and provides a brief description of what they treatment they considered to be unfair based on their response. Participant aliases were substituted with their demographic description. Table 22 lists participants' firsthand examples, the source of the being treated unfairly, and a brief description of the unfair treatment (sorted alphabetically by source).

Table 22: Interview Participants' Firsthand Examples of Being Treated Unfairly

Participant	Interview Response	Source	Treatment
Age 25-34, White, Asian Male	*"…I could see that as feeling like a bias if I was the heads down hard worker kind of quiet type and constantly getting passed over for promotions. Because I have been that person, and I've known a lot of those people at various workplaces, and then you always see the like, the loud vocal one getting promoted whether they were a good worker, or whatever, regardless of that. Like, they could be lazy or have terrible ideas, but as long as they were hearing their voice frequently and often and generally liked. That would be the person that got promoted, so. You'd, like, play the game. But I guess that's normal."*	Manager	Favoritism

Participant	Interview Response	Source	Treatment
Age 35-44, Latin American Female	*"[I] got an offer to go work for this other company because I was really being underpaid… And I talked to him [her manager], and I was like, 'Hey, I have this offer,' so, then he scheduled the meeting with me, to tell me that they would not go into counteroffer, that they were not going to try to keep me, that I should really think about this because they were changing the way that they were doing interviews, and now there was a test. And, if I wanted to come back that I wouldn't be able to pass this test, so that I would have to think hard about the decision, because if I left, I wouldn't be able to come back. I was like, I cannot believe I am hearing this right now from my own manager, right? And it's okay if he had told me, 'Hey, we can't counter. I tried everything that I could, but you know, please decide to stay with us,' right? But it wasn't that at all. And it was just so upsetting. And I did say all of this on my exit interview, and I told HR everything. But I don't really think that anything was done about it."*	Manager	Being underpaid, lack of managerial support
55-64, White Male	"*Other than, you know, unrealistic deadlines, I can't think of any examples now."*	Manager	Unrealistic deadlines
55-64, Asian Female	*"At least one, but I think he and his boss, maybe he got, I don't know, I would not say encouraged, but he did not get any prevention from the boss. Maybe the boss is the same type of person that is bullying other people. And they're very assertive, not in a good way, to get what they want. I did go and talk with my boss about it. That this is a bully. He has no authority, no right to do to treat me that way, but he did… But luckily, I got good friends at work that they know the situation because it did not just happen to me, but it happened with different women. So yeah, the guy is really bad, and I believe that he was the cause of at least one person leaving the job."*	Peer	Bullying
Age 45-54, White Female	*"But yeah, definitely, times when I would be working on a project., you know, all the way, almost to the very end of it. Very little input nobody wanting to be involved in it."*	Peers	Lack of collaboration

Table 23 lists participants' secondhand examples, the source of the being treated unfairly, and a brief description of the unfair treatment (sorted alphabetically by source).

Table 23: Interview Participants' Secondhand Examples of Being Treated Unfairly

Participant	Interview Response	Source	Treatment
Lucy	*"I just think it's a lot of what I already talked about from a fairness perspective. You know, whether it's going to try to talk to someone about something being wrong. And then, you know, not being heard when there's an open-door policy."*	Leadership	Not being heard
Bob	*"…but it is annoying when you'll see somebody who comes in and like is flirting with managers or whatever, just buddy, buddy. And, like, they don't necessarily do good quality work and are, like, goofing off, but they're the ones that get promoted because they have that relationship with the manager. Not necessarily like, a not work inappropriate relationship, but like a friendship or closeness with management, is the one that gets promoted. I could see that as being a bias and not truly looking at performance or metrics-based reasons for promotion. That being said, I mean, if I was a manager, I want to promote people that I like and that I get along with, and that get along with other people. So, like, I think there's always two sides of a viewpoint."*	Managers	Favoritism
Ruby	*"So, I do have somebody on my team that uses 'they' pronouns, and I think there are some members of our team that can usually slip to like a 'she,' you know, pronoun, but I think it's just. I don't think there's any ill intent there, you know. I think it was just adapting to that. But I think it's up to us as a team to correct those people outright to support the person that you know might have felt negatively impacted. They want to be recognized as 'they,' right? So, it's up to us to stand up, you know, for those things and remind people gently on the team to use the correct pronouns. But I don't think there's not once been a malicious misuse."*	Work team	Pronoun

Jill, the participant who wanted to offer advice to people who have been treated unfairly in the workplace, proclaimed,

> *"I just would want them to know that it's not right. And that I would hope that they would know that there are people out there, you know, trying to mitigate those problems, that it is a big deal. It's not just, you know, hurt feelings or whatever it gets dismissed as by higher-ups. It has a real tangible impact on the organization's bottom line. Whether that's turnover or, you know, lack of*

engagement with technical documentation because you're sick of seeing 'he' every five seconds. I don't know. I just, I would want them to know that… it's like a real problem, and it hinders work. It hinders productivity and it hinders employee satisfaction, and all of that affects the bottom line. And that's all anybody cares about, so. That's what I want them to know."

Additional Feedback

At the end of the interview, all interview participants were asked if they had anything else that they wanted to share about workplace bias and its impact on documentation in software production. Ten of these participants provided additional feedback, which fell into four themes: three participants talked about workplace bias, three discussed the takeaways they had from participating in the interview, two discussed explained why they felt technical communicators faced more important issues than bias, and two discussed other technical communication issues they've experienced in the software industry. Table 24 briefly summarizes what each interview participant who provided workplace bias feedback discussed, followed by a quote from their response.

Table 24: Interview Participants' Additional Feedback – Workplace Bias

Participant	Response Summary
Bob	Trying to write clear and concise while avoiding writing with bias. *"I think in my world, it's mostly trying to avoid bias and making things as clear and concise as possible. And then all of the tips that were in your survey, like making sure that everything is easily accessible, quickly findable, in a uniform format, located centrally. Things like that are what I consider when writing, and storing, and giving access to documentation. Less so about actual biases that have happened in this particular scenario, but I try very hard to avoid those biases. Even though I fully admit that I have both conscious and unconscious bias that I try to combat, even though Mac is better than PC. I'm going to stick to that bias, but you know. The social biases are the ones that I'm trying to combat."*
Lily	General workplace bias culture and recommendations when facing it. *"I think that there's always gonna be people around who perpetuate any kind of bias because they can continue to get away with it. I just think that it's on us as individuals to call it out wherever we can. And if you don't work for a company where it's not safe to do that, and it's a crappy market right now, but my only recommendation is to find another company. Because I'm sort of a pessimist that unless you group together power, strength, and numbers, then, unfortunately, it's a toxic part of your culture and is unlikely to change. So, I just wanna exercise caution for particularly women like, if you see it, call it out. Change it if you can, but otherwise, save yourself and find another company. That's I guess that's how I would summate my feelings about it."*
Sam	Avoiding idioms to be more inclusive in technical writing. *"The only other thing that came to mind is, like, when you're giving examples like you, you write about a concept, and you need to give an example. And I think of this as some of the stuff I read about tech writing and being non-biased, was the examples. It's probably more in the context of ESL, like people whose first language isn't English even. But you're not using idioms, like, 'level the playing field' or you know, things like that. Just to be more clear and inclusive."*

Table 25 briefly summarizes what each interview participant who provided feedback about interview take aways, followed by a quote from their response.

Table 25: Interview Participants' Additional Feedback – Interview Takeaways

Participant	Response Summary
Ana	Sharing bias concerns with work-based diversity committee. *"I just wanted to say that I had never put these two things together. So, thank you for that knowledge that I just gained in my life. So, I thank you for that, and I feel like I'm going to be talking about this and sharing this with the committee, cause we are trying to do all of these things to make people feel more included, and this and that, but I don't think that we are even close to approaching on that side of things, right? We're not taking that into consideration at all, and I think that it would be nice to do that. So, I feel like this interview was more beneficial to me."*
Jack	Feedback about connecting to bias before the survey and after the interview. *"No, other than the fact that it's just really great having the awareness because it's like, I think on the initial questionnaire, I'm like, I'm not sure. I mean, I'm sure the bias is there. But the specific examples are a little harder to come by. But it's like I said, with the awareness of like, Oh, yeah, we do that… And I think it's really great that you're doing that."*
Mia	Interview introducing her to new documentation strategies. *"I get to learn something about documentation I never did before."*

Eva and Joe explained why they felt technical communicators faced more important issues than bias. Eva said that she thinks most of the technical writing issues in software companies are not bias-related. She stated,

> *"Nothing comes to mind, and that's not to say that everything is just peachy keen. It's more like, well, the struggles that I feel like we're facing aren't a bias issue. The company that I work for, at least on the surface level… there's a lot of diversity. Not to say that there can't be biases, but I feel like my company really tries to advocate for making space for a range of ideas and people throughout the development process."*

Joe felt that to improve technical communication in these workplace contexts, technical writers should prioritize the information maturity model, which is a book-related concept focusing on information development. Joe explained,

"I did want to bring up that information development and information maturity model. Because, like, I said, I think that that was, that's an overarching perspective on ways to improve technical communications. And within that, the work that you're doing is something that is an important piece… Their information maturity is so ad hoc that, you know, they're going to be more focused on other priorities than addressing bias in their documentation. Although, I think if you can make a good compelling reason to look at it and show here's a way to do it and bake it into your processes so it's just another step, then, it would take hold."

Jane and Rose discussed other technical communication issues they've experienced in the software industry. Jane brought up her concerns about the lack of proofreading, but was unsure if it was a cultural or gender-based issue stating,

"I see this a lot a lot of places, people are not proofreading their work very exhaustively these days. They're just kind of doing a one-and-done type of thing and letting it go. That really bothers me. In some ways, it seems to be more of a cultural or gender-based type of thing. I think women are more apt to be more anal that way."

Jane also mentioned that lack of proofreading connects to quality and effective documentation and could tie to cultural or gender-based biases, stating, *"Yeah, you can have little aspects of that. I know that maybe people that are in teams may not admit to that. But I think you, when you're working with a group of people. It's inevitable, I think."* Rose shared her experiences with different work groups having difficulty collaborating due to how they self-identified their job title or work experience. Rose explained,

"The one thing I know I dealt with was that everybody who worked on these labels; like electrical engineers, had an attitude against people who weren't electrical engineers. And, what's my background, you know? There was a lot of that. I mean, like, it mostly came from people that the

people in the field as well seem to have their field attitude. Like, I've done the work, you know. I'm not sitting in an office. So, there was a lot of this, I don't know what that's called again, but like, you know, everybody really protected what they knew how to do in this world of, you know, collaboration, and it was hard to sometimes to reach those gaps when you thought you had a better idea, and they would say, I've been doing this for 20 years, you know. I go, okay. You know, there was a lot of that."

The feedback from the surveys and interviews revealed a broad range of participant experiences related to bias. When I asked interview participants to elaborate on their workplace bias survey responses, most who believed bias was present had firsthand or secondhand examples to support their beliefs. In some of the interviews, participants who confirmed their belief of the presence of bias in these workplaces were unsure or unable to connect these issues to documentation effectiveness and quality. In the concluding chapter, I synthesize these results and connect participant perceptions (and examples) of workplace bias to technical software documentation.

CHAPTER FIVE: DISCUSSION

This chapter discusses the survey and interview results by addressing five areas of this dissertation. First, it connects the findings back to the research questions. Second, it revisits the significance of workplace bias, which includes connecting findings to themes of intersectional feminism and social justice and presenting new intersectional themes. Third, it explores the implications and conclusions for the technical communication field. Fourth, it draws attention to the limitations of this study. Finally, it concludes by presenting suggestions for future research.

Research Question Findings

This section discusses how the results answer the primary (RQs 1 and 2) and secondary (RQ 3) research questions.

RQ #1: Software Workplace Bias Perceptions & Experiences

RQ #1: What are TCPs' perceptions and experiences specific to bias in the software workplace?

One survey question and one structured interview question aimed to answer RQ #1. During the survey, approximately 75% of survey participants and 73% of interview participants indicated that they believed they or one of their coworkers experienced biases in the workplace. The remaining 27% of interview participants said they chose their answer because they could not think of a firsthand or secondhand example of workplace bias while working in the software industry. All interview participants who responded "Yes" (during the survey) provided examples of firsthand workplace bias, and approximately 25% provided secondhand examples of workplace bias. There were 20 firsthand examples and three secondhand. These results indicate that participants not only believe that bias exists in the workplace, but they all could speak to at least one firsthand experience. When describing the source of the firsthand bias they experienced, participants discussed bias being projected onto them from internal

and external work groups. Internally, several TCPs discussed teams outside of technical writing, such as developers and engineers. Externally, two white female interview participants provided examples of what they perceived as gender-based or physical appearance bias from IT-based customers.

RQ #2: Impact on Technical Software Documentation

RQ #2: Do TCPs' perceptions and experiences relating to bias impact technical software documentation, and if so, how?

One survey question and two structured interview questions aimed to answer RQ #2. When survey participants were asked if they believed workplace bias impacted the effectiveness of technical software documentation (either inside or outside of their workplace experience), 40% said yes, and 32% were unsure. In comparing this to the responses to RQ #1, which asked about the presence of bias more generally in the workplace, the survey findings for this question indicate that TCPs did not connect their workplace bias-related perceptions and experiences to factors impacting software documentation. The first structured interview question followed up on the survey responses of the interview participants by asking them if they felt workplace bias had impacted the effectiveness of technical software documentation. The most common response was yes; they believed it did. Most of these participants discussed issues between SMEs and technical writers that they perceived as biases that impacted documentation. These results with interview participants were like the broader survey results; 33% of interview participants said yes, and 33% were unsure. The second structured interview question asked if they could think of a time when workplace bias hindered a TCP from creating quality and effective documentation. Responses between participants were close, with 47% saying “yes,” and 40% saying “no.” All participants who said yes provided examples.

RQ #3: Diagram Heuristic

RQ #3: Using intersectional feminism as a theoretical framework, can a diagram that shows workplace scenarios and possible responses be used to mitigate biases in technical documentation?

The heuristic diagram and example were only shown to interview participants. Therefore, the answer for RQ #3 was based primarily on one structured interview question and four planned probing questions. The structured interview question asked participants if the visualization would be useful for technical communicators facing workplace bias. All interview participants indicated that yes, it would be useful. The first planned probing question was for participants to explain why they chose this response. The second planned probing question asked participants to share what they thought would be the best way to share the visualization with TCPs. The third and fourth planned probing questions were intended only for participants who responded "no" or "unsure" to the structured question. The third planned probing question was to ask if they had suggestions for revisions. The fourth planned probing question was to ask if they thought there was another tool or method that would better serve TCPs. Although I originally planned to ask the last two probing questions to participants who said "no" or "unsure," I changed my strategy for the fourth question and began asking this question to participants who said "yes." I did this for a couple of reasons. First, some interview participants didn't elaborate very much on their feedback on the diagram, so I added this question to stimulate more conversation. I also recognized early on that my decision to limit asking this question to participants who did not respond with "yes" wasn't necessarily the best approach. I realized that any participant could know of another tool or method that I missed in my research, and therefore, it would be beneficial if they brought that to my attention. Also, someone could respond by saying that my heuristic diagram was useful and still know of another useful tool; those opinions weren't necessarily mutually exclusive. Only six interview participants were asked this question, and no one could think of an alternate tool or method. However,

one participant used this question to segue into feedback recommending how the heuristic design could be used for "*scenario-based training*."

Revisiting the Significance of Workplace Bias in Technical Communication

This section revisits the significance of workplace bias in technical communication by connecting survey and interview findings to previously discussed intersectional areas relevant to this study, including intersectional feminism and social justice. It also draws upon this study's results to introduce new themes.

Connections with Intersectional Feminism and Social Justice

Using intersectional feminism as a theoretical framework for this study was helpful when analyzing interview findings connected explicitly to questions about workplace bias and the heuristic diagram. During the interviews, participants provided several firsthand and secondhand examples of bias in the software company workplace. Some participants were also aware of their own biases and how they impacted areas of onboarding and recruitment in the workplace. In the spirit of intersectionality, the examples explained how TCPs connected the bias to their personal identities, which ranged from perceptions of bias related to gender, race, age, group, and more. Several participants provided more than one example of bias impacting different areas of their identity. Mia, for example, discussed separate examples of issues with race and gender. This framework also proved to be a useful approach based on interview participants' responses to the heuristic diagram examples that were designed using this framework. The examples were intersectional in that they addressed issues of bias for several types of people, groups, or things related to technology. This was relevant to the interview portion of this study; beyond the participants unanimously categorizing the heuristic diagram as useful for TCPs, it also helped them connect workplace bias to documentation. This concept was a challenge for several interview participants who could not make a connection between these two concepts during the survey or when

elaborating on their survey responses related to workplace bias and documentation (early in the interviews). As previously discussed, social justice issues are at the core of this work, as the presence of specific types of biases in the workplace connects to issues of DEI. Participants discussed firsthand and secondhand examples of bias conflicting with implementing DEI in the workplace.

New Intersectional Themes

While I expected themes connecting to intersectional feminism and social justice to emerge, there were some additional intersectional themes that emerged that I did not consider. First, participants discussed their own biases. Some of their biases were tied to issues of DEI, while others were more closely tied to group bias. When I use the term "group bias" in this context, I am referring to a group membership that is not based on DEI issues (e.g., gender, race, ethnicity). Bob, for example, talked about preferring using a Mac over a PC, and how this preference impacted how he engaged with people when performing onboarding training. He explained that he may have made assumptions about people who did not align with his preferences and how he would usually have to dedicate additional time or training to help them learn. While examples such as Bob's were more of an outlier response in terms of overall data, I did not consider that participants would discuss such specific biases outside of more traditional bias-related issues (e.g., gender). After reviewing Bob's transcripts discussing his personal biases, I wondered if the people he onboarded in these scenarios felt impacted by this bias, and if so, I am curious how it impacted them.

Like Bob's example, other participants discussed forms of group bias, including technical writers versus other teams outside of documentation; (e.g., developers, engineers, and leadership). This stood out to me because I was slightly surprised at the number of participants who discussed feeling marginalized by a workgroup that was often a group with whom they relied on collaborative relationships to create effective, quality documentation. Issues of group bias that were presented by

these participants redirect this dissertation back to its goal of fostering a workplace communication culture of inclusion coupled with expertise, which was previously mentioned in Chapter Two. Drawing attention to those who felt marginalized by a workgroup, this workplace divide impacted how these groups communicated. It seems plausible that this hindrance in communication could prevent TCPs and SMEs from communicating thoroughly, thereby impacting the TCPs' subjugated knowledge for creating documentation. As a result, this could diminish the effectiveness and quality of the documentation. I think this especially rings true for the female interview participants in this study who discussed gendered experiences of being treated in a manner that devalued their professional expertise.

Another theme that emerged was biases that may have sounded complimentary to the person making the comment, but negatively received by the person facing the bias as negative. Mia talked about stereotyping as a form of bias that may seem positive but ultimately negatively impacts the group for which it is promoted. She gave the example of someone saying Asians are good at math and explained that although the statement is complimentary, it is damaging to the group it targets because it singles them out.

Implications and Conclusions for the Technical Communication Field

As reported in previous studies (Calikli & Bener, 2015; Chattopadhyay et al., 2020; Dias Canedo et al., 2019; Macnab & Doctolero, 2020; Stacy & MacMillan, 1995), this study confirms the presence of bias in the software company workplace. While it was inconclusive that TCPs surveyed and interviewed for this study connected the presence of bias as a workplace factor impacting documentation effectiveness and quality, about half of the interview participants confirmed the presence of this issue and provided examples. This study affirms the usefulness of a heuristic diagram to help TCPs mitigate biases in technical documentation, although additional guidelines are needed on how to train technical communicators on how to evaluate documentation for biases and how to introduce and implement the

diagram in the workplace. In addition, the heuristic diagram could benefit from a new design iteration based on participant feedback. This study also implies that there are additional opportunities for addressing and mitigating workplace bias beyond the heuristic design component, which is discussed further in the subsequent *Suggestions for Future Research* section.

Potential Application of the Heuristic Diagram in Industry

Considering the potential to use the heuristic diagram and example in the workplace, I need to develop three types of changes. First, the heuristic diagram example needs a few design-related updates. Based primarily on the feedback, I need to determine if I will change the opacity and colors used in the example. Regarding the heuristic diagram, the only feedback I received asking for a change was adding a "step-zero" that explains how to identify biases in the documentation. While I agree that whoever is auditing the documentation for biases needs to understand how to do it before performing an audit, I am unsure if I would add another step to the heuristic. Since the participant described their recommendation in a manner that I consider to be a prerequisite to using the heuristic diagram, I do not believe it should be another step. Instead, there should be a deeper analysis on how we could train technical communicators on bias on how to recognize biases in documentation. The idea of including this as a prerequisite makes sense, but it is a complex issue. Based on participant feedback, I'd need to perform a new review of the literature so I could think more critically about how the heuristic diagram would be introduced into the workplace. Participant feedback was mixed as to whether it should come from a person, team, or external resource (e.g., manager, peer, publication). Introducing the heuristic diagram in a technical communication workplace is a separate strategy from incorporating it into the workplace, but they are both necessary to drive implementation. I would need to do a deeper analysis of participant feedback and a different review of the literature to understand better how practical application of adopting new technical writing strategies in the technical communication workplace. My

primary plan is to edit the heuristic diagram example based on participant feedback, conduct additional research about strategies for introducing and adopting it as a method or workplace tool, and put together an initial plan of what that would entail. I was particularly drawn to one piece of feedback where the participant suggested I do a test run of the process. The process would consist of training technical writers on how to audit for bias, have them audit an existing technical document, make changes based on the feedback, track how those changes impact the business, and conduct a conference presentation of the findings. I would add to that plan by conducting it as a study I detail in a manuscript submitted to a peer-reviewed technical communication journal. That could benefit as an expansion of this research because it would give me the next round of data for applying the heuristic by generating new data focused on workplace use. This strategy would also allow me to establish ethos on its usability and address additional concerns about implementation that were brought up by interview participants. For example, a trial run could give me tangible results on the benefits and drawbacks of incorporating the heuristic diagram. If the research could specifically uncover tangible benefits, it would make it more attractive to people outside of TC. I also give credence to the feedback from participants who discussed that mitigating bias needs to align with company culture to drive change in these workplaces. In addition, participant feedback addressed that prioritizing documentation needs to be valued by the company, which is especially for TCPs who want to dedicate company time to mitigating and addressing biases in documentation. Both concepts point to company priorities, but appreciating the value of TC (most notably, the value documentation adds) in these fast-paced work environments can be challenging. Therefore, I think the potential application of the heuristic diagram must include a comprehensive assessment of how this can be achieved using different approaches. Perhaps it offers more than one solution for implementation, leaving the decision of how to introduce it to the company

to the TCP. In either instance, it is a complex topic that can be presented after additional analysis of this study's results and a different approach to the literature review.

Potential Academic Use Case

As a reiteration of the group bias issues that participants discussed, I think one of the ways to mitigate bias in the workplace is to prevent it. While one cannot necessarily control someone else's biases, academia offers a pathway to introducing us to different groups of people early in their academic and professional careers. Several participants described being treated differently by developers and engineers. Since collaboration with these groups is vital in software companies and various technical communication workplaces, this study points to an opportunity to introduce and offer collaboration opportunities between TCPs and computer science students. Brady et al., for example, advocated for connecting software engineers and TCPs as a form of interdisciplinary work but cautioned against exposing engineering students to real-world work scenarios (2006). I believe academia can drive the intersectional value of introducing these two groups in an educational context without entwining their engagement to workplace. Similar to the work of Mirel and Olsen, who designed and piloted a technical communication course for students majoring in software engineering (1998), professors of technical communication and software engineering can band together to create either a capstone project or other course-related assignment that allows these two groups to collaborate. It may be beneficial, for example, for software engineers to create a deliverable such as a website or other software-related tool while concurrently working with TC students as SMEs for documentation. Not only does this emulate what they are likely to experience in the workplace, it introduces these work groups to each other early so they can understand the nature of each other's work. This course design TC gives students an opportunity to understand the priorities of software engineering as a discipline and vice versa. I believe this exposure, especially during an early part of higher-education coursework, drives understanding of

both groups, who will eventually rely on each other in the workplace. This understanding could help ease tensions and stereotypes between the two groups, thereby reducing the opportunity for group bias to develop in the workplace.

Study Limitations

This section discusses the study limitations, which include those based on recruitment, surveying, and interviewing methods. I used remote-based recruitment, surveying, and interview methods to collect participant data. I chose this method for three reasons. First, it allowed me to survey participants outside of my geographical location because I am not focusing on a single physical site for recruitment. Second, videoconferencing reduces research travel expenses typically associated with meeting in person (Barker, 1991; Deakin & Wakefield, 2014; Skelton, 1992). Third, it shortened the time for building rapport with participants (Deakin & Wakefield, 2014). However, it also created several study limitations, including (1) extra prep time and legwork to ensure remote participants meet technology needs, (2) technological challenges with interviewing participants remotely, (3) lack of or difficulty seeing non-verbal cues (Deakin & Wakefield, 2014; DiCicco-Bloom & Crabtree, 2006), (4) remote locations distracting participants, (5) challenges in building rapport with "more reserved or less responsive" individuals (Deakin & Wakefield, 2014, p. 610), and (6) potential issues with validating and contacting potential participants (e.g., fake requests to participate in research). An additional limitation for survey and interview methods was measuring effectiveness and quality as indirect methods. Of all those limitations, the most challenging issue for this study occurred during the survey portion of the study when the project was penetrated by bots.

Survey Bots

As previously discussed, I implemented several security settings before publishing my survey. However, the initial settings proved insufficient after my survey was penetrated by bots. Before

publishing the survey, I was not overly concerned about bots because I recruited primarily on closed group pages and my private social media accounts. What I did not consider were the security implications of when people shared the link outside of these closed forums. For example, I found out that one of my professional contacts added a link to my study on the STC Technical Editing SIG website, which was a public webpage. While I can't say for certain that this is the reason my survey link was crawled and penetrated, I think posting outside of closed social media pages made my survey more vulnerable to bot attacks. I understand that people were just trying to spread the word about my research, but I did not consider beforehand that I should have added verbiage in my original social media posts asking people not to share the link to the survey publicly. Luckily, the security settings that I had in place made it easy for me to identify and purge bot-related data. I was quickly able to identify and purge failed CAPTCHA attempts, duplicate submissions, and fake submissions based on Qualtrics fraud scoring algorithms. During this process, I reevaluated Qualtrics' security settings and realized I could have avoided bots with personalized, invitation-only survey links. I am not sure if I would have chosen that method initially, but the time and stress of evaluating and purging dozens of fake responses made me feel that, in hindsight, I would have planned my recruitment verbiage and security settings differently. In addition, even though implementing stronger security features eventually proved effective in eliminating bots from taking my survey, I also believe it made it more difficult for real people to take the survey. There is a difference between just being able to share your survey URL with people to take it versus having to jump through security hoops such as successfully completing CAPTCHA or entering a password before they can access the survey questions.

Remote Interviews

All the interviews for this study were conducted remotely, which potentially caused issues with building rapport with participants. Before conducting this study, building rapport was a concern for two

reasons. First, I recognized that using online interview tools could prove challenging for building rapport with participants with certain personality traits. For example, “online rapport is therefore only an issue when interviewing an individual who is more reserved or less responsive” (Deakin & Wakefield, 2014, p. 610). Second, I was concerned that building rapport during interviews was particularly critical for this study due to the nature of some interview questions. Specifically, the questions centered on workplace bias; these questions did not only ask participants' opinions but asked them to elaborate on their answers and share examples of bias in the workplace. In addition, taking a feminist approach to this study’s interviews made building rapport a critical part of the semi-structured interview process, for which I was cautioned in the literature to consider that “the online environment produces challenges in developing the trust and rapport that can further encourage both researcher and participant reflexivity” (Hesse-Biber, 2012, p. 576). I attempted to combat this by asking bias-based questions towards the end of the interview. I also recognize that the online environment could have prevented me from fully examining social cues because I had a limited view of the participants’ bodies during interviews, and I was not observing their body language while taking notes.

Participant Sample Size and Demographics

The participant sample size and demographics represent a very small portion of the broader group of technical communicators that were defined within the scope of this study, therefore, results are not generalizable. Only 25 participants completed both parts of the survey, and only fifteen of those participants were interviewed. In addition, participants' gender identities were predominately female for both parts of the study. The survey consisted of nine males and sixteen females, and the interview had four males and eleven females. I was slightly surprised by the imbalance being more female than male because the software industry is male-dominated; however, the technical communication industry is female-dominated. According to Data USA and Software Engineer Data & Statistics, recent gender-

related data for the software industry indicates that this workforce is approximately 80% male and 20% female (2024; 2021). Data USA as well as Carliner and Chen estimate that the technical writing field is approximately 70% female and 30% male (2019; 2024).

This study only had three participants (in both the survey and interview) who were people of color. Two females (one Asian and one Latin American) and one white/Asian male. This aligns with Data USA and Software Engineer Data & Statistics research, which estimates that approximately half of the people working in the software industry are white (2024; 2021). The annual household income range of most survey participants predominately represents higher wages versus people with lower-middle-range salaries. Approximately 88% of survey participants disclosed their income. Over 70% of participants indicated making over $100,000, and approximately 20% ranged from $80,000-100,000. Only one participant had a lower annual household income of $40,000-$60,000. Workplace experience data from these participants indicated that over 75% of survey participants had more than five years of industry experience. Therefore, these study results align with the expected salaries of the technical communicators who participated in this study. According to the Bureau of Labor Statistics, the 2022 median pay for software developers, quality assurance analysts, and testers was $124,200 per year (2023) and $79,960 for technical writers (2023). It should also be noted that even though this question asked for "household income," I am unsure if all participant responses included their spouse/partner's income. Therefore, the effectiveness of income-related data may be skewed based on participants' work experience in the software industry. Due to the sample size and demographical limitations, this research could be considered a pilot study for future workplace bias in technical communication work.

Suggestions for Future Research

This section discusses my suggestions for future research on workplace bias in technical communication. This includes a study focused on women of color in STEM (science, technology,

engineering, and mathematics), additional research focused on defining and explaining bias and how it impacts documentation in TC, being aware of online survey bots, and designing an updated version of the heuristic diagram.

Women of Color TCPs in STEM

While there is extensive research that has been done about women in STEM, there is an opportunity to expand on this research at the intersection of technical communication and digital humanities. I would like to see a workplace bias study performed that targets TCPs that are women of color in professional STEM environments. This is important for three reasons. One is that the findings in this study align with other scholars and studies that discuss gender inequity for women in STEM (Beltran et al., 2022; Carmona-Cobo et al., 2019; Dias Canedo et al., 2019; Hyrynsalmi & Sutinen, 2019). When discussing their experiences with firsthand bias, almost half of the examples shared by participants were connected to their perception that the bias was gender-based. In addition, most of the participants who self-identified as female believed that bias was not only present in the workplace but also impacting the effectiveness of the documentation. Of the survey participants who self-identified as female, 75% indicated that either they or one of their coworkers experienced workplace biases, and 50% believed that workplace bias impacted the effectiveness of the technical software documentation. Of the eleven female participants who were interviewed, seven of them provided at least one example where they experienced firsthand or secondhand gender-based bias in the workplace. In addition, one male interview participant provided examples of when he felt gender-based bias in these workplaces because he was a male. The second reason that the study should extend to other areas of STEM is because of the feedback that I received during the interviews. When discussing firsthand biases, participants mentioned the source of the bias stemming from various teams, including software developers, engineers, leadership, and IT-based customers. These groups are not just found in software companies but in other

STEM fields. Therefore, additional research could shed light on the prevalence of bias specific to other STEM fields beyond the software or technology industry. The third reason is that it acknowledges the demographic limitations of this study; the race of approximately 90% of survey participants and 85% of interview participants was white. Although this aligns with U.S.-based labor demographics for the software industry, further research is needed to help us better understand the bias-related perceptions and experiences of marginalized groups within these workplaces. Therefore, this research should specifically center on women of color in STEM.

Connections to Workplace Bias and Technical Documentation

This study also proposed that I call upon new research that defines and explains bias while substantiating how it impacts documentation in TC. This study showed a participant disconnect between the presence of workplace bias in the software workplace and bias as an issue impacting documentation. During my review of the literature, I found existing research that discussed coding or data bias and biases in AI technologies (Benjamin, 2019; D'Ignazio & Klein, 2020; Perez, 2019; Vee, 2017), but I did not encounter studies that spoke in depth about the number of ways bias affects technical documentation or examples of bias specific to documentation. Most of the studies that I found focused on one specific type of bias affecting documentation. Germaine-Madison, for example, discussed English-speaking bias in technical communication instructions and visuals (2006). While I think focusing on specific examples of documentation bias adds value, TC field could benefit from a more all-encompassing approach to exploring bias and how it impacts documentation. I think this is important because several of the participants in this study were hard-pressed to see how bias could impact documentation, some even thinking that it wasn't possible because the documentation we were focusing on in this study was technical in nature.

During some of the interviews, participants had an “ah-ha” moment after reviewing the heuristic diagram. This occurred after they reviewed the heuristic diagram example because it provided visual, concrete scenarios of bias in the documentation. I think these reactions were mainly driven by two factors that need to be addressed in this future research. First, TCPs need to really understand bias; providing a definition was not sufficient. Even after being provided with a definition, my analysis showed that some participants were still unsure what to label as bias. The second factor is that TCPs need to really understand what bias is and how it affects us individually in the workplace, thereby impacting the work that we do. When asked about the presence of bias in these workplaces, some participants were hesitant to label people as being based, and some were almost defensive when asked if they thought bias was the culprit of the unfair treatment they described. While I empathize with that dilemma, I would categorize these reactions as a form of bias conveyed by those participants. Perhaps their bias was that the term was taboo, or perhaps they didn’t want to label an experience as such when they themselves could not confirm the bias. But as professional communicators, we should also be privy to the fact that it’s unlikely that a coworker will admit that they are biased against a coworker, whether they are aware of their bias or not. That’s why I applaud the participants who were self-aware enough to admit their own personal biases. TCPs shouldn’t feel afraid or guilty about labeling a behavior or lack of workplace action as a bias. Bias isn’t a dirty word. This study wasn’t about labeling people good or bad because of their intent; it was simply about discussing the presence of bias and how it impacts the work we do as technical communicators.

Also, while there were some participants who didn’t have examples of bias but said they assumed it existed, there were participants who would not acknowledge bias because they didn’t have examples. I think driving awareness to address these issues is key. We need research that clearly articulates what bias is and how it affects us as human beings. With this scholarly foundation, TCPs can

truly start to open their eyes to the possibility that bias influences how we process and share knowledge and information in technical documentation. Research should iterate that addressing bias is not about intent or pointing fingers at the source of the bias. As discussed earlier, I was part of a team that redesigned documentation without consideration of people with color vision deficiency. Did our oversight make us spiteful people? Did it mean that we were intentionally prejudiced against visually impaired persons? I can say with confidence that it was not an intentional bias. But it is still a bias, nonetheless. A bias we held as able-bodied people who are not visually impaired. Once we became aware of the bias, we wanted to fix it.

I think awareness of bias in the workplace is the cornerstone of this research. If TCPs can identify biases, they can attempt to mitigate them in two ways. The primary way to mitigate bias is to try not to project your biases onto others. Whether it's implicit or explicit, it's still biased. The second way is to realize that biases do impact the work we do as TCPs, so we need to check for them and try to reduce them as much as possible. Is our work going to be perfect? No. Someone will always disagree with communication design, layout, or format. This was evident in the study results when analyzing what participants felt was most important for making effective and quality documentation. However, if the TC field can generate new research that really helps TCPs understand what bias is, it may foster a deeper understanding of how bias impacts the work we do. That awareness will help combat biases in our deliverables, making our work more inclusive. In addition, this can be a step in the right direction towards addressing this study's findings that participants could not think of other tools or methods to drive awareness about biases in documentation. Providing foundational research about bias, as I have described here, may help stimulate researchers in the field into creating tools or describing methods that practitioners could use in the workplace.

Beware of the Bots

After my experience with the survey bots, I would like to contribute to research discussing bot detection and fraud in communication research. Researchers using online surveys, especially those offering participant compensation, must be privy to fraud issues to ensure data integrity. In 2022, Qualtrics was ranked the number one survey platform; its usage was over 16,750 organizations globally (2022). I chose Qualtrics for this research because of its reputation and its availability to me as a UCF student. After my survey was compromised, I spent hours studying its security features so I could evaluate a solution to save me from having to discard the survey that I originally created. Perhaps I was just uninformed as a junior scholar, but I think the advancement of AI and the machine learning I watched evolve during this research was astounding. For fill-in answers, for example, the bots started with non-sensical fill in responses like "N/A," but then they evolved to rewording some of my questions to form the fill-in responses. It became increasingly more difficult to identify fraudulent responses, although I realized quickly that multiple touch points in security design were key. Therefore, I think it's important for me to share what I learned with other researchers. I plan on presenting and writing a paper about my experiences with bot fraud when using Qualtrics for online surveying. I'd like to explain how researchers can use various techniques to mitigate fake responses before, during, and after online survey collection.

Updated Heuristic Diagram

My final suggestion for future research, which is one that I plan on performing, is to design another iteration of the heuristic diagram and example and propose a plan for using them in the workplace. The redesign would be based primarily on participants' feedback on the heuristic. I also think I should give it a catchy name – calling it the "heuristic diagram" is probably not the best way to make it easy for TCPs to reference. In addition, this study would include an additional analysis of the feedback

they provided as to the best way to share the heuristic diagram with technical communicators. I would use their feedback to help make my own plans for sharing the heuristic diagram with TCPs.

APPENDIX A: IRB EXEMPTION DETERMINATION LETTER

UNIVERSITY OF CENTRAL FLORIDA

Institutional Review Board
FWA00000351
IRB00001138, IRB00012110
Office of Research
12201 Research Parkway
Orlando, FL 32826-3246

EXEMPTION DETERMINATION

September 27, 2023

Dear Amanda Altamirano:

On 9/27/2023, the IRB determined the following submission to be human subjects research that is exempt from regulation:

Type of Review:	Initial Study
Title:	Exploring Workplace Bias in Software Companies
Investigator:	Amanda Altamirano
IRB ID:	STUDY00005869
Funding:	None
Documents Reviewed:	• HRP-251 - FORM - Faculty Advisor Scientific-Scholarly Review.pdf, Category: Faculty Research Approval; • Altamirano_Diagram.docx, Category: Interview / Focus Questions; • Altamirano_Zoom-Practice-Guide.docx, Category: Other; • Study 5869 Altamirano - HRP-255 - FORM - Request for Exemption_v5.docx, Category: IRB Protocol; • Study 5869 Altamirano Recruitment Text - Email_v2.docx, Category: Recruitment Materials; • Study 5869 Altamirano Recruitment Text - Flyer_v4.docx, Category: Recruitment Materials; • Study 5869 Altamirano Recruitment Text - Social Media Facebook_v3.docx, Category: Recruitment Materials; • Study 5869 Altamirano Recruitment Text - Social Media LinkedIn_v2.docx, Category: Recruitment Materials; • Study 5869 Altamirano_ Interview Scheduling - Email.docx, Category: Other; • Study 5869 Altamirano_Interview Confirmation - Email.docx, Category: Other; • Study 5869 Altamirano_Interview-Guide_v2.docx, Category: Interview / Focus Questions; • Study 5869 Altamirano_Survey_HRP-254_Explanation-of-Research_v4.pdf, Category: Consent Form; • Study 5869 Altamirano_Survey-Questions_v3.docx, Category: Survey / Questionnaire; • Study 5869 Altamirano-Interview_HRP-254_Explanation-of-Research_v4.pdf, Category: Consent Form;

This determination applies only to the activities described in the IRB submission and does not apply should any changes be made. If changes are made, and there are questions about whether these changes affect the exempt status of the human research, please submit a modification request to the IRB. Guidance on submitting Modifications

and Administrative Check-in is detailed in the Investigator Manual (HRP-103), which can be found by navigating to the IRB Library within the IRB system. When you have completed your research, please submit a Study Closure request so that IRB records will be accurate.

If you have any questions, please contact the UCF IRB at 407-823-2901 or irb@ucf.edu. Please include your project title and IRB number in all correspondence with this office.

Sincerely,

Tamiko Fukuda
Designated Reviewer

APPENDIX B: SURVEY EXPLANATION OF RESEARCH

EXPLANATION OF RESEARCH

Title of Study: Exploring Workplace Bias in Software Companies
Principal Investigator: Amanda Altamirano
Faculty Supervisor: Sonia H. Stephens

You are being invited to take part in a research study. Whether you take part is up to you.
The purpose of this research is (1) to better understand technical communicators' perceptions and experiences about software industry documentation (software instructions) and workplace bias and (2) to determine whether a diagram can help reduce biases in technical documentation. The diagram portion of this study applies to interview participants only.

This study includes two parts: a survey (occurring now) and an optional follow-up interview. The survey will be completed remotely using Qualtrics, an online survey software, and can be accessed via computer (recommended) or mobile device (e.g., tablet). Due to the technical requirements of this study, devices using only cellular connectivity are not recommended.

You will first be asked questions to determine your eligibility to participate in this research. If you are eligible and choose to continue with the survey, you will be asked multiple-choice and short-answer questions about your work experience in the software industry, your opinions about software industry documentation and workplace bias, your interest and availability for being interviewed for this study, and your interest in compensation for this survey. The survey also includes optional demographic questions. I anticipate that it will take you between 30 and 40 minutes to complete the survey.

Participants will be selected for interviews based on their work history to ensure a wide range of experiences. If you are selected to participate in the interview, you will be contacted via email or phone to set up a time to meet using Zoom. You will be asked questions that follow up on your responses during the survey. I anticipate that it will take between 45 and 60 minutes to complete the interview. If you participate in the interview, you will be audio-recorded during the Zoom interview. If you do not want to be recorded, you will not be able to be interviewed for the study. Discuss this with the researcher or research team member.

Your IP address and email address will be collected during the survey. If you are interested in participating in the interview portion of this study, you will also provide your name and preferred contact information (e.g., email or phone) in order to schedule the interview.

Per the University of Central Florida (UCF) policy, all data gathered during this study will be securely stored for a minimum of five years after study closure on UCF's secure password protected One Drive account. After that, they will be deleted. Identifiable information will be stored separately from any de-identified data. Your information that is collected as part of this research will not be used or distributed for future research studies, even if all of your identifiers are removed.

To take part in this research study, potential participants must meet the following criteria:

- Technical communicator (any employee or owner impacting software production or documentation) with current or former work experience as an employee or owner in the computer software industry.
- Have access to a computer or mobile device (e.g., tablet) with an Internet connection.
- Be able to read, speak, and write English.
- Be 18 years of age or older.

The survey includes a question about your interest in compensation for participating in this survey. You will need to provide an email address in order to receive a $5 Amazon electronic gift card for completing the survey. You must complete both parts of the survey in order to receive the gift card. The gift card will be sent to the email address you provided during the survey approximately 7-10 business days after you complete the survey. Limit of one survey completion and compensation per person. There is no compensation for the interview portion of this study.

Study contact for questions about the study or to report a problem: If you have questions, concerns, or complaints: Amanda Altamirano, Graduate Student, Texts & Technology Ph.D. Program, College of Arts and Humanities, (407) 823-2126 or by email at amanda.altamirano@ucf.edu or Dr. Sonia H. Stephens, Associate Professor, Department of English and Texts & Technology Program at (407) 823-2126 or by email at sonia.stephens@ucf.edu.

IRB contact about your rights in this study or to report a complaint: If you have questions about your rights as a research participant or have concerns about the conduct of this study, please contact the Institutional Review Board (IRB), University of Central Florida, Office of Research, 12201 Research Parkway, Suite 501, Orlando, FL 32826-3246 or by telephone at (407) 823-2901 or email irb@ucf.edu.

APPENDIX C: PART TWO QUALIFIED PARTICIPANT SURVEY QUESTIONS

The following questions focus on work experience in the software industry.

P2: Q1 Which of these workplace teams best represents your work experience in the computer software industry?
Select all that apply.
Note: If you write in the "other" field, do not use names or other identifying characteristics.

- o Customer/client/end-user support (1)
- o Product or project management (2)
- o Software development/implementation (3)
- o Technical communication/documentation (4)
- o Software Testing/Quality Assurance (QA) (5)
- o Owner (6)
- o Other (7)

P2: Q2 Which of these employment statuses represents your present and past positions that you have held in the software industry? *Select all that apply.*

Note: If you write in the "other" field, do not use names or other identifying characteristics.

- o Full-time employee (1)
- o Part-time employee (2)
- o Contract employee (3)
- o Intern (paid) (4)
- o Intern (unpaid) (5)
- o Consultant (6)
- o Volunteer (7)
- o Retired (8)
- o Other (9)

P2: Q3 Which of these employment statuses represents your present and past physical location when working in the software industry? *Select all that apply.*
Note: If you write in the "other" field, do not use names or other identifying characteristics.

- o On-site (employer-provided office or location) (1)
- o Telecommute (remote) (2)
- o Hybrid (remote and on-site) (3)
- o Other (4)

P2: Q4 Indicate your years of experience working for (or owning) a software company.
Choose the option that best represents your total combined work experience (please round to the next year if over 6 months).

- Less than a year (1)
- 1-5 years (2)
- 6-10 years (3)
- 11-15 years (4)
- 16-19 years (5)
- 20 years or more (6)

The following questions focus on software documentation.

P2: Q5 Did you support the creation or management of technical software documentation (instructions on how to use the software)?

- Yes (1)
- No (2)
- Unsure (3)

P2: Q6 How did you support the creation and management of the software documentation? *Select all that apply.*

Note: If you write in the "I supported by (other)" field, do not use names or other identifying characteristics.

- I wrote documentation (1)
- I edited documentation (2)
- I collaborated (worked directly) with documentation writers (3)
- I collaborated (worked directly) with documentation managers (4)
- I provided subject-matter expertise (gave information to help create new or update existing documentation) (5)
- I supported by (other) (6)
- I did not support the creation and management of software documentation (7)

P2: Q7 What role(s) were you working in when you supported the software documentation? *Select all that apply.*

- Customer/client/end-user support (1)
- Product or project management (2)

- Software development/implementation (3)
- Technical communication/documentation (4)
- Software testing/QA for end users (5)
- Testing for internal use only (6)
- Other (7)

P2: Q8 Have you read any of the technical software documentation produced by the most recent software company for which you have worked?

- Yes (1)
- No (2)
- Unsure (3)

P2: Q9 For the most recent software company you have worked for only, do you believe that their documentation is effective for all people who use the software?

Note: If you write in the "other" field, do not use names or other identifying characteristics.

- Yes (1)
- No (2)
- Unsure (3)
- I have never read their documentation (4)
- Other (5)

P2: Q10 The following options describe the characteristics of *quality* documentation. Select the *characteristic* most important to you and provide a brief statement as to why.

- Intrinsically (naturally) good. Explain why: (1)
- Clearly represented. Explain why: (2)
- Contextually appropriate for the task. Explain why: (3)
- Accessible to the reader. Explain why: (4)

P2: Q11 The following options describe features of *quality* documentation. Select the *feature* that is most important to you and provide a brief statement as to why.

- Accurate, credible, unbiased, and trustworthy. Explain why: (1)
- Complete, relevant, timely (not outdated), and valuable. Explain why: (2)
- Concise, consistent, easy to understand (information is clear), and interpretable (definitions are clear). Explain why: (3)

P2: Q12 The following options describe the characteristics of *effective* documentation. Select the *characteristic* most important to you and provide a brief statement as to why.

- Help users find information quickly. Explain why: (1)
- Assist users who might not use all the software documentation. Explain why: (2)
- Guide users in completing common tasks. Explain why: (3)
- Show processes outside the normal flow of tasks. Explain why: (4)

P2: Q13 The following options describe features of *effective* documentation. Select the *feature* that is most important to you and provide a brief statement as to why.

- Formats are standardized. Explain why: (1)
- Information is repeated across multiple sections and documents. Explain why: (2)
- Information is organized by user tasks. Explain why: (3)
- Supplemental information is placed in sidebars and call-out boxes. Explain why: (4)

The following questions focus on workplace bias in the software industry.

P2: Q14 The Oxford English Dictionary defines bias as "prejudice in favor of or against one thing, person, or group compared with another, usually in a way considered to be unfair." When you consider this definition, do you believe you or one of your coworkers have experienced bias in the workplace?

Note: If you write in the "other" field, do not use names or other identifying characteristics.

- Yes (1)
- No (2)
- Unsure (3)
- Other (4)

P2: Q15 Do you believe workplace bias has impacted the effectiveness of technical software documentation you have read either inside or outside your workplace experience?

Note: If you write in the "other" field, do not use names or other identifying characteristics.

- Yes (1)
- No (2)
- Unsure (3)
- Other (4)

The following questions focus on interest and availability for being interviewed.

P2: Q16 Would you be interested in being interviewed for this research using Zoom video conferencing software?

- Yes (1)
- No (2)
- Unsure (3)

P2: Q17 Are you available within the next 1-4 weeks to meet for a scheduled interview that takes 45 minutes to 1 hour?

- Yes (1)
- No (2)
- Unsure (3)

P2: Q18 The researcher needs to contact you to schedule an interview. If you provide your email or phone number, it is only used for participating in this research. Please indicate your preferred method of contact for scheduling an interview.

- Email Specify email: (1)
- Phone call Specify phone number: (2)
- Text message Specify phone number: (3)
- I prefer not to be contacted (4)

The following question focuses on your interest in survey compensation.

P2: Q19 Are you interested in receiving a $5 Amazon electronic card (sent to your email) as a "thank you" for participating in this survey?

- Yes, send it to the same email I provided earlier. (1)
- Yes, send it to this email: (2)
- No (3)

Optional Demographic Questions

The goal of these questions is to collect demographic data to supplement the research questions for this project.

P2: Q20 How old are you?

- 18-24 (1)
- 25-34 (2)
- 35-44 (3)
- 45-54 (4)

- 55-64 (5)
- 65+ (6)
- Prefer not to answer (7)

P2: Q21 What is your gender?

Note: If you write in the "(other)" field, do not use names or other identifying characteristics.

- Male (1)
- Female (2)
- Non-binary / third gender (3)
- Transgender (4)
- Other (5)
- Prefer not to answer (6)

P2: Q22 What gender pronouns do you use?
Select all that apply.

Note: If you write in the "(other)" field, do not use names or other identifying characteristics.

- I don't use gender pronouns. (1)
- He/him (2)
- She/her (3)
- They/them (4)
- Other (5)
- Prefer not to answer (6)

P2: Q23 What race do you identify as?
Select all that apply.

Note: If you write in the "(other)" field, do not use names or other identifying characteristics.

- American Indian or Alaska Native (1)
- Asian (2)
- Black or African American (3)
- Native Hawaiian or Other Pacific Islander (4)
- White (5)
- Other (6)
- Prefer not to answer (7)

P2: Q24 What is your household income?

- Under $40,000 (1)
- $40,001 - $60,000 (2)
- $60,001 - $80,000 (3)
- $80,001 - $100,000 (4)
- $100,001 or more (5)
- Prefer not to answer (6)

APPENDIX D: INTERVIEW EXPLANATION OF RESEARCH

UNIVERSITY OF CENTRAL FLORIDA

EXPLANATION OF RESEARCH

Title of Study: Exploring Workplace Bias in Software Companies
Principal Investigator: Amanda Altamirano
Faculty Supervisor: Sonia H. Stephens

You are being invited to take part in a research study. Whether you take part is up to you.

The purpose of this research is (1) to better understand technical communicators' perceptions and experiences about software industry documentation (software instructions) and workplace bias and (2) to determine whether a diagram can help reduce biases in technical documentation. The diagram portion of this study applies to interview participants only.

This study includes two parts: a survey and an optional follow-up interview. Since you have already completed the survey and agreed to move to the follow-up interview, this explanation of research is for the interview portion of the study. The interview will be conducted remotely via computer (recommended) or mobile device (e.g., tablet) using Zoom, a video conferencing software. Due to the technical requirements of this study, devices using only cellular connectivity are not recommended.

The researcher will be in a private room independent of the participant during the interview. Your location during the interview is based on a location of your choosing. The researcher recommends that you be in a private room during the interview.

During this interview, you will be asked to expand upon your survey responses relating to software documentation and workplace bias. You will also be asked for feedback on a diagram designed to help reduce biases in technical documentation. I anticipate that it will take between 45 and 60 minutes to complete the interview. There is no compensation for this part of the study.

You will be audio-recorded during the Zoom interview. Your audio recording will be transcribed by Zoom. Please note that the recording will be used by Zoom based on their privacy policy. The initial transcript is automatically generated via Zoom video conferencing software. The researcher will review this transcript and manually transcribe it as needed. If you do not want to be recorded, you will not be able to be interviewed for the study. Discuss this with the researcher or research team member.

Per UCF policy, all data and audio-recordings gathered during this study will be securely stored for a minimum of five years after study closure on the University of Central Florida's (UCF) secure password protected One Drive account. After that, they will be deleted. Identifiable information will be stored separately from any de-identified data. Identifiable information includes your name, contact information (e.g., email or phone), and audio recording. Your information that is collected as part of this research will not be used or distributed for future research studies, even if all of your identifiers are removed.

To take part in this research study, you must meet the following criteria:

- Technical communicator (any employee or owner) impacting software production or documentation) with current or former work experience as an employee (or owner) in the computer software industry.
- Have access to a computer or mobile device (e.g., tablet) with an Internet connection and access to Zoom.
- Be able to read, speak, and write English.
- Be 18 years of age or older.
- You must have completed both parts of the survey prior to your scheduled interview.

Study contact for questions about the study or to report a problem: If you have questions, concerns, or complaints: Amanda Altamirano, Graduate Student, Texts & Technology Ph.D. Program, College of Arts and Humanities, (407) 823-2126 or by email at amanda.altamirano@ucf.edu or Dr. Sonia H. Stephens, Associate Professor, Department of English and Texts & Technology Program at (407) 823-2126 or by email at sonia.stephens@ucf.edu.

IRB contact about your rights in this study or to report a complaint: If you have questions about your rights as a research participant or have concerns about the conduct of this study, please contact the Institutional Review Board (IRB), University of Central Florida, Office of Research, 12201 Research Parkway, Suite 501, Orlando, FL 32826-3246 or by telephone at (407) 823-2901 or email irb@ucf.edu.

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