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Underrepresented and Underestimated: Impact of Interactions During the Career Search Process on Female STEM Graduate Students

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Underrepresented and Underestimated: Impact of Interactions During the Career Search Process  
on Female STEM Graduate Students

By

REBECCA K. ANDERSEN  
DISSERTATION

Submitted in partial satisfaction of the requirements for the degree of

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in

Educational Leadership

in the

OFFICE OF GRADUATE STUDIES

of the

UNIVERSITY OF CALIFORNIA

DAVIS

Approved:

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Committee in Charge

2023

## **DEDICATION**

This dissertation and my doctoral journey are dedicated to my mother, who has overcome barriers to change lives as an educator in STEM. You are my inspiration and shining example of leadership in education. This dissertation is for you.

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## ABSTRACT

It is critical to pave the way for more women in science, technology, engineering, and mathematics (STEM). Despite the need for an increased workforce, women remain underrepresented in technology careers and particularly technology leadership (Tomaskovic-Devey & Han, 2018). Furthermore, there is a lack of research on how STEM recruiting and hiring practices impact female career progression and career decision making in STEM (Behroozi et al., 2019, 2020a; Friedmann & Efrat-Treister, 2023; Lunn & Ross, 2021a; S. Lunn & Ross, 2021b). The purpose of this study was to examine the career search experiences of mid-career female students and recent alumni in an online professional master's degree focused on data science who were seeking to make a mid-career change into technology and aspired toward roles in leadership. Using a qualitative approach, this study specifically considered student and recent alumni interactions with career agents (i.e., recruiters, hiring managers, interviewers) during their career searches. Four semi-structured focus groups and ten interviews were conducted with a total of 18 participants. Five themes emerged regarding the career search experiences of participants: difficulty navigating a career search labyrinth, how they valued me matters, community matters, "ambitious, but sometimes I lose hope," and aspirations as a woman in tech. This study identified how structural barriers that are unique to career search learning experiences can negatively affect female career self-efficacy while STEM self-efficacy relating to STEM learning experiences remains high. This study revealed how structural barriers can be transformed into structural supports during the career search to positively impact female career progression and career choices in STEM.

*Keywords:* Women, graduate students, STEM, career search, job search, self-efficacy

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## **CHAPTER ONE: INTRODUCTION**

### **Background and Purpose Statement**

The phrase “glass ceiling” was defined 30 years ago as an artificial barrier in the form of workplace policies and culture, preventing qualified individuals from advancing to senior-level positions (U.S. Department of Labor, 1991). Today, the glass ceiling persists for women in science, technology, engineering, and mathematics (STEM) (Amon, 2017; Fernandez & Campero, 2017; McKinsey & Company, 2022). Intersectional factors of race and class can also lead to a “concrete ceiling,” creating an impenetrable barrier preventing marginalized individuals from even entering the tech workforce or progressing in their careers (Beckwith et al., 2016).

Gender inequity in STEM career development has wide-ranging effects, including preventing women from accessing high-paying STEM careers and restricting the size of the STEM workforce. Most importantly, the barriers that exist for women in STEM careers, particularly in STEM leadership, reinforce existing inequities within the STEM industry and in the technology products which are produced. For example, search engines have become a main vehicle for information and yet, the algorithms used in these search engines have demonstrated gender and racial bias (Nobel, 2018; Vlasceanu & Amodio, 2022). These types of inequities in technology products are the direct results of a lack of diverse gender and racial representation in the technology workforce; technology is created by humans who bring their biases and prejudices into the products (Nobel, 2018).

Despite renewed efforts to increase the representation of women in the STEM workforce, they continue to be underrepresented, even as they have increased in their share of science and engineering degree attainment (National Center for Science and Engineering Statistics (NCSES), 2023). In 2020, 26% of bachelor’s and doctoral degrees in mathematics and computer science and 25% of engineering bachelor’s degrees were awarded to women as compared to 25% of mathematics and computer science and 19% of engineering bachelor’s degrees in 2011 (National

Center for Science and Engineering Statistics (NCSES), 2023). Women have also had a large growth in the share of science and engineering graduate degree attainment, with the number of women enrolled in STEM graduate programs increasing by 37% from 2017 to 2021 (National Center for Science and Engineering Statistics (NCSES), 2023). Regardless of these gains in education, women represented only 28% of the total science and engineering workforce in 2021 (National Center for Science and Engineering Statistics (NCSES), 2023), and their relative representation in technical roles declined between 2018 and 2022 (McKinsey & Company, 2022).

In 2021, only 26% of the computing workforce was female, and only 3%, 7%, and 2% of this workforce were African-American, Asian, and Hispanic women, respectively (National Center for Women and Information Technology, 2022). Computing is the only STEM field in which women's representation has steadily declined in the past few decades (Corbett & Hill, 2015; Martinez & Christnacht, 2021). Furthermore, representation of female workers is lower in senior leadership roles. In 2020, among participating companies in the Top Companies for Women Technologists program from AntiaB.org, 36.2% of the entry level workforce was female, and 23.6% of the senior and 24.1% of the executive level roles were female (Anitab.org, 2020a). These statistics represent all roles, not only technical positions, within companies recognized to be welcoming workplaces for women – and yet female representation remains low. This is important for many reasons, including the financial benefits of a gender diverse workforce (Glass & Cook, 2018), the fact that female leaders promote engagement and employee well-being (McKinsey & Company, 2021), and the need for equitable access for women to a fast-growing, impactful, and well-paid career field (DuBow & Gonzalez, 2020).

Between 2019 to 2029, the U.S. Bureau of Labor Statistics employment projections showed an 8% growth in STEM field employment compared to 3.7% for all occupations (Zilberman & Ice, 2021). Occupations in software engineering are predicted to grow at a rate of 21.5% and will

account for two-thirds of all new STEM jobs created, while the mathematical science occupation, which includes data scientists, is predicted to grow at a rate of 33% (Zilberman & Ice, 2021). That said, in 2022, the technology industry began to see significant cuts in employment in the form of layoffs (Karaian & Kelley, 2023). According to an online tracker, Layoffs.Fyi, there were 161,411 layoffs in 2022 and 121,255 layoffs in January and February of 2023 (*Layoffs.Fyi - Tech Layoff Tracker and Startup Layoff Lists*, n.d.).

Despite recent cuts, the technology industry still has a lower unemployment rate at 2% in February 2023 than the national unemployment rate, which is at 3.6% (CompTIA, 2023). The technology industry had a significant hiring boom in 2020 to 2021, and it is expected that, even with recent layoffs, the industry and related workforce will continue to grow with an increased demand for technology talent (CompTIA, 2023; B. Ford, 2023). As the tech industry begins to build again, it is important to consider representation of women and other underrepresented groups. It is particularly important to consider the underrepresentation of women of color in technology leadership, which is more extreme than white women and includes a lack of representation for Black, Latinx, Native, and Asian women (Tomaskovic-Devey & Han, 2018). According to Layoffs.fyi, a popular website tracking layoffs in the tech industry, 44.8% of the layoffs between October 2022 and January 2023 were women (C. Steele, 2023).

Computing was originally female-dominated until it was deemed socially acceptable for men (Rankin, 2021; C. Thompson, 2019a, 2019b), and the statistics around educational degrees show that women are increasingly interested and invested in STEM careers (National Science Foundation, National Center for Science and Engineering Statistics, 2019; National Center for Science and Engineering Statistics (NCSES), 2023). As gender equity researcher Dr. Joy Rankin (2021) noted, “the question is not how we get more women into tech, but rather how did tech “become a field that is overwhelmingly white, male, and generally hostile to those who are neither?” (p. 2)

Interventions to increase the share of women working in STEM has focused on increasing the number of women interested in STEM, but there is a lack of research on how STEM recruiting and hiring practices impact female career progression and career decision making (Behroozi et al., 2019, 2020a; Friedmann & Efrat-Treister, 2023; Lunn & Ross, 2021a; S. Lunn & Ross, 2021b).

The call to understand the experiences of mid-career female graduate students during their career search was predicated on two main issues: (1) the need for gender equity in STEM careers and (2) the existing structural factors that influence female graduate students' career search and career progression in mid-career and leadership roles. This study looked at the career search experiences of mid-career female students and recent alumni in an online professional master's degree focused on data science who were seeking to make a mid-career change into technology and aspired toward roles in leadership or positions with recognized power, such as managers or technical leads. Specifically, I considered student and recent alumni experiences of interacting with career agents (i.e., recruiters, hiring managers, interviewers) during their career searches. I defined career searches as the period when a student or alum is actively engaging in recruiting activities. This research included examining participants' perceptions of how career agents evaluated them as STEM workers and potential leaders, the impact of stereotypes and biases, and how their experiences with career agent interactions affected their STEM identity development, self-efficacy, and career decision making.

While most of the literature addresses female representation and persistence in STEM degrees, there is a need to understand the career pathways of female workers in STEM, including why these individuals may migrate away from the STEM pathway or have their STEM career goals disrupted after earning their degrees (Carlone & Johnson, 2007; Friedmann & Efrat-Treister, 2023; Lunn & Ross, 2021a). Technical graduate degrees are advertised as a method for one to establish credibility in technical skills and can serve as an important qualification for STEM leaders (National



Center for Science and Engineering Statistics (NCSES), 2023). Studies have examined the recruitment and retention of undergraduate female students in STEM and factors that influence their career decisions (Ong et al., 2018; Rainey et al., 2018); however, graduate students and recent alumni are relatively understudied (J. L. Smith et al., 2013). Graduate students demonstrate commitment to a particular domain, such as STEM; they are already interested and invested, and the natural outcome of their degree is to take up roles in their chosen domain. In 2021, 41.8% of the graduate degrees in mathematics and computer science were awarded to women, which was a significant growth from 2017 (National Center for Science and Engineering Statistics (NCSES), 2023), yet the percentage of women working in mathematics and computer science occupations has remained relatively constant (Martinez & Christnacht, 2021; National Center for Science and Engineering Statistics (NCSES), 2023).

Little research has directly examined the female perspective for the career search in male-dominated roles within technology or included intersectional analysis, taking into account the many facets of a female student's identity (Ireland et al., 2018; Lunn & Ross, 2021a; Lunn & Ross, 2021b). To understand female persistence and access to STEM leadership careers after attaining a STEM graduate degree, my study looked at the point at which mid-career female professional graduate students and recent alumni in data science engaged in the career change process.

There remains a need for growth in the STEM workforce, and at the same time, there is a need to reach greater equity and access to high-paying and satisfying STEM careers by groups that have traditionally not been well-represented in technology, including women and particularly women of color (Oh & Lewis, 2011), as well as develop a diverse workforce which can help to fuel innovation (Botella et al., 2019; Carnevale et al., 2014; *Innovation, Diversity and Market Growth*, 2013). Studies have shown that homogeneity in the workforce can hamper the exchange of ideas, whereas diverse representation in the workforce leads to innovation and greater economic returns (Phillips,

2014). Having a workforce that represents the community is also important to ensure products and services meet the needs of the community. There are many examples serving as cautionary tales for when women and people of color are not represented in the technical workforce, including Apple's Health app for tracking "key health metrics," which left out the tracking of menstrual cycles (Duhaime-Ross, 2014), or the widespread problem of artificial intelligence facial recognition software misidentifying Black faces at rates five to 10 times higher than white faces (Simonite, 2019). Given the growing attention by technology companies on diversifying their workforces (Apple, 2021; Facebook, 2021; Google, 2021), the national need for a growing STEM workforce (*Maintaining U.S. Leadership in Science and Technology*, 2019), and the importance of female representation in leadership (Glass & Cook, 2018; Hunt et al., 2015; McKinsey & Company, 2022), this study fosters critical discourse on how interactions during the career search with representatives from technical companies recognize mid-career female candidates and the impact of this recognition on career progression and career decision making.

### **Research Questions**

Research questions for this study were:

1. What are the career search experiences of mid-career female data science graduate students and recent alumni seeking to advance toward leadership roles in the STEM industry?
  - a. How do mid-career female data science graduate students and alumni make sense of these experiences, particularly interactions with career agents?
  - b. In what ways do these interactions affect career decision making and career progression?

## Conceptual Framework

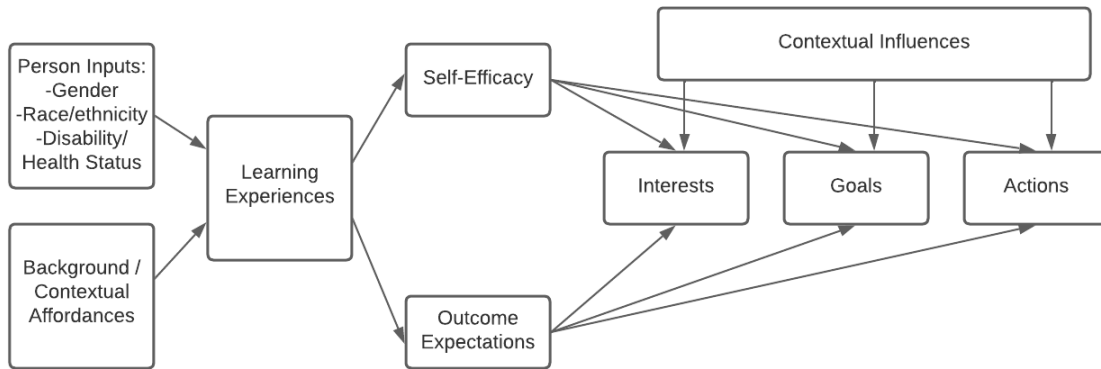
I approached this study from a critical constructivism worldview. This perspective understands that knowledge is constructed by individuals who operate in a social and contextual world that often privileges some while marginalizing others (Kincheloe, 2005). Using the critical nature of this worldview, I focused on the role power plays in the construction of knowledge, in what is deemed worthy or not worthy, and how these processes affect the individuals who experience them. My goal was to bring forward stories of female graduate students from varied backgrounds who had gone through the process of career search and interactions with career agents to make known their perspectives and how the context of the career search process and interactions with career agents shaped their decision making and career progression. I also examined how dominant power operated in this process and what affect it had. While I approached this work with inquiry, the process of my inquiry was guided by an established theoretical framework used in STEM career development as well as my own reading of the literature, my professional background, and experiences as a career coach in STEM. With these perspectives, I developed a conceptual framework to guide my inquiry and help understand the role of context and power in this process. Making my underlying conceptual framework explicit ensured that I was aware of my perspective and how it had potential biases that could be brought to this work since knowledge cannot be separated from the knower (Kincheloe, 2005), or in this case, research from the researcher. In short, this conceptual framework was my lens for considering the career search experiences of mid-career female graduate students and recent alumni in data science. By making the conceptual framework explicit, I ensured that this lens served to crystalize rather than cloud interpretations of the data (Charmaz, 2012).

The conceptual framework for this study was informed by the social cognitive career theory (SCCT) model of career decision making (Lent et al., 1994; Lent & Brown, 2019) along with findings

from the literature demonstrating the presence of structural/contextual and psychosocial factors that affect female career progression. SCCT is derived from Bandura's general social cognitive theory, which focuses on the interplay of three key agentic variables: self-efficacy, outcome expectations, and goals (Bandura, 1986). In Bandura's (1986) model, self-efficacy is the key driver and is defined by people's beliefs about their capabilities "to organize and execute courses of action required to attain designated types of performances" (p. 391). The SCCT model builds on Bandura's framework to include learning experiences, or sources of self-efficacy, as well as personal and environmental influences on the career decision making process. In the SCCT model, learning experiences affect self-efficacy and expectations in career outcomes (see Figure 1); these two factors drive interest in career fields, resulting in goal setting or persistence in career choice (Lent, 1994). Antecedents of the SCCT model include person-inputs and background factors, which can influence learning experiences (Lent et al., 1999). Person-inputs are characteristics, such as gender, race/ethnicity, and health/disability status, while background factors include educational quality and socioeconomic resources (Lent & Brown, 2013). Contextual influences – which may be social supports and social barriers – are also found to interact and influence self-efficacy and career choice (Lent et al., 2005). SCCT has been used to understand persistence in STEM among underrepresented populations, including women (Cole & Espinoza, 2011; Fouad & Santana, 2017; Lent et al., 2005, 2010; Litzler et al., 2005; Lunn., 2021a; K. N. Smith & Gayles, 2017). Other factors have also been considered alongside self-efficacy in SCCT, such as identity as a scientist (Chemers et al., 2011; Robnett et al., 2015).

**Figure 1**

*Social Cognitive Career Theory Framework*

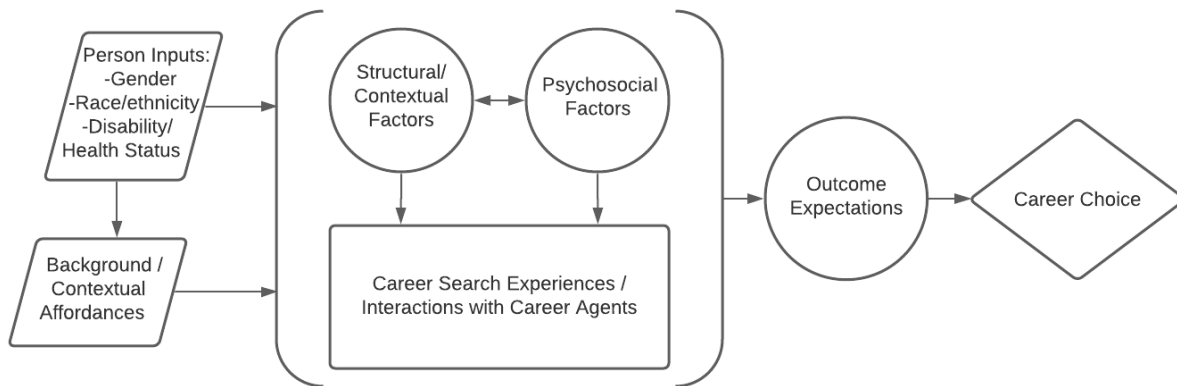


*Note.* Adapted from Lent et al. (1999). A Social Cognitive View of School to Work Transition. *The Career Development Quarterly*, 45, 301.

My study focused on the ways that female students and recent alumni made meaning of their interactions with career agents and how this affected their career progression and decision making. I was primarily interested with what occurred during the career search learning experiences, including supports and barriers that were embedded in this experience, and how these supports and barriers interacted and influenced individual or agentic factors. I was not solely focused on self-efficacy as the main driver for career choice but instead was open to discovering what was happening during the participants' learning experiences to drive and affect career choices. SCCT influenced my contextual framework through theorizing the ways in which personal and environmental factors interact and influence an individual's experience, the meaning they make, and ultimately outcome expectations and career choice. The conceptual framework I used to approach and guide this study is displayed in Figure 2.

**Figure 2**

*Conceptual Framework*



In my conceptual framework I have person-input and background/contextual affordances as antecedent factors to the career search experience. Within the learning experience, I broke out subconstructs of structural/contextual factors and individual/psychosocial factors. I was particularly interested in those structural/contextual factors that could create barriers female students and recent alumni may face during their career searches and interactions with career agents. Identified barriers for women in technology and STEM include the representation of women in technology (Carli et al., 2016; Cowgill et al., 2021; Makarem & Wang, 2020), stereotypes and biases (Bian et al., 2017; Carli et al., 2016; Corbett & Hill, 2015; Hill et al., 2010; Moss-Racusin et al., 2012), chilly environments (Cabay et al., 2018; Ireland et al., 2018; LaCosse et al., 2016; Wynn & Correll, 2018), and discrimination (McKinsey & Company, 2020; Scott et al., 2017; Women who Tech, 2020). These structural/contextual factors interplay with individual/psychosocial factors. The individual/psychosocial factors of women in technology and STEM include stereotype threat (Leslie et al., 2015; Schuster & Martiny, 2017; Shaffer et al., 2013; C. M. Steele, 1997), sense of belonging (Moss-Racusin et al., 2018; Ong et al., 2011; Rainey et al., 2018; J. L. Smith et al., 2013), identity (Carlone & Johnson, 2007; Chemers et al., 2011; Robnett et al., 2015; Settles et al., 2016), and self-efficacy (Correll, 2004; Ireland et al., 2018; Jones et al., 2009; Settles et al., 2016).

Within my conceptual framework, I was focused on the participants' career search experiences, particularly interactions with career agents. I considered the personal and environmental influences on the career search experience, as well as the structural/contextual and individual/psychosocial factors at play within these experiences. Ultimately, I considered how these elements affected outcome expectations, career progression, and career choices for STEM roles within the technology industry domain. In the following chapter, I will go into detail the structural/contextual and individual/psychosocial factors identified in prior research, which have been found to play a role in the women's career progression and more specifically, experiences in STEM career progression.

## **CHAPTER TWO: LITERATURE REVIEW**

### **Introduction**

This literature review provides the background and context for this study on the mid-career female graduate students' experiences with interactions during the career search process by reviewing relevant theory and prior research. I will first outline the general process and phases of a standard technical career search. I have knowledge of this process from my role in career development, working at a technical graduate school. I will next review research on why it is important to see gender equity in STEM, including the business case, equity case, and the liberation case for gender diversity. I then review literature that provides an overview of representation of female workers in STEM careers, focusing specifically on careers which are technical in nature and where the greatest gap in representation is seen. Next, I review literature on common factors affecting women's career progression and gender equity in historically male-dominated careers. This section is broken into the two categories: structural/contextual and individual/psychosocial factors. Finally, I review the key gaps in the literature and contributions of my study.

### **Career Search Process**

A career search involving a technical role often involves a few concrete stages. First, there is the application phase, during which job candidates submit resumes or profiles for a company's consideration. Resumes are commonly submitted online through a software program known as an Applicant Tracking System (ATS). The ATS software scans the resume against a set of characteristics identified by the recruiter and hiring team and then provides an analysis of a candidate's overall fit with the job profile. If a candidate is seen as a fit, they move on to the next phase in the process; if not, they are often dropped from consideration without a status update. Job candidates can also submit their resumes for consideration through referrals, which is when an



employee at the company submits a candidate's resume and recommends them for hire. Referrals typically result in greater consideration for a job than applications submitted online.

If they proceed through the application phase, job candidates then move through a screening phase, which generally entails a short meeting with a recruiter. After meeting with the recruiter, the job candidate's resume often still needs to be approved by the hiring manager to proceed to the next phase. Even if a participant makes a positive impression on a recruiter, they may be rejected based on the hiring manager's assessment of their background and experience.

Next is a general interviewing phase, which can involve multiple rounds of screening interviews before leading to a final interview. The screening interviews can consist of case study (e.g., scenario and behavioral based) questions, but are usually technical in nature and require either a take-home coding assignment or live coding with an interviewer. Take-home coding assignments can be lengthy and time consuming. Live coding requires job candidates to work through and solve technical problems while simultaneously explaining their thought process to an interviewer, often over a virtual meeting platform such as Zoom. At times, the live coding sessions are time restricted and require careful planning to complete all problems and leave space for discussion.

The last phase is a final round of interviews. Pre-pandemic, this round was called an "onsite interview" and could consist of a multi-hour visit to a company's office where a job candidate would engage in a sequence of interviews with different stakeholders. Since the pandemic, the final round interview is often held virtually but is still generally the same length of time as a traditional onsite interview. During the final round, job candidates may meet with team members, the hiring manager, and other company stakeholders. They could be asked to create and give a presentation, and the final round usually includes multiple technical interviews. Technical interviews may be as previously described, or they could be "paired programming," where the participant approaches a technical problem and attempts to solve it collaboratively with the interviewer. Throughout the round of

interviews, candidates can be also evaluated for a culture fit with the company. This evaluation is often done in conjunction with all job candidates, and interviewer interactions and may include targeted behavioral based questions, often related to the values or leadership principles identified as important by the company in question. In the final round of interviews, after an onsite interview, a candidate may have an additional screening interview with a skip-level manager (i.e., the hiring manager's manager or department lead) or other influential stakeholder(s) before a final hiring decision is made.

### **Underrepresentation of Women in STEM Leadership**

There are numerous reports demonstrating the underrepresentation of women in STEM, particularly in technology roles in the technology sector (Tomaskovic-Devey & Han, 2018). A 2017 report by the Government Accountability Office (GAO) reviewed census data and Equal Employment Opportunity Commission reports, finding that from 2005 to 2015 representation of women in technology remained flat (United States Government Accountability Office, 2017). Data from the National Center for Women & Information Technology concurred; the percentage of women in computing and mathematical occupations has remained between 25% to 26% since 2007 (DuBow & Gonzalez, 2020). As noted earlier, women are even more underrepresented in roles within the technology sector. Women have consistently made up 25% of workers in technology roles in non-technology based companies (such as retail or finance), but only 18% of workers in technology roles in technology companies are women (United States Government Accountability Office, 2017).

Since 2014, leading technology companies have started publishing diversity reports and making ambitious goals for increasing representation of historically underrepresented groups, yet the lack of change in female representation persists. Table 1 shows the gender breakdown for technology and leadership roles in prominent technology companies (i.e., Facebook, Google, Apple),

as reported in annual diversity reports linked on public company websites (Apple, 2021; Facebook, 2021; Google, 2021). Roles are categorized as technology or leadership by the company. Generally, technical roles are defined as those that require specialization and knowledge in science, technology, mathematics, and engineering to complete job duties. Leadership is generally defined as director level and above, including those in people management and individual contributor (non-management) roles. Intersectional data (e.g., gender by race/ethnicity) is not included in the table, as only Google makes this data publicly available in its diversity report. While these companies do present small gains in representation, it is important to note that, nationwide, female representation in technology roles, such as computer software engineer and computer programmer, decreased over the 15-year timeframe of 2004 to 2019 (DuBow & Gonzalez, 2020). There are many computing subfields that make up the category of technology roles, and women are usually overrepresented in execution rather than strategic roles (DuBow & Gonzalez, 2020).

In addition to underrepresentation in technology, many reports showed women are also underrepresented in leadership roles (McKinsey & Company, 2019, 2021, 2022; Tomaskovic-Devey & Han, 2018; United States Government Accountability Office, 2017). While Table 1 shows greater female representation in leadership than in technology, in the publicly reported aggregate data used to create this table, it is unclear what roles are classified as leadership or technology. The leadership category may be quite broad and include roles outside of the technical domain, which is executive rather than strategy. Women may be more well-represented in lower-level leadership roles that are removed from technology.

**Table 1**

*Global Percentage of Workers by Gender in Technology and Leadership Job Categories, as Reported in Annual Public Company Diversity Reports*

		Facebook		Apple		Google	
		Tech.	Leadership	Tech	Leadership	Tech	Leadership
2014	Men	85%	77%	80%	72%	83.4%	79.2%
	Women	15%	23%	20%	28%	16.6%	20.8%
2020	Men	75.2%	64.5%	76%	69%	76.4%	71.9%
	Women	24.8%	35.5%	24%	31%	23.6%	26.7%

Table 2 displays statistics of female representation by named role (e.g., professional, mid-level manager, senior manager), both within and outside the technology sector, as reported by the GAO (United States Government Accountability Office, 2017). This information shows an attrition of female workers moving up the career ladder toward leadership. For example, in the non-technology sector, women make up 59% of the U.S. workforce in the professional category while they make up only 31% of senior managers. Conversely, we see the opposite trend for men – in the non-technology sector, they make up 41% of the professional category and 69% of senior managers. Representation of women is even worse in the technology sector, where women make up 30% of professionals and only 19% of senior managers as compared to men who make up 79% of professionals and 81% of senior managers.

**Table 2**

*Percentage of U.S. Workers by Gender in Various Job Categories, Within and Outside the Technology Sector, as Reported by the GAO From 2015 EEOC Data*

	Senior Managers		Mid-level Managers		Professionals		Technicians		All other jobs <sup>a</sup>	
	Tech Sector <sup>b</sup>	Non-Tech <sup>c</sup>	Tech Sector	Non-Tech	Tech Sector	Non-Tech	Tech Sector	Non-Tech	Tech Sector	Non-Tech
Men	81%	69%	71%	59%	70%	41%	79%	44%	57%	52%
Women	19%	31%	29%	41%	30%	59%	21%	56%	43%	46%

*Note.* Data are as reported in the 2017 GAO Report, pulled from EEO-1 data.

<sup>a</sup> The category “all other jobs” refers to sales workers, administrative support workers, craft workers, operatives, laborers, helpers, and service workers.

<sup>b</sup> Tech Sector includes leading technology companies from the Standard & Poor 500 Information Technology Index, which encompasses companies in industries such as computer systems design and software publishing.

<sup>c</sup> Non-Tech refers to companies outside the technology sector, such as retail and financial services.

A 2018 report from the nonprofit Center for Employment Equity, housed at the University of Massachusetts, Amherst, concurred with the findings from the GAO (see Table 2) that there is an attrition in female representation as you move up toward leadership (Tomaskovic-Devey & Han, 2018). The Center for Employment Equity used EEOC data from 2016 and examined gender and race representation in the 177 largest Silicon Valley technology firms, finding “the higher the rank of the job, the less numerous women and minorities become” (p. 2), and this is particularly true for women of color (see Table 3). The Center for Employment Equity also found that nearly a third of the companies included in the analysis had no executives who were women of color. Black women made up only 0.4% of executives compared to 14.6% of white women. White women increased in representation as the seniority of the leadership position increased, holding 13.77% of professional roles and 14.6% of executive roles. Black, Latinx, and Asian women all had a decrease in representation as the leadership level increased.

**Table 3**

*Percentage of Leadership Positions with Female Representation, by Race and Ethnicity, for 177 Top Silicon Valley Technology Companies, as Reported by the Center for Employment Equity From 2016 EEOC Data*

	Professionals	Managers	Executives
Black Women	1.1%	0.9%	0.4%
Latinx Women	1.6%	1.6%	0.8%
Asian Women	11.6%	7.8%	4.5%
White Women	13.77%	18.2%	14.6%

The 2022 McKinsey & Company report on “Women in the Workplace” collected information from 333 participating organizations employing more than 12 million people. The findings showed that between 2017 and the start of 2022, the representation of all women in manager positions only increased by 3% (McKinsey & Company, 2022). While the representation of women in executive-level management roles (e.g., C-suite, including Chief Executive Officer, Chief Operating Officer, Chief Information Security Officer, etc.) increased by 6% between 2017 and 2022, women of color still only made up 5% of C-suite positions (McKinsey & Company, 2022). Between the entry level and the C-suite, the representation of women of color dropped by more than 75% in 2021 (McKinsey & Company, 2021), and this statistic has remained largely unchanged.

### **Importance of Gender Equity in STEM Leadership Careers**

#### **The Business Case for Women in STEM Leadership**

Many studies have examined the financial impact of a gender diverse workforce and found that diversity is good for business (Glass & Cook, 2018; Herring, 2009; Hunt et al., 2015; Welbourne et al., 2007). These studies showed that having women in top management teams, which are composed of the general manager or chief executive officer (CEO) and the individuals who directly report to them in the organizational chart, has a positive association with company financial

performance. Financial benefits include short- and long-term financial performance of initial public offering (IPO) firms (Welbourne et al., 2007) and increased sales revenue, more customers, and greater relative profits (Herring, 2009). A 2015 industry white paper from McKinsey & Company demonstrated these financial benefits, creating a business case for diversity (Hunt et al., 2015). The McKinsey & Company conducted an analysis of 366 companies and found that the companies who were in the top quartile of gender diversity for leadership were 15% more likely to have financial reports above their national industry median. In other words, companies with more gender diversity in leadership experienced greater financial returns. The same benefit was found for companies in the top quartile of racial or ethnic diversity. In this case, companies were 35% more likely to have financial returns above their national industry median. Correspondingly, companies in the bottom quartile for both gender and ethnic or racial diversity were less likely to achieve above-average financial returns.

While the correlation between gender diversity and positive financial performance is clear, there is less understanding or agreement on the cause of this link. It has been posited that gender diversity produces positive outcomes because it supports innovation through a diversity of perspectives (Herring, 2009). A study of 205 small and medium-sized enterprises in the Spanish technology industry concurred with this hypothesis, finding that gender diversity positively moderated the relationship between information exchange and innovation performance (Ruiz-Jiménez et al., 2016). While other studies have found similar support for gender and innovation, they have also showed that environmental and contextual factors make a difference in the effect of gender diversity. For example, a study focused on the technology sector by Triana et al. (2019) found that gender diversity in senior managers has a positive impact through information exchange between individuals with diverse backgrounds but that diversity makes the most difference when the environment is supportive, such as in organizations that are predisposed to building alliances.

Recent studies have cited that context matters in the overall effect of diversity on financial and organizational performance (Bear & Woolley, 2011; Glass & Cook, 2018; Hoobler et al., 2018; Hunt et al., 2015; Pearsall et al., 2008; Post et al., 2021; Thomas-Hunt & Phillips, 2004; Triana et al., 2019). A meta-analysis by Hoobler et al. (2018) on the effects of female representation in leadership on financial performance found mixed results on the impact of an increase representation of women in leadership and positive financial performance and called for a more nuanced approach to examining the business case of diversity. Hoobler et al. noted that when we equate gender to biological sex and use the financial bottom line as the primary measure of the value of women's leadership, we may not see always see direct link between diversity and increased performance. The authors instead call for an understanding that differences between men and women are unique and individual, and as such, the impact of these differences cannot merely be measured by a presence or absence of diversity and is shaped by environmental factors.

A study by Glass and Cook (2018) on the effect of gender diverse boards on business and equity practices showcased the difference an environment can make in diversity effects. This study examined the financial outcomes and board governance of Fortune 500 firms during 2001 to 2010 as well as the gender composition of their CEOs and boards of directors. Similar to other studies, the findings suggested that gender diversity makes a positive impact in business and equity outcomes. However, the study also found that the impact of women in leadership roles on the board of directors was strongly conditioned by not just the presence or absence of other women, but the presence of other influential women in leadership positions, such as multiple board positions (Glass & Cook, 2018). This finding indicated that merely increasing gender diversity alone will not result in positive outcomes.

Simply put, without support, women are less influential, and the positive impact of gender diversity in the workplace is not fulfilled (Bear & Woolley, 2011; Pearsall et al., 2008; Thomas-Hunt



& Phillips, 2004). This is particularly true in male dominated fields, such as STEM, where gender can have a negative effect on team performance due to the activation of gender stereotypes (Bear & Woolley, 2011; Cady & Valentine, 1999). It is not merely enough to have more women on teams and in leadership positions. Women must feel empowered (e.g., through an inclusive environment or specific supportive programs, such as mentorship) for the positive effects of gender diversity to be seen.

Beyond the benefits a diverse workforce brings to financial and organizational performance, there are also benefits in increasing the amount of available talent. Since the early 2000s, technology companies have been in a race for “tech talent” that has only increased over time and has often been characterized as a “talent war” (Dowd, 2021; Helft, 2007; Loten, 2021; Nicas & Weise, 2018). While this race for talent has cooled in the recent economy, technology companies are still hiring and are also looking to meet employee demands for workforce diversity and inclusion so that they can attract and retain tech talent. The 2020 Diversity Hiring Survey from popular job site Glassdoor (2021) reported that 67% of job seekers consider workforce diversity to be an important factor when evaluating a job offer. Similarly, a 2021 report from Handshake, the primary job site used to connect college students with internships and entry-level positions, cited 65% of Generation Z women look for women in leadership roles before applying for a job (Handshake, 2021). Both women leaders and young women who are beginning their career are increasingly prioritizing working for a company that is committed to diversity, equity, and inclusion (DEI) (McKinsey & Company, 2022). Promoting and retaining women in leadership roles has become critical for employers looking to expand their workforce by hiring more women – not only as a means of increasing talent supply, but to prevent turnover, which has more of an effect on women of all backgrounds and people from other historically underrepresented groups (Scott et al., 2017). Further, high turnover rates cost the industry more than \$16 billion each year (Scott et al., 2017). To

support the goal of increasing representation of women in leadership, we must understand their career pathways.

### **Equity Case for Women in STEM Leadership**

In the United States, women make up roughly half the population and in 2019, made up 57% of the professional workforce; therefore, women should have similar representation in STEM occupations (DuBow & Gonzalez, 2020). Instead, the representation of women in STEM occupations consistently hovers around 25% (26% in 2019) (DuBow & Gonzalez, 2020). In addition, women are more likely to be stuck in junior roles and face barriers on the path to leadership (McKinsey & Company, 2019). The U. S. federal government, including the GAO and EEOC, have spent time engaged in research, outreach, and strategic priority setting specific to equal employment opportunity in the technology sector. A 2017 report by the GAO showed that more actions are needed to ensure equal opportunity for all in technology. The EEOC's fiscal year 2017-2021 Strategic Enforcement Plan identified barriers to technology sector hiring and recruiting as a strategic priority.

The fact that women have less representation in STEM careers means they have less access to a career field that is fast growing, creative, and flexible and has a salary premium (DuBow & Gonzalez, 2020). Nationally representative salaries for STEM workers are displayed in Table 4. Even in a down economy, the technology industry has a lower unemployment rate than the national average (CompTIA, 2023). The STEM occupation outlook is still strong in terms of both the number of jobs available and compensation, with a reported median annual salary of \$96,770 for computer and mathematical occupations as compared to a median annual salary of \$56,310 for all occupations nationwide (U.S. Bureau of Labor Statistics, 2021). The salary premium for STEM roles starts early, with the National Association of Colleges and Employers (NACE, 2021) reporting a first-destination median annual salary of \$76,986 in 2019 graduates in computer and information

sciences as compared to the overall median salary of \$54,488. Salary averages for computer and information sciences y has also been steadily increasing, showing a 7.8% increase over the previous year (National Association of Colleges and Employers, 2021). The Bureau of Labor Statistics (BLS, 2021) listed data scientists and mathematical science occupations as being the 11th fastest growing occupation, with a median annual wage of \$98,230. The public website Payscale (2023) listed even higher projected salaries for data scientists in the San Francisco Bay Area, which is traditionally known as a tech hub for the United States. Based on an analysis of 531 salaries, Payscale reported an average base salary of \$126,991 and potential bonus and profit-sharing packages totaling up to \$64,000. Notably, the wages on Payscale (2023) may be reflecting a wage premium for technology workers employed in the technology industry. This wage premium is documented in census data with a U.S. salary median of \$89,000 for technology workers within the technology sector and \$78,000 median for those working in other sectors (United States Government Accountability Office, 2017).

**Table 4**

*Nationally Representative Salaries for STEM Workers*

	<i>Entry Level Salary<sup>a</sup></i>
Computer & Information Science Degrees	\$76,986
All Degrees	\$54,488
	<i>Salary (all levels, by job type)</i>
Data Scientists, SF Bay Area <sup>b</sup>	\$135,000
Data Science & Mathematical Science Occupations <sup>c</sup>	\$98,230
Computer & Mathematical Occupations <sup>c</sup>	\$96,770
Technology workers, in Tech Sector <sup>d</sup>	\$89,000
Technology workers, outside of Tech Sector <sup>d</sup>	\$78,000
All Occupations <sup>c</sup>	\$56,310

<sup>a</sup> Entry-level salary data is reported by the National Association of Colleges and Employers (NACE) for the college class of 2019.

<sup>b</sup> Salary for Data Scientists in the SF Bay Area is reported by LinkedIn (n.d.).

<sup>c</sup> Salaries as reported by the Bureau of Labor Statistics.

<sup>d</sup> Salaries as reported by the U.S. Government Accountability Office in a 2017 Report on diversity in the technology sector.

Not only do women have less access to careers in technology, but they have less access to this wage premium. Women make up 25% of workers in technology roles in non-technology-based companies (such as retail or finance) but only 18% of workers in technology roles in technology companies (United States Government Accountability Office, 2017). This could be one of the reasons the gender wage gap is wider in STEM occupations than in non-STEM jobs (Pew Research Center, 2018).

The 2022 “Women in the Workplace” McKinsey white paper reported a significant underrepresentation of women in senior levels within all industries and a “broken rung” at the step up to manager as the biggest challenge women face in obtaining leadership roles. In other words, women are stuck in entry level roles, which prevents them from gaining management and then further leadership opportunities. McKinsey reported that for every 100 men promoted to manager, only 87 white women and 82 women of color are promoted. The broken rung obstacle is prevalent in every step of technical career progression, with less women represented in technology company management and leadership (Tomaskovic-Devey & Han, 2018). A 2018 survey of 12,211 female developers by HackerRank demonstrated that this broken rung shows up early in career progression. They found that women over 35 being 3.5 times more likely to be in junior positions than men (HackerRank, 2019). Not only would women experience greater equity if there was greater gender representation in leadership, but workers as a whole would be more likely to experience equal pay and report higher job satisfaction (Some, 2020). Women managers have been shown to do more to support their teams, including furthering company efforts in DEI (McKinsey & Company, 2021, 2022). In fact, women are twice as likely as men leaders to spend substantial time on DEI initiatives even though 40% of women leaders say this work is not recognized in performance evaluations (McKinsey & Company, 2022).

The recent pandemic only worsened the situation for women in technology. A 2021 study by Girls in Tech found high burnout rates for women, particularly those with male supervisors (63% burnout as compared to 44% burnout for women with female supervisors) and in companies with male CEOs (85% burnout as compared to 15% burnout when the CEO is female) (Girls in Tech, 2021). McKinsey & Company (2022) asserted that burnout, stress, and exhaustion continue to affect women more than men. In a global survey by AnitaB.org (2020b), women reported increased levels of job insecurity due to the pandemic, with 46% stating they were worried about losing their job, and 21% reporting that it was likely they would lose their job. More worrisome is that in a market which has seen remarkable growth, even during the pandemic, women are concerned about their ability to find a new job. Forty-three percent of all women and 57% of Black, Hispanic/Latinx, Native Americans, and Pacific Islander/Native Hawaiian women reported that if they lost their job, it would be hard to find a new one (Anitab.org, 2020b).

Technology careers have many benefits, including serving as an engine for economic mobility. Women are continually underrepresented in these careers, which prevents them from engaging with this economic growth and the social impact technology companies have. A prevalent tenant of American society is the ability of individuals to get ahead, and economic reports find that Americans are generally optimistic about the economic mobility of individuals; however, there is evidence of less intergenerational economic mobility in the United States than in many other rich industrialized countries (Isaacs, 2016). The broken rung of women to advance into management and leadership positions, especially within the technology sector, is evidence of less economic mobility. The EEOC's vision is "respectful and inclusive workplaces with equal employment opportunity for all." If we are to achieve this vision, we must achieve equity in workplace opportunities for women in STEM leadership (United States Government Accountability Office, 2017, para. 5).

## **Liberation Case for Women in STEM Leadership**

Recent social justice advocates, such as Lily Zheng and Michelle MiJung Kim, have urged a shift away from using the business case for DEI as history has shown that it will not result in meaningful, sustainable change (Kim, 2021; Zheng, 2019). A focus on the business case has resulted in one-time or stand-alone diversity educational programming (Giscombe & Mattis, 2002), significant investments in DEI by companies (Novacek et al., 2021) and a focus on DEI in employer branding (Wells et al., 2021). Unfortunately, many diversity education efforts fail (Dobbin & Kalev, 2018) and there can be backlash on marginalized groups (Zheng, 2022). While an abundance of DEI roles were created after the murder of George Floyd in 2020, they are now diminishing at a faster pace than non-DEI roles and tend to have higher employee turnover rates (Ayas, 2023). Reporting on the cutting of DEI roles in technology, Tremoglie (2023), a reporter for *The Washington Examiner*, stated “None of this should be shocking, as no DEI position is ever needed for a company to function” (para. 5). This factor is a good demonstration of why relying on the business case for women in STEM leadership will not work. If businesses truly believed in the business case or the ability for diverse representation in the workforce to lead to increased profits and performance, they would not compromise DEI initiatives in a down economy when profits and performance are even more vital than normal.

Michelle MiJung Kim (2021) made a compelling argument that the equity case for DEI is also one that is not sustainable. She noted that when people follow the argument that DEI is “simply the right thing to do,” it is easy for them to adopt a saviorism mentality (Kim, 2021). The equity case for DEI gives people or businesses motivation to help solve “other people’s problems” (Kim, 2021), which is problematic because it can be easily compromised, such as in a down economy, and can center those in power as saviors. This perspective may also lead to deficit thinking about underrepresented groups, including the idea that they need or want saving (Gorski, 2016).

Kim (2021) instead urges us to consider that we must see ourselves in the work of DEI. In other words, we must realize that the systems and barriers women in STEM leadership face not only harm women, but they harm everyone. Systems, like the technical recruiting process which is reported by men and women as being broken and painful to navigate, are ones that should be the focus on DEI initiatives to help everyone involved (Behroozi et al., 2020a; Behroozi, 2022). Barriers, such as stereotypes of women as communal and emotional and not fit for leadership, mean that male leaders also cannot adopt communal traits or show their emotions without penalty (Kim, 2021; Wessel et al., 2015). Quoting Lilla Watson and an Aboriginal Rights Group in Queensland, Kim (2021) writes, “If you have come to help me, you are wasting your time. But if you have because your liberation is bound with mine, then let us work together” (p. 33) In other words, when we consider how our liberations are bound together, we have found the most enduring way to advance DEI (Kim, 2021).

The liberation case for women in STEM leadership may be more difficult to adopt, as it requires ongoing personal reflection and commitment. However, it is not until we all see ourselves in this work, see that we are working for all our liberation, that we will begin the process of dismantling systems that have served to support white supremacy, patriarchy, and other forms of oppression.

### **Factors Affecting Women’s Career Progression in STEM**

Although introduced more than 40 years ago, the glass ceiling metaphor is still common today in describing the “invisible” barrier women face as they attempt to progress upward in their career (Zimmer, 2015). While leadership may be practiced at any organizational level, the glass ceiling refers to the barrier between women and positional leadership, roles that are often positions of power and recognized and rewarded in visible ways (American Association of University Women, 2016). Women continue to face a glass ceiling at the end of their climb toward leadership roles. This

glass ceiling is not the only barrier in their journey; women experience a myriad of subtle obstacles on their journey – such as the “broken rung” discussed earlier (McKinsey & Company, 2022). Eagly and Carli (2007) asserted that the more relevant metaphor is that of a labyrinth, which describes the complex, both anticipated and unanticipated, barriers that women face while navigating the path toward leadership. The labyrinth metaphor acknowledges that leadership is attainable and that barriers exist. These barriers can be structural (e.g., stereotypes and biases, representation, chilly environment, social capital, discrimination) or individual/psychosocial (e.g., stereotype threat, belonging, identity, self-efficacy) in nature. To move from a labyrinth to distinct pathways for women to leadership, we must understand these often subtle and insidious barriers – the various factors affecting women’s upper-level career progression in STEM.

A dissenting article by Ceci and Williams (2011) found that there are no barriers to female career progression and that, conditional on applying, women are more likely to be hired in today’s workforce. While Ceci and Williams (2011) concluded that gender discrimination does not exist in academic hiring, they also found that a resource imbalance often affects female participation in important activities for academic career growth, such as publishing research. This resource imbalance is caused by women serving in jobs with fewer resources and a primary focus on teaching, a factor that the authors noted as not being related to discrimination as men may also be equally affected by this resource imbalance if they are in similar positions. However, women are disproportionately put into those types of roles, often tasked to complete “women’s work” that is communal in nature, and often discounted (Cabay et al., 2018). While the authors’ findings of resource imbalance may not be overt discrimination, it is a gender-related barrier.

Similarly, the findings of a research article on a UK executive search firm’s hiring of talent for top management roles showed a gender-related barrier (Fernandez-Mateo & Fernandez, 2016). While women may be no less likely than men to be hired if they enter the candidate pool, perceived



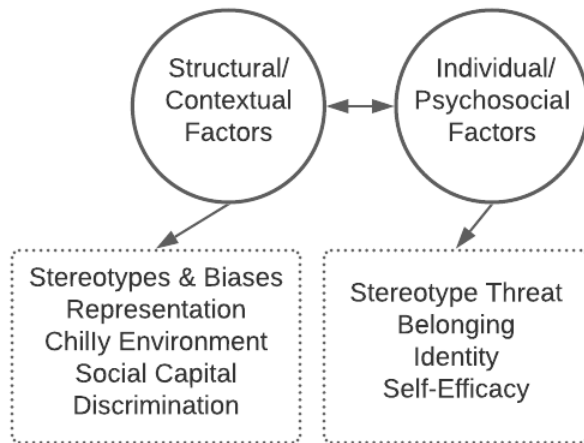
discrimination, stereotypes, and bias may cause women to self-steer away from interviews (Fernandez-Mateo & Fernandez, 2016). Rather than proving that discrimination in hiring and career progression does not exist, these articles provide evidence that barriers are complex and contextual.

It is important to note that women may each experience the labyrinth toward leadership in distinct ways. Barriers are shaped by both their environmental and individual context; as the American Association for University Women (AAUW, 2016) noted, “There is no monolithic women’s experience of leadership” (p. ix). Race and ethnicity are important social identities in each woman’s experience, in addition to disability status, socioeconomic status, age, etc. In a synthesis of research examining the intersectional experiences of Black women and girls in STEM education, Ireland et al. (2018) argued that women who are members of intersecting marginalized groups have distinct experiences related to their social identities and an intersectional framework must be used when working with these groups. Some research has found race and ethnicity to be more salient than gender in determining a woman’s experience in STEM (Malone & Barabino, 2009). If we do not approach this work with an intersectional lens, we may miss out on social identity factors that are even more salient for some women than gender.

In the following sections, I review four common structural/contextual barriers that have been identified in literature around female career progression in STEM. I then discuss four psychosocial factors that are often cited as being affected by these barriers and contribute to limiting career progression. The interplay of structural/contextual factors and individual/psychosocial factors is displayed in Figure 3. Although research considering intersectional identities is sparse (Ireland et al., 2018; Lunn & Ross, 2021a; L. Malcom & Malcom, 2011; Rainey et al., 2018), with most of the research centered broadly on women in STEM (which often ends up being white women in STEM), when possible, I have highlighted intersectional factors, particularly race and ethnicity, that pertain to career progression.

**Figure 3**

*Factors Affecting Female Career Search Experiences in STEM and Leadership*



**Structural / Contextual Barriers**

***Stereotypes and Biases***

A seminal report titled “Why So Few?” by the AAUW reviewed hundreds of academic articles written during the past 25 years and found that stereotypes and biases were key themes affecting women representation in STEM (Hill et al., 2010). A follow-up report by the AAUW in 2016, this time focusing on women in leadership, also found stereotypes as a concrete obstacle for women. The AAUW (2016) defined stereotypes as cognitive shortcuts, categorizing people using a set of characteristics, such as gender and/or race, and notes that these stereotypes can lead to biases, or fixed beliefs about people based on repeated exposure to stereotypes.

The stereotype that girls are better at humanities and boys are better at science, technology, engineering, and math, and even the stereotype that males are more associated with intelligence has become a pervasive cultural message, leading to implicit stereotypes and biases (Bian et al., 2017; Cvencek et al., 2011). Numerous studies showed that men are stereotyped as more competent in STEM (Corbett & Hill, 2015; Grunspan et al., 2016; Moss-Racusin et al., 2012) and more closely aligned with the identity of an engineer, scientist, or STEM worker (Carli et al., 2016; Cowgill et al., 2021; Makarem & Wang, 2020; Reuben et al., 2014; Thébaud & Charles, 2018; Wynn & Correll,

2017). These stereotypes have lasting impacts on the career search and career progression of both men and women in STEM.

For example, a 2012 randomized double-blind study with science faculty from research-intensive universities found that faculty participants rated male applicants as significantly more competent and more hireable for a laboratory manager role as compared to identical female applicants; males were also offered higher salaries and more career mentoring (Moss-Racusin et al., 2012). Notably, Moss-Racusin et al. found that female students were less likely to be hired because they were viewed as less competent by both female and male faculty participants and that preexisting biases moderated the treatment of female applicants. Women are not only seen as less competent than men but can also be seen as deficient in the skills and abilities necessary to be successful in STEM fields. A set of experimental studies by Carli et al. (2016) found that, because stereotypes about women are often dissimilar to the stereotypes of scientists, there is role incongruence between scientists and women. As their journal article title articulately states, “Women Don’t Equal Scientists.” How can women grow their careers in STEM when they are seen as less competent and even incompatible with the role of a STEM professional?

In addition to the stereotypes concerning women and STEM, women who aspire to leadership face the stereotype that women are less oriented for leadership roles since women are seen as communal (friendly, helpful) while men are agentic (assertive, goal oriented) (Amon, 2017; Carli et al., 2016). These stereotypes lead to something that multiple research articles have cited as the double bind that women face in needing to be seen as both likeable and competent (Amon, 2017; Carli et al., 2016; Cowgill et al., 2021; Phelan et al., 2008; Quadlin, 2018; Thébaud & Charles, 2018). In the study titled, “Looking Through the Glass Ceiling,” one research participant captured this impossible dichotomy, stating, “She’s either going to be an authoritative b-word, or she’s going

to be like this motherly figure” (Amon, 2017, p. 5). This double bind means women are evaluated differently than men, with shifting hiring criteria creating discrimination.

For example, in a resume audit study, it was found that grade point averages (GPAs) mattered little for men (i.e., a low GPA had the same call-back rate as a high GPA), but women were penalized for having a high GPA, resulting in men with a high GPA having a call-back rate of nearly two-to-one compared to women with similar GPAs (Quadlin, 2018). In a study with a follow-up survey, interviewing hiring decision makers, it was found that employers valued competence among high-achieving male applicants but likability among similar female candidates (Quadlin, 2018). Rather than appreciating the competence in high-achieving females, they penalized these candidates for their lack of perceived likability (Quadlin, 2018).

In addition to being evaluated with different criteria, women are also evaluated differently regarding achievements and setbacks. In Qualin’s (2018) resume audit study, more respondents made excuses for the poor grades of men versus women; specifically, about 21% of respondents made comments that mitigated low grades for men, versus 12% of respondents mitigating low grades for women. Similarly, in two studies with undergraduate STEM students, it was found that women’s STEM setbacks were more often attributed to internal factors, such as ability, whereas men’s STEM setbacks were more frequently attributed to external factors, such as situational circumstances (LaCosse et al., 2016). Women’s achievements are also evaluated differently and may be discounted as related to their gender rather than merit (Cabay et al., 2018).

In addition to facing gender-based stereotypes and the associated double bind, women of color face additional hurdles, needing to overcome stereotypes related to both gender and race – in short, a second double bind (Ireland et al., 2018; L. Malcom & Malcom, 2011; S. Malcom et al., 1976; Ong et al., 2011). In 1975, a small group of women of color, including Black, Mexican-American, Native American, and Puerto Rican women, gathered to discuss the double bind

challenges of sexism and racism, and how programs aimed at furthering the representation of people of color or women were often thought to include those with intersectional identities, but they were overlooked and underserved (S. Malcom et al., 1976). Today, this unique double bind persists. Women of color continue to face more structural barriers toward careers in STEM, and there continues to be a lack of sustained support (Ong et al., 2011).

When nearly 80% of leaders are still using gut feeling and personal opinions to make employment decisions, stereotypes continue to have a real impact on career progression (Filipkowski, 2015). Women of all types end up having to spend considerable energy attending to the perceptions of others in order to meet expectations (Amon, 2017). Stereotypes can also lead to unequal divisions of labor. Women are often given tasks and responsibilities that are community oriented and seen as “women’s work” (e.g., taking minutes for meetings, managing documentation, and organization) rather than tasks more closely related to STEM work (Cabay et al., 2018). These factors can lead to women spending time on activities that are not considered in the promotion evaluations or new career roles. The past few years have brought a renewed (or perhaps new) focus on companies’ efforts in diversity, equity, inclusion, and belonging (DEIB). Women have risen to this challenge, spending more time on DEIB than men, such as supporting employee resource groups, showing up as active allies to women of color, and recruiting employees from underrepresented backgrounds (McKinsey & Company, 2021). While companies say this work is vital to success, it goes unrecognized in performance reviews (McKinsey & Company, 2021), perhaps due to stereotypes about what work is meaningful and counts when measuring performance and leadership.

### ***Representation***

As outlined earlier, there is a lack of female representation in STEM roles, technology companies, and leadership positions. This lack of representation creates career barriers for women,

including through the activation of negative stereotypes. For example, a lack of female representation in STEM increases stereotypes that women do not belong in STEM and are not scientists (Schuster & Martiny, 2017). The activation of stereotypes can affect hiring decisions. For instance, a 2005 experimental study found that after the activation of traditional gender stereotypes (e.g., men are analytical leaders, women are communal team players), male evaluators tended to show a negative bias toward female applicants and a positive bias for male applicants (Rice & Barth, 2016). This same study also found that if evaluators were primed with the idea that women and men could exhibit behavior outside of traditional gender stereotypes, male evaluators had a more positive evaluation toward female applicants than when traditional stereotypes were activated. Thus, one way to break negative gender stereotypes is to increase female representation.

The effect of representation on stereotypes was also documented in an experiment by Carli et al. (2016), which found that the higher the representation of women in a particular STEM field, the more similarity was seen between characteristics of scientists in that field and characteristics of women. For example, psychology is a scientific field where women are dominant, and Carli et al. found that personality characteristics between women and psychologists were similar. Conversely, Carli et al. found that characteristics between computer scientists and women were dissimilar, whereas characteristics between computer scientists and men were similar. These studies showed that when interacting with career agents (e.g., networking, submitting a resume, interviewing, negotiating) in the STEM field, due to a lack of representation, women could be perceived negatively and found to be lacking the personality characteristics required to be successful (Carli et al., 2016; Rice & Barth, 2016). Faced with negative stereotypes, women may also experience gender identity threat during career interactions, leading to lower confidence (van Veelen et al., 2019) and decreased performance (C. M. Steele, 1997).

Career and workplace inequities are also increased by the lack of female representation in STEM (Pew Research Center, 2018). Women in the male-dominated STEM industry have reported feeling that they are overlooked, unseen, and isolated – feelings that are only amplified for women of color who are even less represented in STEM (Cabay et al., 2018; Cowgill et al., 2021; Malone & Barabino, 2009; Ong et al., 2018; Rainey et al., 2018). Table 5 contains data from a Pew Research Center survey conducted in 2017 of a nationally representative sample of adults (including 2,344 STEM workers), which found that more women perceive gender inequities in workplaces with majority male workers. The PEW survey also found that an even higher share of Black women in STEM reported discrimination.

**Table 5**

*Percentage of Women in STEM Jobs in Each Type of Workplace Who Report Types of Gender Inequities, as Reported by and Adapted from the PEW Research Center, Women and Men in STEM Often at Odds Over Workplace Equity report, 2018.*

	Type of gender representation in the workplace		Men in STEM jobs
	More women / even gender mix	More men	
They have ever experienced gender-related discrimination at work	44%	78%	19%
They have ever experienced sexual harassment at work	21%	27%	7%
Their gender has made it harder to succeed in their job	14%	48%	7%
They feel the need to prove themselves at work all/some of the time	52%	79%	60%
Sexual harassment is a problem in their workplace	33%	48%	28%

Finally, the lack of female representation means that there is also a lack of female mentors and support systems in place for women, something that has been noted as particularly damaging to

Black women in STEM as they are often more demographically isolated and have more stereotypes to overcome (Ireland et al., 2018; Makarem & Wang, 2020; Rainey et al., 2018). The demographic isolation of women, especially women of color, diminishes their sense of belonging in STEM careers and can mean they have less resources to succeed (Rainey et al., 2018). When women look for validation and support, there are not always other women readily available to turn to and their concerns can go unacknowledged (Cabay et al., 2018).

### ***Chilly Environment***

Stereotypes and the lack of female representation in STEM fields create a chilly environment for women (Makarem & Wang, 2020; Wynn & Correll, 2018), which can be exemplified by microaggressions, incivility, and ostracism that send unwelcoming and alienating cues to women, women of color, and underrepresented racial and ethnic groups (Cabay et al., 2018; Ireland et al., 2018; K. N. Miner et al., 2018; Pew Research Center, 2018). While stereotypes and lack of representation can contribute to a chilly environment, this atmosphere can also increase stereotypes and contribute to the lack of representation, creating a perpetual cycle and contributing to the labyrinth of barriers women face in their STEM leadership journeys (Cheryan et al., 2009; LaCosse et al., 2016). For example, researchers found that settings, such as chilly environments, that promote gender-based stereotypes can increase the phenomenon of female setbacks in STEM, which are then attributed to spontaneous internal factors rather than external factors (LaCosse et al., 2016). This situation then creates a career barrier for women in that they are measured more harshly for setbacks and failures, essentially requiring them to prove their capability more than men.

Chilly environments contribute to the lack of female representation in STEM by sending cues to women that they do not belong. These cues have even been found in job descriptions and recruiting sessions, both of which have a goal of enticing individuals to apply to open roles (Leslie et al., 2015; Wynn & Correll, 2018). A study of recruiting sessions found that, particularly when



recruiting session presenters were attempting to be relatable to students, there was a pervasive use of gender stereotypes, extreme technicality, and cultural references based in masculine and geek culture stereotypes (Wynn & Correll, 2018). A study on field-specific beliefs about the necessity of raw talent concurred with this study on recruiting sessions, finding that an emphasis on technical skills or raw talent contributes to a chilly environment and is seen as less welcoming to women, thus lowering representation (Leslie et al., 2015).

It must be noted that women of color experience a unique chilly environment compounded by gender, racial, and ethnic stereotypes, and the experience of being “one of a few” women of color in STEM (Ong et al., 2011). In addition to facing gender-related microaggressions, women of color may experience racial microaggressions, exclusion, and isolation (Ireland et al., 2018; Ong et al., 2011). Two different reviews of empirical research on the experiences of women of color identified STEM social and cultural climate as a leading challenge to STEM career persistence among women of color (Ireland et al., 2018; Ong et al., 2011). At the same time, a study that included in-depth interviews with 150 undergraduates found that, for minority women, issues of persistence are more often based on practical concerns (such as financing a degree) rather than experiences of the chilly STEM environment (Varma, 2007). It could be that the chilly environment matters more as women progress through their education and careers.

Overall, chilly environments mean that women, and particularly women with intersectional identity factors, often have different workplace experiences than men (K. Miner et al., 2019; Pew Research Center, 2018). Half of women in STEM jobs report experiencing gender-based discrimination in the workplace compared to only 19% of men in STEM roles (Pew Research Center, 2018). This gap widens when considering technical roles, such as those in data science, where 74% of women report experiencing gender-based discrimination compared to only 16% of men (Pew Research Center, 2018). The chilly environment has real effects for women, and women

who experience chilly workplace environments may experience related negative occupational and psychological well-being outcomes (K. Miner et al., 2019). Throughout the career search process and during interactions with career agents the chilly environment, including ambient cues of belonging, may discourage women from making career choices to persist in STEM and/or strive toward leadership positions (Cheryan et al., 2009).

### ***Social Capital***

Access to certain types of social capital in the technology industry is another contributing factor contributing to the labyrinth of structural obstacles women face in STEM leadership progression. The type of social capital to which women are often restricted involves the social networks and cooperative relationships that form ties between individuals, assist in gaining access to professional development and career opportunities, and help to gain recognition for one's talents and skills within the technology industry (Twine, 2018). Social capital has been shown to be positively related to career search outcomes, career advancement, and providing access to high-profile projects (Choi, 2019; Hasan, 2019; Obukhova & Lan, 2013; Trimble & Kmec, 2011). For example, candidates who use social networks, as a career search method, experience improved career search outcomes (Obukhova & Lan, 2013), and candidates who are referred through connections are more likely to be hired and experience an initial wage premium (Brown et al., 2016).

Social capital is important to career development, but women, particularly women of color, often have less access to social capital within the technology profession that afford access to career opportunities, including professional development and referrals (Trimble & Kmec, 2011; Twine, 2018). Social networks tend to be demographically similar, resulting in a practice of homophily (McPherson et al., 2001). For instance, a 2016 case study of a mid-sized US corporation using data from 2006 to 2010 found that most referral matches were from people of the same gender and the same race or ethnicity (Brown et al., 2016). If social networks are homophilic and women are

underrepresented in STEM and in leadership, then women as a result can experience restricted access to social capital and experience being cut off from vital networks.

Recruitment practices based on homophilic networks continue to shut out women from accessing leadership roles (Allemand et al., 2021). For instance, a common practice for technology companies is referral-based hiring, where current employees make referrals, and those referrals are given preference during recruitment. Access to referrals has been shown to vary accordingly with gender and race (Hasan, 2019; Trimble & Kmec, 2011), and this practice of using referrals can create a barrier for women. A 2018 study of Black female tech workers also found that referral-based hiring contributes to the lack of representation for women of color in STEM and that the networks of Black women yielded less information about jobs, potential mentors, and promotion opportunities (Twine, 2018). As such, due to their networks, men are more likely to be informally recruited and receive job leads (McDonald, 2011; McDonald et al., 2009).

Of course, these challenges may cause women to not follow the trend of networks with homophily. A 2019 study of electronic professional networking sites (such as LinkedIn) found that networks with high proportions of ties with men enabled shorter career searches and higher salaries, and they also found that women's e-networks had more gender heterophily than those of men (Hasan, 2019). At the same time, a 2018 study on LinkedIn found that weak connections with little overlap in friendship circles do not play a meaningful role in job outcomes, so if women are expanding their network to be more heterophilic, this may not matter depending on the type of connection (Garg & Telang, 2018).

Stereotypes and the chilly climate in STEM contribute to limiting the growth of heterophilic networks for women. Stereotypes can lead women to not be recognized as scientists or STEM leaders, and accordingly, they are treated as if they are not relevant, while chilly climates leave women out in the cold, unable to network with colleagues (Hasan, 2019; Malone & Barabino, 2009).

Women are isolated with diminished social capital and denied vital knowledge, which can be useful in helping to reach one's goals or complete work projects (Malone & Barabino, 2009). Women of color again face the double barrier of sexism and racism in accessing social capital, making this an even greater structural barrier (Malone & Barabino, 2009, 2009; Ong et al., 2011; Park et al., 2019). A recent National Science Foundation funded study on the role of relationships in STEM experiences demonstrated that barriers to social capital, particularly for women of color, is a key driver of inequality in STEM (Park et al., 2019).

Beyond job leads and advancement opportunities, diminished social capital means women are cut off from information and resources that can help them be successful at work. For example, with less social capital, women have less access to form relationships with mentors, which have been shown to be a critical support structure for women in overcoming gender-based barriers (Ireland et al., 2018; Makarem & Wang, 2020; Ong et al., 2018). Without access to social networks, women are also left out-of-the-loop or in situations where they do not have access to information known by others (Jones et al., 2009), which can be important for furthering work goals and have psychosocial consequences. An experimental study by Jones et al. (2009) on out-of-the-loop experiences found that when participants were left out-of-the-loop, they felt less competent and had less trust or affection for others at work. In other words, being left out-of-the-loop affects individuals' perceptions of social ties and of themselves. Even when women can build social capital, stereotypes and gender bias may make their capital ineffective. An experimental study by Bian et al. (2018) found that women were less likely to be referred to positions where intellectual ability was mentioned in the job description, and this gender bias held for both female and male referrers.

Access to social capital is a nuanced barrier for women. With the increased use of online recruiting and electronic professional networking sites, more research is needed to fully understand the experiences of women with social networking. As the studies showed, women continue to have

less access to social capital, and the capital they do possess has less influence on their career development.

### ***Discrimination***

Examples of discrimination are interwoven in each of the previously discussed structural barriers which produce and magnify discriminatory acts. The outcome of gender-based stereotypes and the chilly environment in STEM is discrimination against women. The most common forms of discrimination, as reported by the Pew Research Center (2018), include earning a lower salary, being treated as less competent, and receiving less support than men. The Pew Research Center findings are not broken out by intersectional identities (such as women of color); however, they do report that a higher share of Black STEM workers report discrimination than workers of other racial and ethnic identities. The 2017 Tech Leavers Study, which surveyed 2,006 United States residents who had left a technology related job in the last three years, found that 30% of underrepresented women of color reported being passed over for a promotion compared to 22% of white or Asian men and 22% of white or Asian women (Scott et al., 2017). The McKinsey Women in the Workplace 2019 Report cited that Black women and women with disabilities report more microaggressions and acts of discrimination than other women. For example, 69% of white female workers surveyed agreed with the statement “I have equal opportunity for growth and development” while only 56% of Black female workers and 54% of female workers with disabilities agreed. See Table 6 for more details on microaggressions experienced by women of various identities as compared to men in the 2021 McKinsey report.

**Table 6**

*Percentage of Individuals Experiencing Microaggressions in the Workplace, as Reported by and Adapted from the McKinsey & Company Women in the Workplace 2021 Report*

	All Men	All Women	White Women	Asian Women	Latinas	Black Women
Being interrupted or spoken over more than others	15%	28%	27%	29%	27%	32%
Having your judgement questioned	24%	31%	31%	25%	29%	38%
Having others comment on your emotional state	12%	18%	18%	13%	16%	21%
Hearing people express surprise at your language skills or other abilities	6%	8%	5%	11%	13%	18%
Hearing or overhearing insults about your culture or people like you	7%	7%	5%	9%	9%	16%
Being confused with someone else of the same race/ethnicity	5%	7%	4%	17%	6%	17%
Feeling like you are expected to speak on behalf of all people with your identity	6%	9%	5%	14%	11%	31%
Having others comment on your hair or appearance	4%	6%	5%	5%	5%	14%

Moreover, one in 10 women in tech reported experiencing unwanted sexual attention (Scott et al., 2017). The Pew Research Center finds that the percentage of women who have experienced sexual harassment at work holds constant between STEM and non-STEM jobs, with about one in five women reporting this experience. However, the Pew Research Center findings pre-date the #metoo movement gaining global recognition in 2017. A Startup & Tech Culture Survey in 2017, conducted by Women who Tech (2017), found that sexual harassment was reported by 45% of female respondents. Later reports by Women who Tech (2020) have shown little improvement in the situation, with 43% of female respondents reporting experiencing sexual harassment in their follow-up survey. Between 2017 and 2020 the percentage of women reported experiencing sexual harassment intended in exchange for a raise or other promotional activities also held constant at around 82% (Women who Tech, 2020).

Sexual harassment and other forms of discrimination create barriers to women's career advancement in technology and can also lead to women opting out of the industry. The next section of this literature review will discuss some of the psychosocial factors that create barriers for female career advancement. These factors are all outcomes of the structural/contextual factors previously discussed.

### **Individual/Psychosocial Factors**

There are a myriad of individual/psychosocial factors that have been found to affect female career progression in STEM and/or leadership roles, including stereotype threat, belonging, identity, and self-efficacy. These individual/psychosocial factors intersect and combine with each other and the previously discussed structural/contextual factors to further create the labyrinth women face in career progression. In the following sections, I will briefly review stereotype threat, belonging, identity, and self-efficacy as potential individual/psychosocial factors that were salient to this study on mid-career female STEM career progression.

### ***Stereotype Threat***

Stereotype threat is the fear of being reduced to negative stereotypes held about a marginalized group of people, including women in STEM (Steele, 1997). This fear frequently becomes self-threatening and damaging. For example, stereotype threat results in decreased performances and can affect an individual's sense of identity; this means women under stereotype threat in STEM and/or leadership may have a reduced sense of belonging, disidentification with being a STEM leader, and may perform to lower standards (Corbett & Hill, 2015; Shaffer et al., 2013; C. M. Steele, 1997). It is important to note that stereotype threat often is a consequence of external and situational forces, which means it can be controlled (Steele, 1997). For example, one experimental study-controlled stereotype threat conditions and found that, when women are represented as successful and numerically balanced (when compared to men), performance increases (Shaffer et al., 2013). Stereotype threat has been seen to show up in STEM workplaces when female workers feel tested or when women are in situations where they compare themselves to men (Corbett & Hill, 2015).

Even job descriptions can trigger stereotype threat and lead to women opting out of STEM careers. A nationwide study of faculty, postdoctoral fellows, and graduate students found that field-specific beliefs about the importance of raw talent or giftedness over dedication, which are frequently found in job descriptions, were often less welcoming to women and lead to decreased representation (Leslie et al., 2015). This lack of representation, in turn, further activates stereotype threat (J. L. Smith et al., 2013). Not only does stereotype threat negatively affect representation by triggering threat situations, but it also reduces motivation (and thereby representation) by reducing anticipated positive effects. A 2016 study found that women are less motivated to choose typically male majors, such as STEM majors, if they anticipate low positive effect in them, even if they are fairly confident, they could do well in the major (Schuster & Martiny, 2017).



## ***Belonging***

Due to the labyrinth of previously discussed structural/contextual factors, women often feel isolated (Hill et al., 2010). This isolation, along with stereotypes and chilly environments, creates a diminished sense of belonging for women in STEM (Corbett & Hill, 2015). Isolation and lack of belonging are key reasons many women leave STEM, especially women of color (Ong et al., 2011, 2018). Both gender and race have been found to impact a student's sense of belonging in STEM. A study interviewing 201 college seniors (primarily women and people of color) who majored in STEM or started but dropped a STEM major found that women of color were the least likely to report a sense of belonging and white men the most likely (Rainey et al., 2018). A set of experimental studies conducted by Moss-Racusin et al. (2018) demonstrated how a sense of belonging is an external force that can be controlled by the presence or absence of gender bias. They found that when gender bias was present, women were found to have less sense of belonging than men. However, when STEM departments were found to be unbiased, the differences in belonging between women and men disappeared (Moss-Racusin et al., 2018).

Sense of belonging can affect the interest women have in pursuing STEM careers. An experimental study found that when female STEM students perceive greater effort expenditure than peers, they also have a decreased sense of belonging and motivation (J. L. Smith et al., 2013). Further, this study found that when women are in a male-dominated program, they perceive they need to expend greater effort and have less interest in the program. These findings could be extended to career searches. If a female student interviews for a job with an all-male panel and anticipates having to extend greater effort than their peers, they could have less belonging and motivation.

## ***Identity***

Identity is contextual and socially constructed. It is shaped in different contexts by the recognition from others through actions and interactions (Gee, 2000). A study by Carlone and Johnson (2007) looked at the experiences of successful women of color in science and found that one's STEM identity, or an individual's sense of belonging to the STEM community as a social group, is a predictor of career choice and persistence in STEM. Other research has agreed with this finding (Chemers et al., 2011; Geisinger, 2013; Robnett et al., 2015). Further, when gender is made a salient identity, status beliefs about gender can bias self-efficacy. For instance, women can feel less confidence in their abilities while men can feel greater confidence (Correll, 2004). This sense of confidence then affects career aspirations, with higher self-efficacy leading to higher rates of persistence (Correll, 2004).

A 2004 study by Settles showed that women in STEM who experience interference between their gender and scientist identities, or the feeling that their two identities are seen as distinct and incompatible, reported lower scientific performance and lower psychological well-being, including lower self-esteem and depression. In addition, individuals who do not feel they have a "STEM identity" may even have their STEM career journey disrupted and prolonged as they experience additional barriers and lack of support in their journey (Carlone & Johnson, 2007). Chilly environments have been found to be correlated with women not feeling compatible with STEM identities (Settles et al., 2016).

Since identity is contextual, one can have multiple, or intersectional, identities depending on the context. Mid-career females in STEM may have intersectional identity factors, including racial, ethnic, gender, socioeconomic, or first-generation status, which can create additional impacts to support and barriers on their experiences in STEM and career search journeys. Research showed that women who are members of intersecting marginalized groups in STEM have distinctive

experiences related to their identities (Ireland et al., 2018). Women of color, as discussed, face a double challenge, and may have their identities disrupted based on race and/or gender (Carlone & Johnson, 2007). For some women, race may be a more salient identity factor. A study of women in university science research labs by Malone and Barbino (2009) found that race was more salient than gender for their study participants, with race creating a position for the students in relation to the broader lab community and negatively affecting the students' social standing, including their sense of belonging and access to information.

### ***Self-Efficacy***

Self-efficacy is related to the confidence one needs to accomplish specific goals; self-efficacy develops from feedback in our environment (Bandura, 1982). When gender is made salient in a setting, status beliefs about gender (ex., the diminished status of women in science) biases assessments women make about their own competence at career-relevant tasks and can also affect aspirations for related career paths (Correll, 2004). The gender identity threat that women in STEM face has also been shown to negatively predict career confidence in women, but this same relationship has not been found to be true for men (van Veelen et al., 2019). While some studies have not shown significant difference in self-efficacy between white and Black female undergraduates, diminished self-efficacy has been evidence for Black women in graduate programs (Ireland et al., 2018). Many of the previously discussed structural/contextual factors have also been found to affect self-efficacy; for example, being outside of the social network can affect self-efficacy when women have less access to information (Jones et al., 2009) or to professional development (Makarem & Wang, 2020).

### **Key Gaps in The Literature and Contributions of the Current Study**

There is a documented underrepresentation of women in STEM, particularly in leadership roles. The representation worsens when we consider women of color. There is also a documented

business case, equity case, and liberation case for having strong gender representation in STEM fields. Companies are more profitable and have stronger operations, and as a nation the United States has expressed beliefs in equal employment opportunities (United States Government Accountability Office, 2017). By furthering gender representation, and other DEI efforts, we also help ourselves by breaking down oppressive systems which harm us all – our struggles for happiness and freedom are linked.

As seen in this literature review, there are structural/contextual factors that create barriers for females' progression in STEM careers, including stereotypes and biases, the lack of representation and chilly environment in STEM, the limited social capital available, as well as gender and racial discrimination. These structural/contextual factors create a complex labyrinth women must navigate to progress in their career. Individual/psychosocial factors affected or brought on by the structural/contextual factors also play a role in this labyrinth, including stereotype threat, sense of belonging and sense of identity, and self-efficacy.

This literature review included studies that considered factors affecting female persistence in STEM education and female persistence in careers. There are three primary gaps in the literature my study addressed. First, there is a lack of literature focusing on women professional graduate students' experiences in career development and in particular, little research directly considering their perspectives interacting with career agents and attempting to advance in male-stereotyped disciplines such as STEM. There have been recent studies focusing on interactions with career agents, but these studies have been focused on all gender and racial identities and largely undergraduate students (Behroozi et al., 2020b, 2022; Lunn et al., 2021; Lunn & Ross, 2021a). Second, there is a lack of research considering women's perspectives in navigating career search experiences in male dominated disciplines such as STEM. Third, while recruiting in the technology industry has been much discussed in the news, there is a lack of research on what happens in the career search process

for women in the transition from school to career. Most research on women in STEM focuses on changing women, including increasing interest and involvement in STEM (Lunn & Ross, 2021b). To expand our understanding in these areas, my study explicitly looked at the career search experiences of mid-career female graduate students and alumni who represented a variety of racial and ethnic identities and considered how interactions they had with career agents during this process affected their career progression and career decision making.

## CHAPTER THREE: METHODOLOGY

### Introduction

The purpose of this study was to explore the career search process and interactions of female graduate students and recent alumni within the unique context of the STEM industry. The objective was to understand the participants' lived experiences to obtain data that could be used to make recommendations for policy and practices aimed at increasing the representation and retention of women in the STEM industry, and particularly in women who are aspiring to leadership and senior technical roles. The following research questions were answered in this study:

1. What are the career search experiences of mid-career female data science graduate students and recent alumni seeking to advance toward leadership roles in the STEM industry?
  - a. How do these students and recent alumni make sense of career search experiences, particularly interactions with career agents?
  - b. How do these interactions affect career decision making and career progression?

While there is documented research on female persistence in education, the career search processes, including recruiting and hiring, are opaque (Behroozi et al., 2019, 2020a; Lunn & Ross, 2021a). Understanding the student and recent alumni perspective through qualitative methods allowed me to share the stories of their experiences in career advancements and center the discussion on the participants' voices. By utilizing qualitative methods, particularly focus groups and semi-structured interviews, this study brings the potential to influence how career agents approach interactions with female students and recent alumni, the access to career supports that they have, and the career progression and career choices that are made. This research was an important step toward increasing female representation and agency in technology careers.

This chapter begins with a discussion of the study's research design and qualitative methodology, which was used to approach the research questions. Next, I provide an overview of the site selection and participant selection as well as recruitment and sampling. Then, I describe the data collection and analysis employed in this study. Finally, I outline considerations made in trustworthiness, a description of my positionality, and how I engaged in reflexive practices regarding my positionality so that I was lifting the participants' voices rather than my own perspective.

### **Research Design**

This study considered how the career search process and interactions between career agents and students, or recent alumni affected career progression and career choice. The purpose of this study was to understand these interactions by focusing on the participants' lived experiences, the meaning they made of these experiences, and how this affected their choices and agency. This study was bound by the context of the participants and tells their collective story. The purpose was not to establish generalizable findings for other contexts; although, the information is informative to general challenges or opportunities and instances of marginalization or privilege that others face and how they may make meaning in similar contexts.

This study used a qualitative research approach with focus groups and semi-structured participant interviews. I approached this study from a critical constructivist worldview, believing that knowledge is contextual and dependent upon the knower (Kincheloe, 2005). Through the reconstruction of participant stories, we can learn the meaning that the career search process and interactions with career agents may hold for participants. Qualitative research methods were used because "[q]ualitative researchers are interested in understanding how people interpret their experiences, how they construct their worlds, and what meaning they attribute to their experiences" (Merriam & Tisdell, 2016, p. 6). Qualitative methods allowed for a contextual focus which

illuminated how participants within STEM construct their worlds and attribute meaning to these experiences.

This study relied on two primary sources of qualitative data: focus groups and semi-structured individual interviews. In addition, participants in the individual interviews shared their resumes, which were used to provide guidance in interview questions and background in understanding their career journeys and experiences. Overall, the qualitative methodology highlighted and brought to the forefront the participants' experiences of their interactions with career agents as they pursued careers heading to leadership roles in the technology industry. As this research was approached from constructivism, it was important to create conditions for socially constructed data (Merriam & Tisdell, 2016) through focus groups and to highlight the individuals' contextual experience through interviews. The focus groups gave participants a chance to be in community with each other. During the focus groups, participants shared their experiences, including barriers and supports that came up during their career search and interactions with career agents. Hearing and learning from each other created space for the participants to potentially grow their community and social capital as women in technology.

### **Site Selection**

The site for this study was a professional, online data science graduate degree program at a large public research university located in the Silicon Valley, which is an area encompassing the San Francisco Bay area and noted for being the largest confluence of technology companies in the United States (PCMag, n.d.). In, Silicon Valley, 70% of all managers and professionals and 79% of executives in large tech firms are men (Tomaskovic-Devey & Han, 2018). At the time of data collection for this study, the graduate degree identified for this study had the third largest student enrollment of any graduate degree at the university. The degree program published statistics on the student profiles. Thirty-one percent of graduate students in the program were female, and the



average age of the students was 35. At the time of this study, the program did not publish any demographic data on the race or ethnicity of the student population. The degree was advertised as being designed to be completed part-time, while students are also employed full-time. Marketing materials for the degree notes that an average pathway from start to graduation is estimated to take approximately two years. Selected employers for students in this degree and highlighted on the program website included many well-known technology companies, such as Amazon, Apple, Electronic Arts, Facebook, Google, Microsoft, and Netflix.

### **Recruitment and Sampling**

Prior to starting the data recruitment and collection process, this study's research plan was finalized and approved by the University of California, Davis Institutional Review Board (IRB). Participants were recruited through purposeful sampling because I sought to engage with students and alumni who had unique backgrounds and experiences and could provide information particularly relevant to my research question (Maxwell, 2013). One thing I remained aware of in this sampling was key informant bias, or when a small number of informants is purposefully selected and provide the majority of the data but are not representative of the group as a whole. I addressed this potential limitation by selecting for maximum variability (Creswell, 2014).

Due to my profession, I am well-known among the students in this graduate degree program and had access to recruit participants through email and messaging through Slack. Specific sources for recruitment included an email to the graduate program mailing list and posts in public channels in the school's internal Slack team. Through these means, I was able to reach out to all currently enrolled students in the graduate degree program (over 1,000 students). Sample recruitment emails (one recruiting for focus groups and one follow-up message recruiting for individual interviews) are included in Appendix A. A similar recruitment email was also sent to the listserv for the graduate school's pilot Leadership Development Program for Gender Equity (LDP) that was launched in

September 2021 and had 23 students in its 2021 to 2022 cohort. A Slack message was also posted on the LDP channel. I am a co-facilitator for the LDP and in my recruitment messages, outlined how participating in this study was voluntary and part of my research studies as a student and not part of my role as a facilitator. The Letter of Information, which outlined the purpose of the study and confidentiality, was included in all recruitment messages, and can be found in Appendix B. All interested participants were asked to fill out a recruitment survey collecting data related to the participant criteria in Table 7; this information was used to select participants. An outline of the recruitment survey can be found in Appendix C.

### **Participant Selection**

All participants in this study were required to be open and interested to discussing their career search experiences and sharing their resume. In addition, I identified a set of participant criteria, which are summarized in Table 7. First, I focused on female data science graduate students and recent alumni who had interactions with career agents (e.g., recruiters, hiring managers) for a job that they considered to be the outcome of their degree. I prioritized students and recent alumni who had multiple interactions with career agents, which could have taken place during the application and interview process for one or multiple roles. I also focused on students and recent alumni who were interested in growing their career toward leadership positions or roles that hold positional power and are visibly recognized and rewarded (American Association of University Women, 2016). Roles could be recognized through title (e.g., manager, director, lead) or through organizational chart positioning (e.g., reporting to director or above). I sought participants who had engaged in a career search for roles within technology companies or companies that employed a high concentration of STEM workers and created products (goods or services) that advanced the use of electronic and computer-based production methods (U.S. Equal Employment Opportunity Commission, 2016). Lastly, I prioritized the participants who represented diverse intersectional identities, including but

not limited to women of color and those of varied socioeconomic backgrounds. This criterion was a priority because the current research on female career progression in STEM tends to prioritize the experiences of white women (Rainey et al., 2018; Twine, 2018), which then leads to policy and practice recommendations that privilege this population. There is a need for research that gives more voice to women with rich, intersectional identities so that future recommendations can take into consideration their stories and needs and address the underrepresentation these women have in STEM. For this reason, I used a strategy of seeking maximum variation to expand the range of perspectives investigated in this study (Onwuegbuzie & Collins, 2015). Maximum variation sampling included seeking out the widest possible range of the characteristics of interest for this study (Merriam & Tisdell, 2016).

**Table 7**

*Participant Criteria*

<b>Criterion</b>	<b>Description</b>
Education	Currently enrolled or recently graduated (within 12 months) in a part-time data science graduate degree at large public university within the Silicon Valley.
Career Goal	Seeking to build a career toward leadership roles within technology companies, which includes roles that hold recognized positional power such as management positions or positions with significant influence on technical or product decisions at companies that employ a high concentration of STEM workers and create products (goods or services) which advance the use of electronic and computer-based production methods.
Career search	Recently engaged in a career search for a leadership role which involved multiple (1+) interactions with career agents (e.g., hiring managers, recruiters) for either the same position or multiple positions.
Identity	Female and representative of diverse intersectional identities (e.g., race, ethnicity, socioeconomic status, etc.) selected for maximum variation in participant identity.

Literature on qualitative methods does not generally specify the number of participants needed to reach data saturation, and in my research design I was seeking maximum variability and bringing forth both meaning that is socially constructing and individual. Therefore, I attempted to include each person who volunteered for the study and fulfilled the participant criteria. A total of 18

participants took part in focus groups and/or interviews. All participants were provided with incentives for their participation, which included a \$30 gift card for participation in a focus group and/or interview (meaning, a participant could receive up to \$60 for their participation). Participants had the opportunity to share their story to an active listener who was interested in their specific experience and perspective.

The final set of participants for this study are outlined in Table 8. The ethnic and racial identities were self-identified and disclosed by participants in the recruitment survey. Pronouns were collected at the start of focus group and interview sessions. Not included in this table are data on socioeconomic, first-generation college student, visa status, or geographic location. These items were not collected in the recruitment survey, and for that reason and to maximize confidentiality, they are not included in the overview of study participants in Table 8. When disclosed and where relevant to findings, these background factors are mentioned in the findings in Chapter Four. In addition, the first time each participant is mentioned in Chapter four, a few descriptors are provided including their graduation status and ethnic/racial identity. Although I did not specifically recruit for alumni, a small set of recent graduates were able to see recruitment messages on Slack, the school's private communication platform, and filled out the recruitment survey from that pathway. It is typical in part-time degree programs for students to delay their career search until after graduation, and this school collected employment outcome data for up to a year after the graduation data, so I found it important to include these perspectives. For this reason, I allowed recent graduates (within the past 12 months) to participate in this study. I also did not limit the participants to living within the Bay Area. With work, and particularly work in the technology sector, becoming increasingly global and with the rise of remote/virtual work, it did not seem necessary or prudent to limit the study to the Bay Area. All participants were employed at the time of data collection and aspired to build their careers in technology leadership roles.

**Table 8***Overview of Study Participants (n=18)*

<b>Pseudonym</b>	<b>Focus Group Participation</b>	<b>Interview Participation</b>	<b>Ethnic/ Racial Identity</b>	<b>Gender</b>	<b>Pronouns</b>
Rea	Focus Group 1	Yes	Asian	Female	She/her
Binna	Focus Group 1	No	Asian	Female	She/her
Mia	Focus Group 1	No	Asian	Female	She/her
Parul	Focus Group 1	No	Asian Indian	Female	She/her
Elizabeth	Focus Group 2	No	White	Nonbinary	She/they
Janet	Focus Group 2	No	Afro-Caribbean	Female	She/her
Lissa	Focus Group 3	No	Filipina & White	Female	She/her
Ariel	Focus Group 3	No	White	Female	She/her
Saadri	Focus Group 3	Yes	Asian	Female	She/her
Uma	Focus Group 4	No	Southeast Asian (Indian)	Female	She/her
Aiza	Focus Group 4	Yes	South Asian	Female	She/her
Wendy	Focus Group 4	Yes	Hispanic/Latinx	Female	She/her
Oliva	No	Yes	Caucasian	Different Identity	She/her
Teja	No	Yes	Asian	Female	She/her
Nora	No	Yes	White	Female	She/her
Harper	No	Yes	Caucasian	Female	She/her
Ayotola	No	Yes	Black	Female	She/her
Peyton	No	Yes	White	Female	She/her

### **Data Collection**

The data collection process consisted of two primary components: focus groups and semi-structured individual interviews. In addition, interview participants shared their resumes, and these were used to guide questions and provide background. Data were gathered between April 2022 and August 2022.

Focus groups were chosen to collect data that are socially constructed (Merriam & Tisdell, 2016, p. 114). The research was conducted in community with the participants, and focus groups were also an important for building community and conveying that approach. Four focus groups were held during the period of April through June 2022, which included a total of 12 participants. Focus groups were scheduled for two hours in length, except for two focus groups that were scheduled for 60 minutes in length to accommodate participants' schedules. For ease of scheduling and due to the ongoing COVID-19 pandemic, all focus groups were scheduled virtually via the

Zoom platform. While Merriam and Tisdell (2016) recommended focus groups consist of six to nine participants (p. 114), my personal experience with the Zoom platform found that it works best to have smaller groups of around three to four participants. That said, the focus groups for this study varied in size, with one focus group consisting of only two participants due to a last-minute cancellation.

The focus group interview protocol was developed based on the research questions for this study and consisted of questions in three main categories: the career search experiences of participants, how participants made sense of these experiences, and how these experiences affected career decision making/progress. The focus group protocol was refined by a pilot focus group that was conducted in late March, which assisted in sharpening the protocol's focus on the research questions. A sample interview protocol for the focus groups is included in Appendix D.

The focus groups also served as a recruitment tool for individual interviews. During the interviews, individuals were given space to go deeper into their experiences and share further reflections, building on the initial themes and discussions from the focus groups. Interview participants were also recruited via an email to the student listserv as well as Slack posts in public channels by the school's Slack team. I chose to recruit interview participants broadly and not limit participation to focus group participants so that I could obtain maximum variation in the sample. Focus group scheduling was challenging for this population, since most participants were past-time students and working professionals. Interviews were the only way to connect with those participant volunteers who could not make a scheduled focus group meeting.

Both the focus group and interview format centered the participant voices and allowed them to share their story of interactions with career agents and the career search process. This aspect was essential because “[i]nterviewing is necessary when we cannot observe behavior, feeling, or how people interpret the world around them” (Merriam & Tisdell, 2016, p. 108). Hearing directly from

participants in an interview format allowed me to gain an understanding of their lived experiences and the meaning they made of these experiences (Seidman, 1998). Individual, one-on-one interviewing was also beneficial so that participants could share information in confidence. I conducted a total of 10 interviews starting in June and ending in August 2022. For ease in scheduling and due to the ongoing pandemic, all interviews were scheduled via the Zoom virtual platform. Each interview was scheduled for 90 minutes in length, which is a recommended length for in-depth interviews (Seidman, 1998). A sample individual interview protocol is included in Appendix E.

For all focus groups and interviews, I generated field notes during and immediately following the events to capture rich descriptions (Maxwell, 2013). Following common functions of field notes, my notes included a written representation of the virtual interview setting as well as the broader cultural zeitgeist (i.e., if any major cultural events or news was capturing attention that may affect the discussion), a description of non-verbal actions, and my impressions and reflections in real-time (Phillippi & Lauderdale, 2018). Field notes added context to the data that were collected in transcription (Phillippi & Lauderdale, 2018). Immediately after each interview, I made use of memo writing to organize my thoughts, develop ideas or potential themes, and generate understanding of the research topic (Charmaz, 2012; Maxwell, 2013; Phillippi & Lauderdale, 2018).

At the beginning of each focus group and interview, participants were reminded that interviews would be recorded and transcribed, and their names would be kept confidential. To open each interview, I also reviewed the consent to research, including measures of confidentiality and any potential uses for collected data (see Letter of Information, Appendix B). At that time, I verbally collected informed consent. In a follow-up email from focus groups and interviews, participants were given the chance to select their own pseudonyms for use in the study and final report. All data collected were stored securely in password protected cloud-based repositories, including interview and focus group recordings. Any paper data collected (e.g., documents or field notes) were

transferred to the UC Davis Google Platform. Paper copies and recordings were destroyed at the conclusion of this study. Interviews were transcribed using professional transcription software (Sonix.ai), which was also password protected.

### **Data Analysis**

I started the data analysis process with a grounded approach and an open mind to discovering what was happening with the data (Charmaz, 2003). While I focused data analysis on my research questions and approached information through the lens of my theoretical framework, I was also open to all possibilities related to my general research concern of female career search experiences in the technology industry. My goal was to center participant concerns and find connections between their concerns and my research topic (Auerbach & Silverstein, 2003). Throughout the data analysis process, I kept both my research questions and theoretical framework visible in my workspace so that they would be a constant, guiding, and grounding presence. I referred often to these items to guide the process of inquiry, and at the same time, was open to themes outside of my framework that emerged from the participants.

I utilized thematic analysis, as outlined by Saldaña (2021) and Auerbach and Silverstein (2003), as my data analysis approach. I followed three distinct steps that were outlined by Auerbach and Silverstein (2003): (1) selection of relevant text, (2) grouping repeated/related ideas and organizing into themes and categories, and (3) developing theory. Following this outline, I first went through the data and selected any text relevant to my research questions or theoretical framework. I also selected text that was repeated often by participants and seemed to be a significant participant concern related to my research topic. Each selection of text was placed in a separate row in a Google spreadsheet. Spreadsheets have been found to be an advantageous method of organizing qualitative data (Watkins, 2017). When selecting text, I kept in mind three questions posed by Auerbach and Silverstein (2003), “(1) Does it relate to your research concern? (2) Does it help you understand your



participants better? (3) Does it simply seem important, even if you can't say why?" (p. 48). These questions helped me ensure I selected text that related to my research questions and at the same time, was centering the participants' voices. When selecting text, I also looked for challenges, concerns, or barriers that the participants shared to ensure I was paying attention to tension in the data.

Next, I thematically grouped related ideas into separate tabs in the Google sheet workbook. Repetition of ideas are a way to find themes within the data (Saldaña, 2021, p. 259). My grouping of repeated ideas evolved during this process as I would at times find the grouping too broad or too narrow. At other times, I would realize that a theme was not related to my research concern and/or a high concern of participants. As I organized the data, I began to see relevant themes emerge that were related to my research questions and theoretical framework. This step resulted in the generation of an initial list of repeated ideas. From this list, I considered how the ideas compared and contrasted with each other as well as how they painted a picture of the participants' lived experiences and meaning they made (Saldaña, 2021). I further grouped the repeated ideas into themes, or topics that the repeated ideas had in common (Auerbach & Silverstein, 2003). This process was iterative and included the generation of categories and sub-categories as I moved toward consolidated meaning in a set of themes (Auerbach & Silverstein, 2003). To describe the themes, where possible I used in vivo themes or thematic statements taken directly from the interview or focus groups transcripts (Saldaña, 2021, p. 260). Other times I used a short phrase to describe the theme (Saldaña, 2021, p. 260).

Throughout this process, I continually referenced and returned to my research questions and my theoretical framework. The initial theoretical framework was eventually revised by the themes that emerged from the data analysis, as the findings developed a fuller picture of participant career search experiences, the meaning they made, and how these experiences and meaning affected career

decision making and career progression. During the analytic process, I made use of memo writing to capture my thinking and elaborate what was emerging through analysis and testing various theories and ideas on what was happening in the data (Charmaz, 2012).

### **Trustworthiness**

I strove to establish trustworthiness with my research to ensure internal validity, or that the findings to my research questions matched the participants' realities (Merriam & Tisdell, 2016). Merriam and Tisdell (2016) noted that “[o]ne of the assumptions underlying qualitative research is that reality is holistic, multidimensional, and ever-changing; it is not a single, fixed, objective phenomenon waiting to be discovered, observed, and measured as in quantitative research” (p. 242). My study focused on the participants' constructions of reality – participants' views of their own interactions with career agents. My goal was to accurately picture the participants' experiences and meaning, and to this end I engaged in member checks, an audit trail, and rich descriptions.

I conducted member checks by providing each participant the opportunity to provide feedback on findings to confirm data collected and analysis was an accurate reconstruction of their experiences and perspectives (Merriam & Tisdell, 2016). Participants were given an electronic draft of the findings chapter and had a month to review and provide comments or edits to a draft of the findings chapter. Only one minor edit was submitted by one participant; a few other participants responded with positive comments, and most participants did not respond. This practice helped me to be reflective of the potential for my positionality to influence the study (Merriam & Tisdell, 2016). I also kept an audit trail, an organized tracking of all activities and a detailed record of the methods used for this research study (Merriam & Tisdell, 2016). In field notes, memos, and in the final report, I used rich, thick descriptions, which according to Merriam and Tisdell (2016), enables transferability of the information.

I strove to use multiple sources of data (i.e., multiple focus groups and individual interviews) and engage in comparing and cross-checking findings across the different sources (Merriam & Tisdell, 2016). Understanding that there is not one source of knowledge waiting to be discovered, but that knowledge is constructed from multiple points, comparing the different sources of data helped bring forth themes and a framework that conveyed experiences and meaning from multiple truths (Richardson, 2000, as cited in Merriam & Tisdell, 2016). Together these practices helped to establish trustworthiness in my research study.

### **Positionality Statement**

Using qualitative research requires the consideration of the researcher's positionality, insider/outsider status, and how to navigate these in the research process. Otherwise, there is a danger in the researcher displaying bias, performing research on (rather than with) participants, and/or fundamentally affecting the research process (Merriam & Tisdell, 2016). Taking a critical constructivist view meant I was aware of how I as a researcher played a role in defining the findings from this study (Kincheloe, 2005). Therefore, I have tried to be aware of my positionality and the potential it had to influence my findings.

I am both an insider and outsider to the technical community as the Senior Director of Student and Alumni Career Development for a technical graduate school within a university setting. I work within and for the technical community, but my role is non-technical. In addition, I have a Master's degree in Environmental Health and Safety Engineering, which is a role in operations at many technical companies. It is a technical role that I have occupied in my past career, but one that is supporting rather than contributing to product development. In these ways, I have felt the tension in belonging and not belonging, as someone who is in tech but is not a typical tech worker. I relate to female STEM graduate students and alumni in that I am a mid-career female working with

technologists; I may be working with similar work-life balance issues; and I have what could be considered a non-traditional background as a job candidate and STEM worker.

I am a heterosexual, cis-gender, Catholic, white mother from a small town in the Midwest. I am someone who did not grow up with knowledge of the opportunities in the technical industry, and because of my distance, I did not feel a sense of belonging or even awareness of the technology industry. Today, I am living in the Bay Area – a geographic area partially defined by technology – and I am married to a software engineering manager who works at Uber Technologies. Am I a woman in tech or do I simply play a supporting role? Do those in tech have confidence in my status and abilities? There is a continued tension that I personally feel, which I believe is similar and yet distinct from those who are looking to “break into” the technology industry or grow their career to leadership.

My positionality as a white woman means I come with a lens of white privilege, as someone who has benefited from and is living with white supremacy. Ione Damasco (2020) defined white supremacy as “the explicit to subtle ways that the norms, preferences and fears of white European descended people overwhelmingly shape how we organize our work and institutions, see ourselves and others, interact with one another and with time, and make decisions” (p. 3). This means that I am living, eating, and swimming in white supremacy every day. My perspective is influenced by my experiences with privilege. I have tried to be cognizant of my limited perspective, so that I do not use white supremacy to frame my research and advance preferences and privileges that favor majority groups. Research helps to shape the narrative of education, who gets to be in that narrative, and what stories are told. It is critical for me to be aware of my positionality as a white woman so that I can be continually striving to bring forth the stories and experiences from the communities I work with, and for these stories and experiences to create and shape the vessel of research as much as possible.

It is common to try and address the problems of inequity, to seek solutions. Being aware of my privilege meant not advancing the solutions I see, which are influenced from my perspective and accumulated lived experiences, including my race, gender, professional background and more. Instead, in my attempt to engage in humanizing research, it was important to focus on learning the experiences, hopes and dreams of others. My role throughout this study and continually, was to center the narratives of others, to highlight the unseen and hear and share their stories, and have these stories pave next steps and recommendations which help provide the direction for the future.

### **Reflexivity**

Villenas (1996) noted, “Herein I find the key: to resist ‘othering’ and marginalization is to use our multiplicity of identities to tolerate and welcome the contradictions and ambiguities” (p. 728). Rather than ignore our multiple identities, we are called to understand them so that we may better approach our research with inquiry and not silence ourselves or others. I have identities that related to the experiences of the participants in this qualitative study, yet the participants each had their own distinct lived experience. I have had an opportunity in that I am a woman who works in career development for the technology community, seeking to research the experiences of women trying to grow their technology careers. Doing research does not mean ignoring this positionality but rather using it to encourage the stories and experience sharing of others. My positionality means I could bring forth questions that can be asked to go deeper, to reveal more truths around career development and career search processes. However, due to my work in career development, there can be a power dynamic between me and members of the communities I serve. I am often seen as ‘the expert,’ though I believe that only the individual is ‘the expert’ in their own journey. While my leadership role and experience is an opportunity, it is also a challenge. I made it a priority to be aware of this power dynamic. My goal was to do research *with* the participants and not *on* them. In data collection, I was explicit about my desire to hear the participants’ perspectives and what was

important to them; I tried to the best of my abilities to have participants lead the way and to demonstrate that I valued their insights and experiences which they brought to the table.

It was also important to remember that I am not marginalized based on my race, sexuality, ability, or other category of difference; my experiences are not universal, and my research was not the place for my experiences as a woman in technology to be dominant or centered. Rather, I could use my experiences to center others; my experiences can be useful in relating to the participants, in asking thoughtful questions, and to interrogate dominant narratives we hear in technology career development. Overall, it has been important for me to be aware of the privilege I hold and be cognizant that I am living with this, often unseen, privilege; this was particularly important to keep in mind when working to build relationships and create mutual trust with those who held different identities than mine.

In my role as researcher in this study, I acknowledge that I have had the potential to influence the research process and findings by my own positionality (Merriam & Tisdell, 2016). Through analytical memos, I engaged in reflective practices to challenge my assumptions and biases about the process to which I was bearing witness as well as my relationship with the study (Merriam & Tisdell, 2016). As someone who works within career development in the technology space, I had relevant contextual knowledge that aided me in my role as the researcher and primary instrument for data collection and analysis (Merriam & Tisdell, 2016). By being aware of my biases and worldview, in relation to the theoretical framework and participant voices in the study, I have tried to be reflexive regarding my positionality and used it as a method for centering the voices of others rather than my own limited perspective (Merriam & Tisdell, 2016).

## CHAPTER FOUR: FINDINGS AND ANALYSIS

### Introduction

This study explored the career search processes of female graduate students and recent alumni seeking STEM roles and building to leadership positions within the technology industry. The focus was on the interactions that participants had with career agents, which included recruiters, hiring managers, and interviewers. Also taken into consideration as career agents were Applicant Tracking Systems (ATS), which is a software programs designed to scan resumes and then filter based on how they match the job description, often using keywords (Qu, 2023); the ATS is where job seeking individuals commonly submit their job applications online, and the ATS was often the only interaction point participants had with a company, so the ATS was, therefore, a relevant “career agent” in many of their experiences.

The purpose of this study was to not only explore career search experiences but also to gain an understanding of how the female participants made sense of these experiences, and how career progression and career decision making were affected. As a reminder, the research questions for this study were:

1. What are the career search experiences of mid-career female data science graduate students and recent alumni seeking to advance toward leadership roles in the STEM industry?
  - a. How do mid-career female data science graduate students and alumni make sense of these experiences, particularly interactions with career agents?
  - b. In what ways do these interactions affect career decision making and career progression?

This chapter presents the findings from this qualitative study, which included analysis of focus group discussions (four focus groups with a total of 12 participants) and semi-structured interviews (total

of 10 interviews). Five themes related to the above research questions emerged, which were then broken into related subthemes that further illuminated the topic. The five themes and 13 related subthemes are summarized in table 9.

**Table 9**

*Overview of Study Themes and Subthemes*

<b>Themes</b>	<b>Subthemes</b>
<b>Difficulty navigating a career search</b>	<ul style="list-style-type: none"> <li>Obscure career search process</li> <li>Obscure or misaligned expectations</li> <li>Obscure or absent feedback</li> <li>Exhausting and frustrating process</li> </ul>
<b>How they valued me matters</b>	<ul style="list-style-type: none"> <li>Relationship: treating me like a headcount vs a real person</li> <li>Standards of evaluation: rigid vs holistic</li> <li>Stereotypes, biases, and discrimination</li> </ul>
<b>Community matters</b>	<ul style="list-style-type: none"> <li>Representation</li> <li>Social capital</li> </ul>
<b>“Ambitious, but sometimes I lose hope”</b>	<ul style="list-style-type: none"> <li>Sometimes I lose hope: doubt my potential and place in technology</li> <li>Ambitious: recognition of potential</li> </ul>
<b>Aspirations as a woman in technology</b>	<ul style="list-style-type: none"> <li>Desire to fulfill my potential</li> <li>Desire to create change</li> </ul>

**Discussion of Themes**

**Theme One: Difficulty Navigating a Career Search Labyrinth**

Participants often had difficulty getting information about how to navigate their career search, understand expectations by career agents, or improve their strategy and performance. In fact, the phrase “black box” was used by a couple of participants to describe how they were often not aware of how career agents were processing and evaluating their candidacy for jobs. This describes **theme one: difficulty navigating a career search labyrinth**. This theme is broken into four subthemes that represent the barriers present in navigating the career search labyrinth. The first



subtheme, or barrier, that will be discussed is the **obscure search process**, or how participants found information on the career search process difficult to obtain. The difficulty of getting concrete information made it hard to understand the expectations in applications or interviews, and at times participants felt the expectations were misaligned. This is the second subtheme that will be discussed: the presence of **obscure or misaligned expectations**. Feedback was often absent during the participants' career search experiences, and when it was present there was a lack of clarity which made it difficult to interpret. **Obscure or absent feedback** is the third subtheme in the career search labyrinth. Since the process was obscure, participants had to submit many applications and move forward with take-home assignments and interviews that often did not bear results. The process was also described as inherently tiring and stressful. This is the fourth and final subtheme that will be discussed, an **exhausting and frustrating process**.

The career search labyrinth theme represents how, overwhelmingly, participants had confusing and obscure career search experiences. A lack of relevant information, clear expectations, or useful feedback all created barriers within this labyrinth; in addition, the process was also often exhausting and frustrating, which is another confounding barrier. These subthemes will all be discussed in the following sections.

### ***Obscure Career Search Process***

Almost all participants recalled their career search experiences as being confusing or obscure; they spoke about not understanding the overall process and not knowing how to improve their understanding. The confusing landscape created a labyrinth, or a maze that participants did not know how to navigate and in which they often ran into barriers. Janet, an Afro-Caribbean student in her third term, said of the career search process, "it's a mystery for me," while Saadri, an Asian and third term student, noted, "I've always felt just clueless about the entire process." Even when participants had experience in technology, they found the career search process to be obscure and at

times, they felt like outsiders because of their lack of knowledge. Rea, an Asian student who had recently graduated, had around five years of prior experience as a data engineer in finance, and expressed this with her thoughts “You don’t know those things. You don’t understand those as an outsider.”

At each stage of the career search process, participants described a lack of information. This started with simply trying to navigate job titles which were noted as confusing, with participants sharing sentiments similar to Peyton, a final semester white student, who noted, “I kind of feel like a babe in the woods trying to navigate just the job title search.” Once participants decided to apply for a role, they would submit a resume through an online portal attached to an Applicant Tracking System (ATS), and most often for participants in this study, the only career agent they encountered was the ATS because participants were often rejected at this stage without any information to help them make progress in their career search. Generally, participants’ experiences matched those of Harper who said, “Feels like things just go into this abyss.” Participants spoke about sending in 50 applications (Ariel and Wendy), 70 applications (Binna), or 80 applications (Saadri). Saadri at one time said she applied to so many companies that when she heard back from one that she didn’t recognize she said, “I forgot that I applied to the company.”

There were exceptions to this lack of information and progress. Nora, a white fifth semester student, and Olivia, a white student who had recently accepted a role in data science at a large, popular tech company, both spoke about applying to a limited number of companies and making immediate progress. Nora said of her search, “No, I think once I decided that I wanted to start interviewing, it was pretty easy to get the interviews.” While Olivia said she “only applied in total I want to say to 20 or so (places), not very many.” That said, Nora also expressed confusion over roles, and while Olivia had a referral from a classmate which resulted in her current new job, she

also had been initially rejected by the ATS for not meeting the exact qualifications and had points in her process where she was confused and felt blocked.

When they could, participants sought to increase their understanding of the career search process by talking to career agents, including the recruiters who were usually the first real people participants interacted with during their career searches. Unfortunately, many participants' experiences were like Rea's who recounted her experience with recruiters saying, "Just ask. They're not telling you anything anyway," and Nora who said, "sometimes recruiters that you talk to like don't even know really." Binna, a recently graduated Asian student who had also recently accepted a data science role in tech, commented on the difficulty of getting information from recruiters, saying "When you ask the recruiter what is expected (for the interview), they can't tell you. So, we are required to make a wild guess based on the short job req." When trying to prepare for interviews or understand if a role was a good fit for their interests and skill set, participants found recruiters were, overall, not a very useful resource.

That said, not all recruiters were unhelpful. Ayotola spoke about the impact a helpful recruiter made in her process, sharing how the recruiter had given her tips for the interview and kept up "constant and clear communication." Not only was Ayotola able to better prepare for the interview, but this communication had an impact on her confidence with her chances in progressing to an offer stage. She shared, "I feel like she (the recruiter) wouldn't be giving the update if I didn't have a chance." Rea spoke about her difficulty connecting with helpful recruiters:

So, finding these recruiters, knowing who to who to reach out to is, is a mystery. And knowing who will help you, or who will tell you anything or people who just keep you in the dark and let you know two days before you have an interview.

Helpful recruiters could make a difference in how participants could prepare and approach interactions with career agents, but they were difficult to find and connect with.

During interview stages, participants would interact with other career agents such as hiring managers and other company representatives serving as interview panelists. Panelists described a similar lack of information at this point. For example, in trying to understand the team functions and work life balance, Wendy said, “They don’t tell you anything. They are not answering your question, but they want you to understand that, hey, don’t talk to me.” Lissa, a fourth semester Filipina and white student transitioning from software engineering to data-centric roles, shared her perspective on the information available to help her evaluate if a job offer is a good fit, saying, “I will also say they don’t usually provide me enough information to figure out if I’m a good [fit for the] role. That’s a conscious effort where I feel like I have to dig for it.” Binna spoke about her experience trying to get information to evaluate a job offer and how it was difficult to determine the level of the role, and therefore difficult to determine if the compensation was fair. In looking back on this experience, she shared,

When I asked about what’s the equivalent level, so I know is this a mid-senior or senior level, they’re kind of wishy-washy about it. They’re like, ‘Oh, it’s on a different leveling system. The numbers are different.’ So, I couldn’t get any information out of them, and the number was substantially lower.

Often asking career agents for more details about an open role did not result in clarity.

The lack of information also affected interactions throughout the career search process, from application to interview. Wendy noted, “they’re also looking for a specific thing, but they don’t tell you and you don’t know what they are looking for really. So, it’s kind of like a shot in the dark.” For her application strategy, Rea spoke about how she “applied scattershot.” Saadri also highlighted the difficulty in knowing the right approach for her application, saying, “I was just completely clueless as to what to put on my resume.” Harper, a fifth semester white student, agreed and when asked about her career search strategy she said,

So, I do apply online. I always have a resume and a cover letter. I also reach out to people on LinkedIn that have similar titles or roles that I might want to talk to. Sometimes they respond, sometimes they don’t, and that’s okay. I don’t know. I think I could... I think I... I

don't know. But the best approach is... I don't know.

Participants often remarked about how their strategies would have changed if they had more information. Janet, who was in her third term at school, spoke about how she was unaware of programs and fellowships that could have aided her in the career search, saying, "so there's just certain thing that I'm finding out that I wasn't told about." She added, "if I knew that [about fellowships, etc.], I would have taken that approach."

Even when candidates were successful in getting interviews or getting offers, they did not always know what they had done to result in that success. Speaking about one interview experience she felt did not go well, Rea said, "I ended up getting [an] offer. I don't know how. I don't know why." Aiza, a South Asian Muslim student early in her graduate school journey, had a similar situation where she was unclear of why an offer came to fruition; she said "And surprisingly, I think after I think it was either two or three days, they sent me like an acceptance offer, and I was like totally blown away because I was like, I didn't know anything of what they asked." While Aiza credited her offer to her ability to show her ability to think on her feet and figure things out, others were puzzled the decisions made by career agents. Ariel summed this up with her reflection,

I don't know if you guys feel the same, but it's really funny to me sometimes. Like what places I hear back from or like what roles. And I think you were saying like there are roles that you feel fully qualified for and you're looking at your resume and you're looking at the description and you're like, yeah, it's one to one. And then you just never hear anything. And then there are some that are way off, and they're interested in you. So, I don't know what that's about.

The fact that the career search process was obscure, and participants could not make sense of their progress led to a loss of trust in the process. Rea gave voice to this perception, saying,

So, I mean, I think I don't trust the process. I don't think companies know what and how to approach what they're looking for. Sometimes they don't even know what they're looking for. But let alone approaching the right way to find that. So, yeah, I don't trust the process.

The loss of trust could affect the participants' confidence that they would be successful. Rea, again, commented on this saying, "my lack of confidence, which happened, which was fueled by the, you

know, the inefficiencies in the process.” The obscure career process was not one that participants could trust, and they expressed a lack of confidence at times that they would be able to navigate it successfully.

### ***Obscure or Misaligned Expectations***

Something that contributed to the obscure nature of the career search process was that participants were often unclear on how they were being evaluated and what the expectations were for their applications or interviews. Saadri captured this in her statement, “I never really understood if you were being evaluated, what you were being evaluated for, and if you are being evaluated, evaluated fairly for your skill set. So, to this day, to me [it] is a mystery.” In addition to expectations being obscure or sometimes communicated incorrectly, participants found that some expectations could be unrealistic. Mia described a meme that was shared in the school’s Slack dashboard, which painted a picture of how interview requirements could be much higher than what is required to complete the job. She spoke about that level of difference between the interview expectations and actual job requirements, sharing,

I often felt that difference and I think there’s like one, at least like several interview experiments where what I heard from the hiring manager is not something like super-duper complicated. But when I went through the technical interview, it was so difficult and soul crushing like that, that level of difference.

Other participants shared similar experiences with Wendy noting, “Like who in real life has, like, the code in the mind? Never, ever. ... everyone Googles the code and but here you need to have it by heart. That’s not realistic. That’s not realistic. You have Google next to you.” When participants did not always have a clear picture of the job requirements, it was particularly hard to understand why career agents had certain expectations.

Often unrealistic expectations seemed to extend to the job postings. Peyton, who had ten years of previous technical work experience, shared her experiences with this, saying,

And the other thing is there will be entry level jobs, but they ask for master's degree. They ask for like five years of experience with a very specific language or tool suite of products. And that's like that's not entry level, right? Or am I. Like, am I just is tech so different from what I've experienced that I'm, am I the outlier here thinking that's weird?

At times, the job description led participants to believe companies did not know what they were hiring for or what the role would require in terms of technical skills and experience. On this topic, Janet noted,

They're hiring people, but they don't know anything what this role is going to be like. So, it's like a big question mark. So, then you're like, okay, so you're asking me these things... to do these skills, like bring these skills. You ask me questions related to this, but then I'm not going to use these skills?

The expectations paired with the description of work did not make sense to the participants.

While expectations often did not match the job requirements, a few participants found that their interview experiences were in alignment. Interview experiences that were communicated clearly to participants and in alignment with job requirements contributed to positive feelings toward the company and enjoyable interactions. Ayotola talked about her experience being well-prepared for the interview, sharing "But... through the interview process, knowing what they really wanted out of me and understanding what I'm walking into, that kind of sealed the deal a little bit." Participants appreciated when the expectations were aligned to the job and communicated clearly, and this often raised the regard they had for a company and team. Unfortunately, this was not a consistent experience. Binna spoke about how she felt about interview processes that had clear expectations noting,

I feel like I've brought my A-game and the interviewers also brought their A-game...So, if I if I don't perform well here, it's not because the questions were misdirected. It's because I fell short. So, I feel like most of the time they are very fairly evaluated.

Binna also had instances where expectations were not clear, and shared, "They communicated wrong expectations and they misled me to prepare for something else, in which case I go down the emotional path of I have been wronged. There's a... there's an injustice here." When the

expectations were misaligned to the role, participants could also lose interest. Parul spoke about an experience she had interviewing for a machine learning role, but then getting technical questions from a different discipline. She said, “I basically lost interest given that I had very specifically asked what to expect.”

Preparation and practice were noted as a key step by participants in being successful in their career search experiences, but with obscure expectations – or even misaligned expectations – they often found it difficult to prepare. Participants understood that professional work often required flexibility and dealing with ambiguity, but as Binna stated,

Maybe in the real world there’s no expectations, and like things change all the time. You’re supposed to come across problems you’ve never anticipated. So, I get that. But at least in the interview setting, I would want these problems to align with what, whatever the job, job requirements or the recruiter communicated.

The participants gave the advice that anyone going through the career search should focus on preparation. As Rea said, “Try to find out that expectation level as, to as much detail as you can before you walk in.” However, it is hard to prepare for situations like the one Rea faced where the interview “was completely different from what the recruiter said it would be.” When expectations were obscure or misaligned, participants overwhelmingly found the interview experience to be frustrating and confusing.

### ***Obscure or Absent Feedback***

The theme of absent or obscure information extended to feedback on the participants’ career search experiences. The following exchange occurred during a focus group, resulting in much laughter and agreement, in answer to the question, “How did you get feedback on how the process was going?”

Binna: Are you kidding? From interviews, this isn’t Disney, nobody gives any feedback.

Rea: Did you say this isn’t Disney?

Binna: A fairy tale. Sorry. Fairy tale is what I meant.

Rea: Because Disney doesn’t either. It was a good a follow up joke.



This exchange is a good example of how beginning in their application stages and extending throughout their interview experiences, participants described a lack of feedback on their candidacy and/or performance. It was rare to receive a response back from applications that the participants submitted – they would spend time tailoring their resume, perhaps including a cover letter, only to never receive a response regarding their application unless they were moving forward to the interview stage. This meant participants did not have any direct feedback on their resumes or other elements of their application from career agents. In addition, it was common for participants to be “ghosted” after talking to a recruiter or even after final round interviews with multiple career agents.

It was typical for participants to describe an experience like the one shared by Teja, who recalled that after her initial conversations with the recruiter, they “Said, okay, fine, we will reach out and then they never reached out.... They ghosted me. Yeah, I was. I followed up also on LinkedIn, but there was no response. So yeah. I felt like, I felt it.” Mia shared her experience further in the interview process, saying,

And I got like, I got ghosted two times where I am really close. I thought I was really close to like, at least it’s after the onsite interview and didn’t hear back anything for like a month until I follow[ed] up. It’s like.... they pick[ed] someone else and that, that would be something I appreciate you could have told me a little bit earlier.

Participants found it hard to be cut from an interview process without explanation and it could be particularly difficult to be ghosted when participants had invested time in the process; Ayotola shared,

Like I think if it was a situation where a recruiter didn’t reach back out after the recruiter conversation, I kind of wouldn’t care, but like if I had to do an assessment or something and I didn’t get the role, it’s like... ah... I hate that I wasted my time on that.

When participants invested their time in interactions with career agents, they wanted this time respected. Accordingly, when participants were ghosted, they often lost interest. Olivia noted, “[The] [r]ecruiter ghosted me essentially mid-process, which, oh I guess I’m not too interested anyway.”

Participants related how they did ask for feedback, but most did not receive any in response. As Janet shared, “And sometimes you don’t get it, you ask for it, and then they just don’t respond at all.” Lissa shared that she had “[o]nly one instance where someone actually provided really specific tangible feedback about the performance and what they were looking for.” Elizabeth, a second semester non-binary white student who had been interviewing for engineering roles where they could use their degree, said, “I find that it’s difficult to get good feedback.”

Participants who received feedback found it helpful, and they appreciated the career agents who could provide feedback. Binna expressed that getting feedback demonstrated a “mutually respectful relationship,” also saying,

But the ones that did give feedback, I really, really appreciated, because they give me specific examples. Yeah. One, it demonstrates to me how well I’ve done and what I can improve on. And two, it shows me that this company cares about me and that like I would definitely reapply in a year if I feel like I can polish up on those things that I fell short on, and they would be open about it.

When career agents took the time to provide feedback, it sent a signal that they appreciated the effort the participants put into the interactions, and they were interested in maintaining a connection. In addition, it demonstrated that the career agents valued the participants.

Most often, participants used their community for feedback; taking the advice that Binna mentioned to “leverage your community.” They shared stories of their career search interactions with classmates and friends and utilized online resources to seek out answers to gain an understanding of their performance and results through the career search process. Ayotola noted, “I got feedback from other places.” Teja also found that community was essential here, noting “So sometimes it becomes very... you have to read between the lines. To know what would have gone wrong. Right? So, you have to discuss with your friends. You have to discuss with their peers, colleagues, too.”

Generally, participants agreed that not getting feedback could be demoralizing. Janet said that not getting feedback is “discouraging because you just, I don’t know what I did.” Experiencing rejections without feedback at times led to the participants questioning their self-worth. Binna’s comment captured this when she related,

And I think after like rejections, after rejections, my like self-worth taking a lot of hits with like little to no feedback. I think I was at a point where I felt like I would just take anything, just give me anything, get me out of here and that probably affected me, like losing any leverage I had or confidence I had in the negotiation phase because I was ready to take the next opportunity that came by.

Participants expressed that this impact on their self-confidence affected their career search in many ways. For example, Mia said,

Not getting feedback will influence your instinct. I think in the past I [was] more confident about how I think the interview went. Like when you go out for an interview, you might feel that I think I got this or no, it’s horrible. I’m not going to, I’m going to, I’m not going to be moving forward but not getting feedback- There were several times I feel like, oh, I’m getting this. It’s such a good experience. And then I got rejected. So, I trust my instinct less and less. But that might not be the case, right?

Without feedback, the participants could not understand why they did not have positive outcomes in their interactions with career agents, which led some of them to question themselves and their skills.

Participants often did not know how to move forward in the absence of feedback concrete and actionable feedback. Teja shared how her experience with receiving abstract feedback that she was not “googly enough” left her with more questions than guidance. She said,

You know, and sometimes when you’re not able to answer questions, then you know that, yes, you didn’t...didn’t know. And then you need to prepare on something. But in cases where the feedback is very abstract, like that googly-ness kind of thing, you cannot prepare you. I mean, what else can you do?

Not having feedback meant that the participants could not strategically revise their approaches to interactions with career agents, and it took away some of the control they had over their career search experiences. On receiving no feedback, Ayotola commented, “I guess out of my control was definitely probably the most difficult part of this whole process.”

Participants related how, when they received feedback from career agents, it gave them back control. Binna said, “once I get that feedback, it almost gives me some sort of control over the areas that I fell short.” Feedback helped them see where they could improve and separate that from their feelings of self-worth. Binna elaborated about her thoughts around receiving feedback from career agents, saying, “I can see what you needed is misaligned with who I am and what I can do. And there are some things I can fix with my effort, in which case that gives you something to work on.” By understanding the expectations and getting feedback on their performance, participants felt they could make progress and take meaningful action to drive results in their career search.

### ***Exhausting and Frustrating Process***

The participants understood the career agents’ need to capture enough information to determine if they were a good match for a position, but they also felt the process to be exhausting and frustrating. One focus group expressed agreement with Aiza’s statement, “searching for a job is like a full-time job in itself.” Unprompted, participants often used the same words or synonyms to describe the process, including “tiring” (Wendy), “exhausting” (Binna and Uma), “pretty exhausting” (Ayotola), “never-ending” (Ariel), “frustrating” (Saadri and Lissa), and “roller coaster” (Teja and Mia). While she was in the middle of her career search experiences, Rea said, “[I] break every day and then come back and appear for another interview.” Janet spoke about the pressure to spend more time on her career search, but also the realities of life. She compared herself to her male colleagues, relaying,

And so, I think you hear them [men] all staying up until the hours and saying, “Hey, I’m going to give up my life... cause of grad school.” And I’m like, I can’t give up my life because I have a family. You know, I have people in my life that I have to take care of or support and so on. And those are different responsibilities you have to adjust with [...]. I just don’t have the energy levels.

Participants struggled to make time for the career search, particularly considering their school, professional, and personal commitments.

Since the process was a significant investment of time, when possible, some participants sought ways to ensure their time was put to good use. For example, some participants resolved not to apply to companies where they thought there would be too many applicants. On this strategy, Lissa advised, “Don’t apply for strictly tech companies, especially the really popular ones. They had so many applicants that I almost think it’s a bit of a waste of a time to even try to apply.” For some participants, this meant avoiding what are called “FAANG” companies – or Facebook, Amazon, Apple, Netflix, and Google. Peyton noted,

So, I haven’t really been applying to the larger companies like the classic Amazon. The FAANGS, FAANG companies, although I have seen a couple of product management positions come up, but again, I just think like one resume in a stack of thousands. And so, it’s kind of like a blind shot.

Ariel gave similar advice, saying, “So it’s worth your time to research smaller, lesser-known companies because firstly they’re more desperate.” Participants tried to maximize their efforts through the career search process and not waste time on things that they felt would not be successful.

Some participants also spoke about how they were willing to walk away from companies that had too lengthy of a process. Saadri recalled her experience, noting, “I almost gravitated to work toward the kind of companies whose interview processes were like four or five maximum.” Parul also noted how she conserved her time, saying if an interview process that wasn’t going well, “I’m not going to be able to crack the rest of the round. So, I was like, there’s no point putting in effort.” Teja had a similar experience. When she felt a hiring manager was fixated on hiring someone with an MBA instead of her technical graduate degree, she pulled out of the process. Teja said, “somewhere in my mind, I knew that... they are going to hire another candidate... so they reached out... to schedule the final panel interview, but I said that I’m no longer interested.” Participants questioned if their efforts had value and would bear any results; Saadri captured this with her comment, “Why am I spending so much time on something that I might not even get... [I]s this interview process

worth it?” The participants wanted to build a career in technology, but they wanted their efforts toward this goal to bear progress and not waste time.

## **Theme Two: How They Valued Me Matters**

When looking back at their career search experiences, participants’ interactions with career agents were influenced by how they felt valued by the career agents. Participants had times where they felt overlooked, underestimated, and/or disrespected. Conversely, they also had interactions where they described being connected, recognized, supported, and/or respected. These moments are captured in **theme two: how they valued me matters**. This theme name comes from a statement by Rea, “...how they valued me mattered.” This theme is divided into three subthemes which represent three types of interaction points with career agents. The first subtheme is **relationship: treating me like a headcount vs. a real person**. The type of relationships participants had could affect their performance and comfort during the interactions with career agents. The second subtheme is regarding **standards of evaluation: rigid vs holistic**. Participants could find themselves in situations where career agents were seeking rigid markers to demonstrate ability and value, such as previous work experience in a particular role and/or industry. At other moments career agents looked at participants as whole individuals and considered how their educational and work experience demonstrated potential to succeed. The third and last subtheme is **stereotypes, biases, and/or discrimination**. Participants were not often sure if they were experiencing stereotypes, biases, or discrimination, but they shared stories of questioning these elements during times where they felt uncomfortable and unwelcome. The potential for stereotypes, biases, and discrimination could create a mental load that colored their interactions with career agents.

### ***Relationship: Treating Me Like a Headcount vs. a Real Person***

Participants described two types of relationships with career agents, those where they were treated as a headcount that needed to be filed and those where career agents made room for a personal connection and treated participants as real people. This subtheme will discuss both types of relationships and how participants described their impact on their interactions and career progression. A few participants were able to persist through impersonal and/or disrespectful applications, where their status as a potential headcount put them in a lower tier of hierarchy with the career agents, but most participants felt that their performance, progress, and interest in career pathways was affected by the treatment of career agents.

**Treating Me Like a Headcount.** Feeling like a “headcount” was a topic that came up repeatedly by participants. They would describe feeling like the career agents did not take time to get to know them. Binna described this feeling with her statement,

I guess my biggest problem is feeling like I'm just a head count. And when I don't get feedback or I am simply ghosted, I feel like, okay, well, I was just another head count. And like this, this company doesn't value me as a candidate, doesn't value me as a human being, just a piece of the machine.

The sense of feeling like a headcount meant that participants did not feel the companies or career agents valued them as people.

This sense of not being valued started at the application stage. As previously mentioned, participants would take time in crafting their applications and generally not receive any responses from career agents or the company. When they did receive a response, it was usually an automated email with a note of rejection. Ariel commented on the lack of response, saying “I probably sent my resume to at least 50 places if I'm not exaggerating and heard back from like five.” Lissa added,

Going through those [job] portals is just a pain in the butt. A lot of times you'll wait like a month, two months, and you'll hear something that you kind of vaguely remember putting your application in. And it was from five months ago, and they're like, “Oh, we've moved on

from now.” I’m like, I figured, thank you for your, your very helpful feedback.

While career agents receive a large volume of applications, each application takes time and effort to submit, and it was difficult for participants to not hear a response. Even after participants had connected with a career agent via phone, the relationship could be abruptly cut off, which led to a sense that the interaction was impersonal and the career agent uncaring. Peyton related her experience where she spent time reaching a company that was a good match for her skills and values, and then had a great conversation with a recruiter, only to receive a cursory rejection afterwards. She commented,

And, you know, so when you get to that point and even the screening phone call goes great, and then you get just a one sentence email back that says, we want someone with more tech skills. It hurts. You know?

The lack of feedback or acknowledgement of the emotional impact of a rejection was difficult.

Even during the interviews, participants could feel that their presence and worth as unique individuals was not really acknowledged. Rea described feeling like one of many during the interview process, saying, "You're just getting interviewed with 10,000 other people that are getting interviewed probably at the same [time], in the same month." Rea spoke about a hiring manager not distinguishing her from other candidates, relating that the hiring manager told her, "I get so many questions and so many interviewers you know I don't know who's asking what." In this case Rea questioned the result of the interview where she received a job offer, asking "How did they rank [candidates] if you mixed up everyone in your head? How did you rank them?"

The impersonal nature of interactions could lead to a feeling that the interview was a required exercise that the career agents did not really care about. In these situations, the interview could feel like an "interrogation" where interviewers wanted to get "straight to the questions," as expressed by Aiza. Saadri related,

Some people will just, like, not even look at your face. They'll just like, "Yeah, okay. Is that your answer, ok next question." ... And it just feels like they're just filling out a form with



keywords and stuff and not really listening to my answer.

About half of the participants characterized their interviews, similarly, talking about interviewers who wanted to get through the questions they were required to ask and close the interview as soon as possible. The participants could sense when the career agents were not invested. Ariel said, "I definitely can tell when somebody is just sort of like reading off a list of questions, versus like they were really trying to have a conversation."

In addition to impersonal interactions, participants described many times where the presence of hierarchy in the interview made it hard to connect with interviewers. Uma also described how interviewers gave her a sense of looking down on her, saying,

So sometimes I feel that many of the interviewers come and start questioning one after another without introducing who they are or what they are looking for. So that kind of does not give me a good vibe, that they think they're big shots and they just want to grill me in different ways.

Describing the sense of hierarchy, numerous participants used the word "condescending" to represent interactions in their interviews, with comments such as "I think some were just condescending" (Rea), "I have also faced the condescending interviewer" (Parul), and "This was an intimidating and condescending experience" (Mia). Teja describing her interactions with a popular tech company where she felt the presence of hierarchy, saying,

So, I feel like they have this kind of God syndrome where they feel like there's no one better than them. And of course, they are very huge, very large [the company]. It would be an honor to work for them and get their brand. That's all fine, but they're not the only one. Right?

Teja went on, remarking, "I feel like the interviewers also, they speak like they are God. You know, they're like, if I'm talking to you, it's your honor that I have given you this much time to talk to you." Teja wrapped up by saying, "The feeling is not mutual. Sometimes it's like... if I'm giving you time, you are also giving me time. So, let's have like a mutual conversation."

Half of the participants recalled how their performance was affected by negative interactions with the interviewers. Rea gave voice to this with her observation, “Sometimes you would just feel like, oh, they already know you're going to fail. They are trying to make you fail so. So, your body stops, like performing in the best way.” Participants described forgetting answers when they faced condescending interviewers. Wendy said,

I feel that blocks me. Maybe I have the answer...or I could have the answer...but the fact that they are like poking at me like this, I just, I just don't like that. I feel that it's very aggressive. I don't like people to be that aggressive.

When Wendy faced aggressive interviewers, she felt that she lost the answer or the possibility of finding the right answer to questions. Mia also described being blocked by intimidating and condescending interviewers, saying,

What was worse was that when they started to ask question in a tone that that was really intimidating [...]. Like in that tone, it can only just make me like blank out. And I couldn't answer the rest of the questions and got really sweaty and couldn't think.

Ayotola told a story of a similar situation. Ayotola was in a second technical round interview when the interviewer got frustrated with her performance and she began to blank. Ayotola said, “I think the thing that happened was he got visibly frustrated, which made me uncomfortable and made it more difficult for me to perform even though I was already underperforming, which was the thing that made me visibly upset.” She also mentioned, “And I know it was my fault, like I think [I knew what] he was asking me to do, which now I laugh at because it was pretty simple. And I think if I wasn't nervous, I would've been able to figure it out.” As these participants noted, interactions with intimidating and condescending career agents could raise stress and anxiety, leading to decreased performance by the participants during the interactions.

One participant, Binna, did express that while she preferred friendly interviewers, how the interviewer treated her did not affect performance. Binna said,

And I think I respond well in an environment where I perceive the interviewer to be more friendly. So, if I'm catching those cues, like more smiles and like more jokes, that tends to

make me feel more comfortable. Although I have found that it doesn't always relate to my performance like the evaluation later. But at least in in that setting, I... I am more comfortable, and I wonder if I'm biased to find somebody who is more similar to how I usually behave because I am that kind of person.

Although Binna was able to persist and perform in situations with unfriendly interviewers, she still preferred a situation where she could make a friendly connection and be comfortable.

The vast majority of participants noted that when they felt the career agents did not value them, they began to not value the opportunity or company. A few participants mentioned how this happened when they were ghosted. Binna said, "There was a company that just ghosted to me after saying, it's not a company policy. They reached out a few months later, and I just ghosted them because you don't care about me, why should I care about you?" Participants spoke about dropping out or cutting off interview processes when they were disrespected. Saadri said, "They offered me the next interview; I said, no, I'm not going to do that. I'm considering, and I didn't have a good interview experience." Aiza recalled how she was "rudely interrupted" and then as a result decided "I don't think I want to like wake up every morning and want to work with certain people, even though it might be their style of working. It's not something that I was comfortable with." Participants wanted to be in an environment where they could be successful, and this did not include cultures that were impersonal, uncaring, and lacking in respect.

**Treating Me Like a Real Person.** At times, participants found interactions with career agents to be personal, supportive, and respectful, and some participants had the fortune of this characterizing most of their interactions. Saadri recalled, "The majority of my interviews have been with people who are respectful of your time and your answers," and Binna mentioned, "I don't think I faced condescension." Rea described a pleasant interaction she had with the hiring manager where she ended up accepting a full-time offer, saying, "He was just cordial. He was respectful." These were memorable experiences and left participants with good impressions of the career agents involved as well as potential jobs at their companies or on their teams.

Participants described a sense of camaraderie and community during interviews where they felt respected. Unlike the nameless interviewers in the impersonal experiences, they were made comfortable by getting to know their interviewers. Uma said, "Another thing that personally makes me comfortable when the interviewer introduces themselves because I don't know many of them." When interviews introduced themselves, it helped participants to feel comfortable. Ayotola spoke about a friendly interviewing experience, sharing "the personableness of that was really pleasant... I was really excited to like I would really want to join the team after that one." These interviews did not have as much of a sense of hierarchy, and at times the interviewer even showed humility. Rea commented on this, saying about her interviewer "exposed that there were things that even he didn't know." The lack of hierarchy and even humility made the career agents more relatable, and it was easier for participants to form a personal connection.

When participants were treated like real people, they described feeling that interviewers were genuinely interested in them as individuals beyond simply their technical abilities. Aiza talked about this, sharing,

I understand it's still an interview and there's some information that needs to be exchanged. So, I understand that setting. But I feel like the approach that people take of... genuinely being interested in you and seeing like, not what you have to offer, but also what the

company has to offer and if you're a good fit into that, I think makes a huge change.

What Aiza described was the opposite of being treated as a headcount; in this case she described being seen as a human being that had value. Wendy related how she felt interviewers got to know her during the final round interview at a large tech company where she received and accepted an offer, saying that “I feel that they saw me like the way I am, unlike any other team before. So, they made me feel comfortable not only because of my skills.” Nora shared a similar experience, saying, “And so he took some more time instead of just interviewing me to really get to know me and like what I wanted to do in my career.” When the career agents took time to get to know them, participants felt more comfortable and had more positive impressions of their interactions. In addition, it allowed them, as Nora and Wendy described, to showcase their value more clearly to the career agents.

When interviewers got to know the interviewees, the interviews felt like a conversation. In this type of interaction, career agents not only took time to get to know the participants but also shared information about themselves, the role, and the team on which the participants might be working. On this topic, Saadri stated, “Their openness and almost like explaining how they work together was really big in the process for me.” Ayotola shared how she felt when she was learning from interviewers, saying “it’s like cool to think about like, Oh, this could be like the kind of work you are doing.” The connections that career agents took time to make and the information they shared made a difference in how participants saw themselves in these new jobs. For example, Nora shared how a hiring manager she interviewed with shared information about the company as it related to her interests. She said, “he also took the time to like connect me with different people, like based on questions that I had, like specific questions about the company.” Nora spoke on the difference this made for her, stating, “He was like so invested and it felt like he was really involved in

the process and actually excited to have me work there. ... made me feel like really excited to work for him."

Another thing that made a difference in interactions with career agents was if participants perceived the agents as actively helping them to be successful in the process. As Parul said, "I feel that the best interview is where, you know, it's a collaborative effort, like where people are also with you helping you succeed." Rea shared her interview experience with her now manager, recalling "He [the career agent] started off saying, 'We're going to work in this problem together. You're not working alone. So, share what you think, and I'll share what I think after. And then we'll code together.'" When describing this experience, Rea said it was "comforting" and "amazing." She further said,

he wasn't condescending at any point. I told him that I didn't have experience with the certain kind of classes in abstract matter, abstract class of Python. And I said, "But I can do it in this way. Is it okay?" He said "Yeah. I mean, we're working on it together. Can you explain to me what this way is? Because I'm not as familiar." He exposed that there were things that even he didn't know. And it was okay that I think he comforted me when I was honest about the fact that I didn't know a certain thing.

Experiences such as Rea's were described as collaborative, rather than critical. Interviewers were actively trying to understand the value that participants brought, their potential, as well as how they could learn on the job and contribute. In these collaborative interviews, the participants described criticism as being constructive. Binna said, "And they'll give you constructive criticism if they're giving criticism or positive, like almost reassuring you." When an interviewer was engaged and responsive, participants described feeling supported. For example, Saadri related, "But I think what really helped was like the positive kind of reassurance that, yeah, you're absolutely right. What would you do to kind of make performance better?"

Essentially, a human connection was important in these career search experiences. As Mia noted, "I think the motivation and the authenticity and empathy of the interviewer definitely

matters.” When the interviewer valued them as people not just as a headcount, it made a difference to their performance.

### ***Standards of Evaluation: Rigid vs. Holistic***

Another factor in how participants were valued were the standards of evaluation, which could fall into two broad categories of being either rigid or holistic evaluations. Participants were often evaluated with rigid standards; career agents were seeking out direct previous experiences as being demonstrative of the participant’s value. In these types of experiences, many participants found themselves “auto-rejected” due to lack of experience, and their previous work experience was discounted and not seen as transferable. Conversely, when participants were evaluated holistically, even where they did not have direct work experience (i.e., they had not previously held a similar job title at a technology company), they were evaluated for their potential and transferable skills developed during education or diverse work and life experiences. This subtheme will describe both types of evaluation standards and the impact on interactions as well as career progression.

**Rigid Evaluations.** Participants often found themselves subject to evaluations with rigid standards, where the criteria for being a successful candidate was rigidly defined and direct past work experience was necessary. Rea spoke at length about being evaluated for her potential or only her experience; in one statement she mentioned she has faced both situations, declaring,

Moving forward from an interviewer perspective, I’ve met both really nice people who've been very curious about you know, my background, what I can offer; people who have actually looked at the potential that I can bring to the table. And those... who have concentrated on my accomplishments in the past.

Participants described feeling that rigid standard of evaluations focused on their past experience rather than considering the potential the participants had for entering new roles and applying the skills learned during their degree to work.

When the accomplishments of their past work experience did not meet the exact requirements of the job they were applying for, participants could find themselves underestimated and discounted. For example, a common experience among all participants was being auto-rejected due to lack of direct experience. Wendy talked about the difficulties in getting seen by a big tech company, asserting, "But Google is, for example, impossible. I think I sent like 50 applications." The graduate degree was supposed to give them credibility, but participants skill found themselves rejected because they lacked previous technology experience. After sharing experiences of being rejected for a lack of technology company experience, Peyton shared, "I'm honestly, some, some days I'm totally confused if this master's degree was a right move because it's not, it's not landing." Speaking on this topic, Binna asked, "How am I supposed to demonstrate experience when, like, nobody will ever give me experience?" Participants like Binna had acquired new skills that they wanted to use in technology, but they could not get hired because they did not have past experience already using those skills in a role in technology. In other words, to get a job in technology, you had to be already working in technology.

Rea shared a story of how she was told she "Killed it" in the interview, but because she did not meet the experience requirements and was considered to be "too young," she would not be hearing back about a job offer. Rea recalled her conversation, sharing,

He's like, "I don't care much about seniority, but I know how other people are looking at it and looking at you across all the other candidates that you have for this job. I just want you to know that you were, your preparation paid off in this interview. So, I want you to walk out with this feeling empowered, even though you might not get a callback."

Even when Rea did well in an interview, the career agents would reject her because of a lack of experience.



When speaking about the interactions they had with career agents in interview settings, participants also recalled times when the interviewers wanted specific answers, and they felt frustrated with this inflexibility. Saadri noted that there are “20 different solutions to the same issue, right? It’s just you can code one thing 20 different ways.” Teja shared, “There can be like ten answers to this. Which one should I pick up, right? So yeah, it's always open. And then it's like, how do you, what do you say that really clicks with the interviewer? So, I had to practice.” Rea shared more of her difficulties of rigid evaluations in the obscure career search process, observing,

You don't know if they want you to spend time on [...]. If it's a machine learning systems design question, you don't know if they want you to spend, you know, 80% of the time on features and not spend barely spend any time on the rest of the modeling process and evaluation versus others who want you to spend 20% on features and then move forward. You'll be, you would be interpreted differently. You would be seen differently. And you almost feel like, I wish I knew; I could have done this. I could have modified my answers.

The career agents desired specific answers, which were difficult to provide given the multiple ways of solving problems and the lack of clarity around their expectations.

Even when participants felt they had answered the technical question appropriately, they would have an experience where the interviewer was not satisfied. Saadri shared, “I would say something and then they [the interviewers] would like almost nitpick questions, like answers to my answers.” It was difficult to meet the rigid standards when participants felt they were trying to guess what the interviewer wanted to hear. For example, Mia stated, “I feel like the interviewer has a set of answers that they want to hear. But I don't know. I don't know.” Because participants faced an obscure career path, the rigid evaluation standards they were held to were often unknown, making this an even more difficult barrier to overcome.

A few participants also shared how they experienced rigid standards in cultural fit. For example, Rea spoke on how companies only wanted to hire a certain personality that was deemed to fit within the company culture. She related how her partner had somehow demonstrated the personality that the company wanted to see, even though his authentic self was different. She said,

For example, the company says we like people who act first, and then think. I mean, act with thought but don't like, wait just because you're thinking. And my partner is a very think first, act later. He will take his time to be able to make a decision. He would be the last person to speak. He'll absorb as much information as possible. So, a very clear, contradictory value. They still thought somehow that he fit the values and they gave him the offer.

Teja also related how companies had rigid standards in cultural fit and how candidates can learn to demonstrate the personality companies want to see, professing,

Places like for Amazon, Google, Apple, they have like tons of videos there. They teach, they tell you like what to say, what not to say. If they ask you this question, how to reply. If they ask you that question how to respond. So, it's like, oh my God.

About the tech companies seeking a certain personality, Teja concluded, “Anybody can come and fool you.” Both Teja and Rea, as well as other participants, found that companies had rigid standards for personality fit.

**Holistic Evaluations.** Participants described holistic evaluations as seeing the candidate as real-people with diverse skillsets and experiences worth exploring and this led to increased comfort by the participants in interactions with career agents. For example, when evaluating candidates holistically, interviewers generally focused on thought processes and what Binna said were “general problem-solving skills” rather than exact technical solutions or knowledge. This practice led to participants feeling comfortable in interview settings. For example, when discussing what made her comfortable in her interview experience, Olivia commented on a holistic evaluation situation,

Both my manager and then the team lead had reiterated that they were very interested in your thought process, even more so than code being perfect. So, my hiring manager says, “I know that on the job you're going to Stack Overflow, you're going to Google most of this stuff anyway. So, I'm not concerned with it being perfect. Like if you make a syntax mistake, it's fine.”

Other participants shared similar stories, often noting how it made them “comfortable.” Saadri related the difference this made in her interview, voicing,

In my interview I did have like a technical portion, but they also like really focused on...how well I was able to really problem solve rather than like knowing one technology specifically.

And, and just I feel like overall [that] made me comfortable in a way during the interview. Participants were not only more comfortable with holistic evaluations, but also felt the approach of focusing on a thought process and general skills was more realistic and relevant to how they would perform on the job.

Another characteristic of holistic evaluations was an increased value on educational experiences. Typically, the participants' professional background was diverse, and they were making a career pivot either into technology or into a new area of technology. Participants shared how they built confidence in their technical abilities through their educational journey and how they wanted employers to recognize the value of this journey. Rea expressed,

We have foundational knowledge that we've learned here and we've constantly, in different ways in life, have had to prove that we can learn quickly. So, I wish that people trusted that over just the number of years of experience, because then otherwise it would discourage it, and it would really discourage people from trying to switch. From trying to... aim for something larger than their years of experience level or anything like that.

Interviewers performing holistic evaluations often had more trust for the skills participants had acquired in their graduate journey, but it could still be difficult to prove that these were as valuable as direct work experience. That said, participants who experienced holistic evaluations were often able to use academic projects to demonstrate their skills and abilities. Olivia recalled her experience with this, noting,

So being able to describe end to end the process, the different choices that I made, the data, whether or not there were imperfections in the data; that was helpful in demonstrating that I had knowledge in the areas that they needed me to even if I hadn't had the professional experience. So, I would.... [M]y interviews kind of heavily considered the [degree name] experience even if the professional experience wasn't a perfect fit.

Teja also shared how interviewers were more interested in projects than work experience, commenting, "Of at least.... in two to three interviews, people were just interested to know about those projects. And not about my professional experience." Projects were a way for participants to demonstrate application of their skills learned through school.

Other participants shared how in holistic evaluations their previous work experience was explored for transferable skills. Peyton recalled a conversation with a recruiter where she discussed her previous product management experience, which was not in software, saying, "He was really interested in hearing about my product management experience. He understood that I wasn't just software, and so I really had a chance to highlight how what I have done kind of can sync up with what someone who managed the software would do." Parul had a similar experience with their tangential previous experience, and noted, "I was able to portray and fall back on my past experience for interviews." The participants appreciated when the career agents took time to understand how their past work experience had transferable skills and value.

Participants looked favorably upon, and at times sought out, employers who would recognize their potential. Mia shared her interview experience where a hiring manager was willing to overlook her lack of a particular experience, saying "I think I'm definitely that's like 100 points on the hiring manager in my mind that who's willing to give that opportunity." Other participants talked about filtering job postings based on language that indicated the employer was open to diverse backgrounds. For example, Peyton shared that she was trying to find job postings which "have that language of saying, no, even if you think you don't fit, we want you to apply kind of kind of thing." Peyton shared how she found similar job postings: "So I found a couple of job postings that have language like that saying, we understand you're not a perfect person, but we want to try to we want to meet you and meet you where you're at... and that further encourages me to apply." Unfortunately, when Peyton sent in an application to one such company, she was eventually rejected before having an interview, because she did not have the exact work experience they were seeking. Talking about this experience, Peyton said, "I felt a little duped," and that being encouraged to apply because she had potential but then rejected for her experience "was ironic in a bad way."

Participants appreciated employers who expressed being interested in their potential and education, but they could still find themselves facing rigid standards even in these situations.

At the end of her journey and after accepting a job offer, Rea shared how she had learned to have confidence in her potential, and that even though they were hard to find, she knew employers existed who would recognize her potential and evaluate her holistically the next time she had to undergo a career search. Her comments summed up the tension between potential and experience and desire to be seen as a whole person. She shared,

Now I understand it's not going to hurt me when people actually want to see what they want to see in you. All the different places that you worked at, different roles that you've worked in have shaped you to become who you are today. And you will be valuable to someone if they can see that. And if they recognize it... they treat you well through the process of recognizing it, you find something. So, I'm confident that if I reapply whenever I want to or need to, I'll be able to get something.

Participants like Rea came to realize that there were employers who would look at them holistically and seek to understand and recognize the potential they had to contribute in technology.

### ***Stereotypes, Biases, and/or Discrimination***

In talking about their experiences, most participants spoke about a general awareness that stereotypes, bias, and discrimination might exist and how this colored their experiences. At times the stereotypes and discrimination were obvious, such as when Parul was told she was being interviewed to meet a “diversity quota.” More often, the stereotypes and biases were less concrete. For example, Peyton recounted her exchange with a male career agent, saying,

And like the tone was like... I don't know, I don't know how to explain this. It made me feel like it was an older person talking to a child. And I feel like that whole mentality of women may not need to be in the workplace. There were some vibes to it. No, that's not giving you very much concrete stuff.

When asked if they encountered any stereotypes or biases from career agents, participants often answered with a no at first but then would pause and finalize their answer as a maybe or that they were not sure. This happened with four participants, who had answers such as Janet’s when she said,

“maybe I don’t remember. I just, I just... yeah, right. Just bury it down.” These comments and others described how even if participants did not face overt stereotypes, bias, or discrimination, they were aware of the possibility and that could create a mental burden. Wendy said she felt a need to appear “super strong” and that “It takes a toll on you. ... I wanted to share that.” It could be difficult to make progress when you anticipated stereotypes, biases, and/or discrimination.

There were only four participants who stated that they did not face any stereotypes, biases, or discrimination. Teja was one of these participants, but at the same time, Teja described a situation with a male interviewer who she said was “rude” and gave her unsolicited advice. When I commented that she seemed to be describing a paternal approach, she responded “Yeah, exactly. Okay, yeah. Okay, okay, daddy.” While Teja did not describe the career agent as treating her differently because of her gender, it was not an experience that she enjoyed.

A few participants emphatically answered in the affirmative that they had faced gender bias and stereotyping. For example, some participants recounted gender stereotyping they experienced in relation to their voice or communication style. Aiza mentioned, “I feel in my case, I have to be like, I have to be extra, extra stern.” Elizabeth spoke about how their voice made them appear to men, saying, “I know for me I have my voice sounds really young. I look really young, and even though I’m way older people assume I’m really young, so then they treat me young.” Uma had similar comments, sharing “

I feel because I’m a female candidate and if another male person speaks in a heavy voice, people will pay more attention because they think that [male] person really knows their stuff, even if the person is really reiterating the same thing...

Participants like Uma, Aiza, and Elizabeth modified their communication style due to potential stereotypes and biases.

Wendy remembered getting asked about her living situation and if she had kids or a husband; she said this changed how she approached this information in interviews, noting, “I started

saying, yeah, I live on my own, I'm single, I don't have kids and I work a lot.... and I was like, I don't have a husband." She followed up this comment, saying "And it's, like, super uncomfortable. But if I was a guy, they wouldn't ask." Other participants also shared how they were worried being seen as a parent (mother) could affect their career.

Two participants talked about discrimination in salary. Uma noted, "I have faced this thing for gender bias. I'm given less salary, even if I'm doing the same work." Parul also related discrimination she faced in salary, and how she was lowballed for a role after she had initially been told the salary was much higher. She said, "And what I found is that I've constantly been lowballed and the feedback that I got from people who referred me is that they need to fill in a diversity quota for calls or for interviews or something."

When describing stereotypes in the interview process, Rea gave an example of when she was given advice from a male career agent that she felt was both discriminatory and put her at a disadvantage when countering stereotypes and biases she may face. She said,

I was told things like don't, and this is from a dominant gender, "Don't introduce yourself for more than three minutes. I don't want that kind of stuff in interviews." My partner was never told that, and I was told that women actually end up doing that but because there are certain assumptions that are not made about us, about our smartness from men and that's why we find that we need a reason to explain or introduce ourselves more. But they put me at a disadvantage. They won't assume that [intelligence] about me, *and* I can't talk about it.

Rea felt career agents would not assume she was intelligent, and at the same time, she was not given the same opportunities as men to demonstrate her intelligence.

Rea also shared the differences she saw in her male partner's career search experiences and her own. She gave an example of how her partner was treated differently through the job search saying,

People definitely look at his potential a lot more than they look at mine. I've tried the same things. I will tell them about how I will approach the problem and how I would do it in the future. And they will come back to me and say, now explain how have you done it in the past? Same thing with my partner, and he would be okay with the first answer and similar roles. [...] They automatically put him up.

Rea saw her potential was discounted, yet her partner's potential in technology was assumed.

A few participants recalled cultural and racial stereotypes and microaggressions that affected their interviews. Ayotola, a Black student, brought up potential stereotypes she felt she encountered due to her name being what she called "non-traditional" (e.g., traditionally African name). She was concerned about how her name might come across and disclosed,

I think also a part of it is, aside from I think that like people have difficulty pronouncing it, like people might see it and think like I need sponsorship or something like that. Like I'm not a citizen or things of that nature.

Although she had a U.S. undergraduate and graduate education as well as current employment and an address in the U.S., Ayotola encountered questions on U.S. citizenship in her interactions with career agents. Saadri, who has a traditional Indian name, remembered a conversation with a career agent where she experienced a microaggression related to her name, recalling, "And then the minute I think we started our call, he was just like, oh my God, you actually speak good English?" She said she "brushed it off" but that "now that I remember it, that was not a nice thing to say."

Participants desired to be seen as qualified and capable, worthy of a tech job. For example, Ayotola spoke about a past technical interview experience that did not go well and how she became increasingly flustered as the male interviewer expressed his frustration with her performance.

Ayotola recalled thinking at the end, "he's going to wonder, like, how did she get this job? Like, is she a diversity hire?" The fear of being seen as a diversity hire or fulfilling a diversity quota came up multiple times with different participants. Aiza, who was a South Asian Muslim from Canada, also touched on this need to be seen as qualified and taken seriously, noting that she feels "men don't take me as, like a visibly Muslim woman, seriously." Aiza gave voice to concerns about being taken seriously, noting, "I personally feel that I have to work my way up to a certain, I guess, representation of like, hey, I know I'm wearing a hijab, but I know I'm qualified..." Many



participants like Aiza anticipated potential stereotypes and biases and sought to proactively address them by putting in effort to demonstrate her qualifications and skills.

Stereotypes, bias, and discrimination was a concern for many participants, and made a difference in which companies they were interested. Some participants spoke about the impact of how companies treated the issue of stereotypes and biases. Elizabeth stated,

I know there's bias. I'm assuming that a lot of people are going to look at me and think something along the lines of, she doesn't know how to do this because of X, Y, Z. And so, I'm anticipating the bias. So, if I see early on that the company is also preparing for that, then it makes me feel like, okay, at least they know... They're working on it. They're somewhere in taking the steps to try to fix it. Yeah, that's what reassures me when I'm interviewing for a job... like, okay, they are at least aware that this issue.

Participants like Elizabeth wanted to join companies that were aware of discrimination and would provide a safe work environment. Janet also touched on this saying,

You just don't want to deal with it on an everyday basis of experiencing discrimination from your peers. And we want to be in a safe environment where you can just focus on your work and learn and if they're not providing that... why do I want to be around that?

Participants also wanted credibility as valuable tech workers and not to face discrimination. Aiza spoke of this desire to be acknowledged and to have confidence, saying, "I want people to take me seriously and say like, oh, okay, I know what I'm doing. And not to belittle anyone. It's just more of like... I just want to be acknowledged." The participants spoke how they desired being able to contribute and show their value at work, and they also anticipated that doing so would be difficult in environments that were not safe or did not acknowledge them.

### **Theme Three: Community Matters**

A salient factor in the interactions that participants had during their career search experiences was community, which included the community of career agents that participants interacted with, the community that provided them with social capital during their experiences, and community that provided emotional support. This factor is captured in **theme three: community matters**. The theme of community is divided into two subthemes, the first of which is

**representation.** In this subtheme, participants talked about how gender and race/ethnicity in the community of career agents was something that they noticed. For some participants, it made a difference in their performance during interviews and/or decision making in careers. The community that participants had outside of the career agent interactions also played a role in their career search experiences and interactions, and the importance of community for information and support is outlined in the subtheme, **social capital.** Almost every participant noted the importance of social capital. Participants found social capital to be useful in many ways, including facilitating interactions with career agents and gaining credibility, interpreting interactions with career agents or getting information about the career search landscape, and as a critical form of emotional support. These three subthemes of community are discussed in the following sections.

### ***Representation***

Most participants recalled career interactions that were primarily with white male career agents; female or nonbinary individuals were not common among career agents. This lack of representation was noted in the many statements regarding interactions with men during their career search processes. As Wendy related, the “majority of them, they were men,” while Rea commented, “The entire process has been all male. And I think all white male.” When participants recalled female career agents or career agents of different races or ethnicities beyond white, they were few. Saadri said, “But in the past, all my other interviews, I can count on my fingers the number of women or women of color that have interviewed me or that I have really seen in director or managing director positions.” Oliva made a similar statement, sharing, “Only one [career agent] who identifies as a female. So, I think this is true of tech in general.” There was a lack of gender, race, and ethnic representation among the career agents with whom any participants interacted.

Some participants remembered more balanced gender representation in their interactions with career agents. In one focus group, a majority of the participants agreed that they saw some

gender diversity in their career agents. Binna said there was “pretty good gender representation,” Rea recalled in at least one interview experience she saw a “balance of representation for gender, not necessarily race,” and Mia noted in her interactions “it’s fairly represented by gender or by ethnicity.” However, more often than recalling a balance of representation, the participants would remember only a few women as part of their interview experiences. For example, Ayotola said she talked to “two women out of five” career agents, and when Wendy remarked that “70% of [her career agents] were male.” The career agents were mostly white men.

When companies were seen as making efforts toward gender representation in career agents, it often made a difference for participants. For example, Binna said, “I think every job that I interviewed for had a very good representation, which is why I didn’t have to think hard about it.” Saadri remembered situations where she saw the efforts in representation, stating,

conversations like women and tech and stuff came up in the interview and that kind of, I don't know, gives me an indication that the company really cares about women in tech and that there's an emphasis on it. So, it definitely put me at ease, you know. Yeah, it made a difference, I would say.

Seeing gender, race, or ethnic representation among the career agents and/or discussing the companies’ approach and values around diversity sent welcoming signals to the participants.

In the absence of these conversations or representation, participants would question the gender representation. Janet said, “[It] makes me question if I'm getting interviewed by only males, are there any females on there and why can't a female [person] interview me at the same time?” Ariel stated, “You can't help but wonder, like, ok you know, this team is all men right now. Like, how did that happen?” Rea spoke on the lack of race/ethnic diversity, stating, “Lack of representation of other colors showed me that they weren't, maybe they weren't doing enough to get those and that didn't feel right for the things that I stand for. I think they need to do more.” The lack of representation sent a signal that the company might not care about diversity or inclusion.

Some participants spoke about their heightened sense of gender and ethnic/racial diversity in general. Uma remarked, “I also see it’s male dominated in data science field.” Harper shared similar perspective, saying, “The further I go into leadership, the more responsibility I take on, the less frequent I see the same number of females. And I think the more we talk about it, the more I’m just so aware.” Ayotola expressed her thoughts about the general lack of diversity in the tech workforce and how she felt underrepresented as an African American woman. She discussed how the Google interview process bolstered her confidence as someone who felt underrepresented in technology, noting,

So that was definitely a reinforcement for I guess like my confidence, my ability to move in this career field, in this space, because obviously there's not a lot of women you know, not a lot of African Americans.

As evidenced in Ayotola’s statement, she was aware of the lack of representation in technology. Aiza also spoke about how she felt underrepresented, recalling,

I think the first thing that I walk into the room that I noticed is like, is there any other visibly Muslim woman there? And I'm kind of used to being the only one. I kind of like being the only one because it makes me sort of like be special in a way because I'm the different one. But I also like I, that's the first thing that I notice. And then the second thing I notice is like, am I, are we the only, or am I the only woman there?

These participants were aware that they had identities that were underrepresented in technology, and they were cognizant of when they were the only one in the room representing their gender, race, ethnicity, or religion.

While many participants had a heightened sense of awareness of gender and racial/ethnic diversity, a few others expressed being desensitized. Lissa said, “I think I actually only interviewed with one [woman], and it didn't really occur to me to think that was weird at all.” Participants noted how they had gotten used to be “the only.” Nora gave voice to this idea with her sentiment,

I just kind of got used to it. Like, I noticed that sometimes, like where I would be the only girl in the room or the only woman in the room. But eventually I just got used to it, so I never really... like when I started interviewing, I guess through the process, I never really thought about it. I mostly think about it when someone else mentions it.

Ariel noted that a lack of diversity in career agents made her wonder what caused women to not be represented, but she also said, "you just get used to it. Like in my, at the computer science department at my college, there were more professors named Chris than there were female professors."

Many participants touched on how representation impacted their career search experience and interactions with career agents. Rea said, "[It] [d]efinitely changed the way I behaved." Aiza recalled how she found male interviewers to be intimidating and felt more comfortable making mistakes around women. She explained,

I feel more comfortable and like making a mistake in front of a female peer versus a male because I feel like, oh my God, they might think that I don't know how to code or something like that or I'm not like legit. So, I definitely have that awareness of like who I'm around.

Olivia concurred about being more comfortable with female interviewers. She said,

She came across as, she, it felt like she made effort to make me feel comfortable. In a way that I don't necessarily feel like I always receive when, my team now is fine but interviewing with men in tech. With men in tech, it's sometimes feeling a little bit more like a competition on who's the most intelligent, even with, like, little coding puzzles or things that doesn't. I don't feel like it mattered to the role itself.

Ayotola expressed how she felt more comfortable in interviews with female interviewers but was not sure why. She said, "I think I perform better in those interviews too. I don't know, I don't know why but maybe just like more comfortability speaking to them." Janet's comments spoke of a similar preference for female interviewers. On male interviewers, she commented,

I think it's just the mental thing and just thinking like, oh, it's a male, then I have to have to be on top of my game. He's probably going to be expecting that I should know it all for this and so on. And their expression isn't very... it's difficult to tell if you're doing well or not. It's very just stoic, I would just say. So, you're just like, oh, am I doing right? Am I being judged?

Janet also noted how she might be more comfortable around female interviewers because these interviews tended to be less technical and more behavioral. Overall, many of the participants

expressed being more comfortable around female career agents and performing better in interview situations with balanced gender representation.

Most participants' experiences with female interviewers were contrary to Lissa who talked about how female interviewers made her nervous, saying "she knows I'm capable of more. Sometimes it's harder to, like, pull the wool over their eyes; I know that's a really, really bad thing to say." Lissa's comment indicated she felt female career agents would not hold stereotypes or biases about the abilities of women in STEM, and the female career agents would have high expectations, which made her nervous.

A few participants spoke about how representation did not affect their career interactions. For example, Teja spoke about how representation did not impact her performance during interactions with career agents. Teja noted that this may be since most of her interviews were virtual and had camera turned off. In this situation, gender, race, and ethnic representation may not have been salient factors because Teja could not see the career agents or notice their nonverbal actions.

Generally, participants expressed preference for gender and racial/ethnic diversity and noted that it influenced their interest in a company. Ayotola said, "It made me excited that I was speaking to a woman," and Janet remarked, "I always say representation does count." Olivia shared, "And so it was nice to interview with somebody who wasn't... who wasn't male." Rea expressed how she gave preference to companies and team with diverse representation, stating,

I also ended up giving preference or looking at certain teams with more preference when they had better representation or they showed, even if not representation, but they showed a certain respect for being able to work in a diverse environment.

Ariel also noted the impact that gender diversity on her career search experiences, recalling,

I have my list of interviewers and I look them all up on LinkedIn, if they're all like white men, I've noticed that does kind of like put me off a little bit versus if I see like some women in there, like people of color or like anyone who's not that identification... I find that a little bit more encouraging, not just about the interviews themselves, but kind of about diversity at the company.

Diverse gender, race, and ethnic representation among career agents was preferred by most of the participants.

Most participants spoke about seeking diversity in the workforce or at least a commitment toward cultural diversity in their future employer. Ayotola said, “cultural diversity in the workforce composition was very important to me, like when I was researching companies.” Ayotola added that “it was very important to me to be in a place where I wasn’t, I didn’t feel like emotionally compromised or constantly uncomfortable. And yeah, I think that played a big part of my job search.” Later she shared, “I do my job better when I am comfortable.” Rea stated she was seeking a “role where I can be a part of a team that accepts a diverse set of candidates, a diverse set of backgrounds, and is conducive to growth.” Elizabeth also spoke of a desire for her employer to have a commitment toward diversity and inclusion, sharing that they did not want to be at a company with a “boys club and a girls club.”

For some participants, representation was a key factor in making decisions about the viability of future employers. This commitment was also demonstrated through Parul’s story. In response to a question on if representation mattered, she related,

It did for me, yes. So, there was this one place I interviewed for where I did not see any women on the interview. Like the onsite, full, onsite. I think even on the phone interview, like it was [only men]. So, during the behavioral round, I asked, “What is your what does your engineering team look like? Are there women engineers on your team?” And it's like, “How does that matter?” That was the response I got.

In response to a follow-up question on how the response by the career agent made her feel, Parul noted,

I was definitely not going to accept that offer. So, yeah, it was like, you know, it was unexpected... and the person seemed shocked by my question that why would I even ask something like that? Because I've not seen any women. I had not talked to any women... And I have been in a place like that where the complete engineering team is a boy's club – like all men, and they won't do it, like beer and cigarettes and all of it. And so, I mean, it's not just that like, you know, you don't want to be the lone female engineer and be sidelined.

Even more than lending comfort in their interactions with career agents, gender, and ethnic/racial representation in career agents gave participants a sense of a company's commitment to diverse representation in the workforce.

### *Social Capital*

When recounting their experiences with social capital, some participants spoke about feeling isolated while others shared how they were connected and supported by their communities. For example, Peyton, who had been struggling with her career search not gaining traction (e.g., applications were not resulting in interviews), mentioned that “it doesn't feel like there's a lot of community [in the career search journey].” Conversely, Binna said, “you're not the only person going through this and there are resources out there.”

Harper shared thoughts on how the community was both helpful and difficult to connect with. Harper said that she found the school community to be “confidence giving and also intimidating because people's skill sets vary a lot, but everybody is they're so helpful. The community aspect of [school name], I'm so happy I did it.” Harper also mentioned how working in a male dominated profession made her wish she had opportunities for more community. Harper was not geographically located in the same country as her graduate school, and she shared how living a great distance away from the school, even though it was a virtual program, felt isolating. When describing some difficulties in her career search, Harper noted that “not knowing the right channels to improve the network” was a barrier. Harper desired greater community to help share information and serve as emotional support through her career search experiences.

Similarly, Wendy shared how she had been in tech for many years and that her school network was inspirational but also that her career overall had “been a very lonely journey.” Wendy spoke about how as a woman and a Mexican who spoke English as a second language, she often felt alone in her career and noted that “being the first one in something is difficult.” Some participants



mentioned the importance of seeing other women in leadership positions so that they could feel they also belonged in leadership, Janet expressed the challenge of connecting to these women. She said,

It's very inspirational to see other women really in those high rankings. But it also feels like, at times for myself, it's very difficult to reach out to them, meaning that they're just not accessible because you don't get to meet a lot of women in tech as much. And when you do, everyone's still trying to get their stuff together as well.

At times, making connections was difficult and while their networks might be inspiring, there could also be a lack of support and connection.

Other participants stressed the need for community as emotional support. For example, Mia spoke about the need to share negative career search experiences to prevent intimidation and isolation. She observed,

I would probably suggest to have some emotional support. And it could be like it could be like me sharing my terrible interview experience and make it funny, hilarious because I feel like sometimes, we don't share the failure enough that at least when I started, I felt like, oh, everyone got really good job, they got into their dream company; but didn't know it really took a lot of tries.

After Mia's statement, Binna concurred saying, "It's hard out there." Rea agreed and said, "You do need emotional support. You do need people to keep bringing you up when you keep feeling worthless." In addition to leveraging classmates, participants used friends and family for emotional support. Both Aiza and Peyton spoke about the emotional support their partners provided during their career searches.

Some participants spoke about how their graduate school facilitated programs assisted in building community. For example, Ayotola talked about the difference joining a gender focused leadership development program had made for her in building connections and community with other women. She mentioned,

I needed that for like my professional growth, I think it was really important for me. Yeah, the sense of community definitely let me know, like even if you do speak out and you say the wrong thing like it's okay – like everybody does that. Like it's not, it's not like a "just you"

type of thing, which is really important. I think that was something important that I need to get over for... or I'm still getting over that. I think that also helped me in interviews on my career search, like helped take some pressure off.

Having a facilitated community building program helped Ayotola overcome potential isolation.

Mentors could be a critical source of social capital, with participants talking about guidance and opportunities they received from mentors. Nora recalled how a male manager helped her and provided career advice: "He helped me updated my resume too, and he was like, you're underselling yourself." While Nora mentioned a male mentor, all other participants who brought up mentorship stressed the importance of female mentors. Harper highlighted the difference she had found in male and female mentorship, recounting,

But another mentor that I had... believed in me to give me that opportunity and I think that's why representation is so important. Because you see where they [women] are, they see where you are, and you pull each other up. And you see the potential. And again, not to say anything negative about my male mentors. I think they're phenomenal and they've given me a lot of great advice. But for my own personal experience, it has not been any male mentor that has thought of me to pull me in a role, which is interesting.

The mentors could serve as an important resource for making the career search process less obscure.

Mentorship might be important, but it was not always available. Wendy recalled how she wished she had more mentorship and has felt like she has been carving her career path alone, without guidance. She said,

I think I've been...I've been doing this on my own. I feel sometimes like super lost. I had these moments of illumination where like, for example, I'm going to change industries. I'm going, but I don't have like a like an elder sister or someone who is who should tell me, hey, you should do this. I think that this will be good for you.

Wendy was not able to connect with a mentor and expressed feeling isolated.

Participants also leveraged their community for feedback on their interactions with career agents (e.g., resumes, interviews), as feedback was lacking from the career agents themselves. Binna talked about using her classmates for help, saying, "So having a study group or having that Slack channel where I could ask questions and seek feedback that made me less blind in this in this dark

journey of job search." Uma concurred, noting, "The only way I have gotten feedback is by again, similar to Binna, repeating the questions to friends and asking them how, like telling them this is how I responded" Ayotola had similar comments about relying on her community for feedback, remarking, "maybe everyone isn't like as crazy as me, but like my mind's going to just be all like, what was it? Like, what went wrong? Like sharing it with other people. Like, like what sounds wrong here to you?" Wendy, Mia, and Rea also shared how they used friends to help gain feedback and interpret interactions with career agents.

Participants could use their social capital to directly move their career search forward with job referral and insight into opportunities. Participants talked about how they got opportunities from the school, such as Saadri when she said, "I don't think I reached out to people on LinkedIn, but professors who are now working in a company or in the tech industry, I'd reach out to them and ask if they knew anyone who was hiring." At times participants were surprised to find that faculty recommended them for jobs with alumni, without checking with them first. This happened to Wendy, who was surprised to find out that she had been referred to her current position by a male faculty member. Participants talked about the importance of social capital to get through the application process, including Elizabeth talking about how they used networking. Lissa noted, "I've had much more luck pulling those personal connection strings," and Ariel concurred, saying, "a personal connection is a must." A few people spoke about how connections were more important than skills. For example, Aiza said, "Having those connections that really brought me in and not my skills," while Wendy mentioned, "I think that I have always gotten like a job from connections more like than really like going and showing my skills." Ariel said of her new job, "just because my friend had added me to the Slack channel, I ended up with this job." Ariel had seen the open role shared in a Slack channel for women in data science and reached out personally to the person who posted the opportunity; this connection then helped Ariel get to the interview stage.

Peyton agreed with the importance of personal connections, saying, “It can be better to have a connection at a company. I think that’s probably true for anywhere, but definitely in tech specifically.” At the same time, Peyton also expressed how building these connections was difficult. She commented,

Well, one, I struggle. It feels a little awkward for me... To just like, cold message someone that you've never met who's a name on the screen to just say, hey, we'd love to chat about something. But I'm trying to... I'm trying to get better about that.

Uma also expressed difficulty using personal connections. She recalled, “So I applied my job search through the job portals, and sometimes I reached out to my connections. This part, I do not enjoy that much because I feel ashamed to ask for help.” While Saadri shared how personal connections were essential in obtaining her first job after finishing her undergraduate degree, she said that she had more luck when she was applying online. She said, “I had more luck hearing back from people actually when I applied online versus when like I went to an actual person and asked them to refer me or anything like that.” Saadri was the only participant to share they had more luck applying through job portals than from personal connections.

A few other participants also talked about how they had trouble accessing their community, including the graduate school community, for career support such as information on the career landscape. Nora shared,

I don't really have like a network of people in the tech industry that I could go to and really like get a good feel about what is the day to day like in these companies outside of my current world.

Peyton felt like the community in her graduate program was lacking, saying, “But I did think there would be more community. I guess where I am going with this, it doesn’t feel like there’s a lot of community.” Participants like Peyton did not see a way to connect to the graduate school community.

Many participants found that their degree gave them credibility through their connection to a distinct social group in their degree program and university. For some, this credibility was a key reason they entered graduate school. Aiza talked about how she found that the degree gave her credibility in their interview process and recalled a career agent who told her, “One of our employees was a [school name] alumni. He did the same thing and we’re like confident that you can too.” This happened to other participants as well, such as Ayotola who said, “They guy who was interviewing me there had mentioned like, oh, you’re in the [school name] program. Like, someone else on the team is there too.” The brand of the degree was found by many participants to be an important factor in its credibility. As Wendy said, “obviously the name – that was very important. As I said, it’s like belonging to a very good club that that matters.” Teja spoke about the school’s credibility as well, asserting, “the brand is so huge.” Saadri conveyed how the degree gave her credibility, noting that another person from her school network reached out to her saying, “Hey, I saw that you’re a fellow [school reference]. I have this position open. Would you be interested?”

Conversely, Peyton found that the degree did not grant her the social capital leading to opportunities she was expecting. Peyton expressed her disappointment in her education stating, “I found initially, maybe again expecting too much, just having [school name] like on the education piece [of my resume], I thought that would be like, oh wow. Oh, I thought that would be a leg up.” For Peyton, the social capital her degree afforded did not overcome her lack of direct experience in technology.

While social capital could be used in many ways during their career search experiences, individual participants were not all able to access and use social capital in the same way. Some found it easy to connect to mentors and their community for emotional support, others felt isolated. Some felt inspired by their graduate school community, others were intimidated. The network was useful

to some, while others found it hard to access. Social capital was important but also nuanced and depended on many individual factors.

#### **Theme Four: Ambitious, but Sometimes I Lose Hope**

When asked for one word to describe her career search, Rea said, “Ambitious, but sometimes I lose hope.” This phrase captures **theme four: ambitious, but sometimes I lose hope** and how the participants had ambitions for their career and expressed confidence and excitement in their technical skillsets, yet at the same time they had moments where they questioned their ability to obtain the roles that would let them employ their skills. This theme has two divergent subthemes. The first subtheme is **sometimes I lose hope: doubt my potential and place in technology**. In this subtheme, participants talked about how the constant rejection and being evaluated with rigid standards created situations where they doubted and questioned themselves. In contrast, the second subtheme is **ambitions: recognition of potential and understanding that the process does not always recognize them**. In this subtheme, participants expressed confidence in themselves, their technical abilities, and their place in technology. When asked about their technical skills, participants would talk about their love of engineering and analytics and the joy they had working in this area. When they were confident, and often in hindsight looking back at their career search experiences after they secured a role in technology, the participants were able to believe they had a place in technology.

##### ***Sometimes I Lose Hope: Doubt My Potential and Place in Technology***

When participants felt their potential was not recognized by career agents, they often doubted and questioned their capabilities. Rea’s comment captured this when she recalled,

There have been a lot of reasons to just doubt and question myself, despite the fact that I'm able to answer a lot of the questions that they're asking me, which is also despite the fact that they're not measuring my potential at all. They're measuring my experience.

In these situations, participants could lose hope and experience doubt in their abilities to be successful in their career search.

Some participants learned that their past work was not always valued because employers had difficulty seeing them in a different job title or job category than the ones they held previously, and this could erode confidence in their abilities to make a career change. For example, in one situation where Peyton did not meet the exact experience requirements, she was offered an interview for an entry-level job with less pay and rank than her previous position. When asked what this meant to her, she said,

That my ten years of experience means nothing. And that, like, I'm competing with, like call it fresh out undergraduates, like, and then I start to almost have like fears of like, am I too old? ... It's like I start to just chip away at it, chips away at my confidence basically as an applicant, because now I'm thinking, am I being unrealistic? Did I approach with the wrong set of expectations? Do I just have to like, bide it, and serve the time? You know what I mean? To try to get there faster again, it feels like moving backward.

Peyton had ambitions in technology, but when her potential was not recognized she would question her place in the industry.

The constant rejection participants faced in their career search led participants to question if they were qualified enough and would be successful in their search. While she was in the middle of her search during her focus group, Rea spoke about constant rejection and shared, "I'm so broken by the fact that someone rejected me, that, oh, I met, you know, like [name] said, I applied when I met all criteria." In her focus group, Lissa talked about how it was frustrating to not know how career agents were determining her qualifications. She said,

I felt that I was 80% applicable to the role. And I know for women it's usually just like, don't just apply to roles just because you don't feel like you're qualified. But even these roles where I was super qualified, I wasn't hearing anything back...

Harper also recalled the difficulties in her career search and how constant rejection made her question herself. She conveyed,

But I also maybe I'll just be really honest, since this is research, there's a little bit of imposter syndrome. Like I have a clear record of success in in these roles that have always been dominated by males. And it used to not really affect me much, but... I don't know. I'm a bit nervous about my skill set. I don't know. Yeah, I don't know. Maybe you've heard that. Or maybe you haven't. But now you have.

While Harper shared how she had a love of technology and passion for working in data science, her lack of success in her career search made her feel at times like an imposter in technology.

Ayotola had a sequence of rejections and recounted the impact they had on her and how she felt like an imposter, saying “I just kind of like, all right, I guess towards the end of like the repetitive not getting the roles kind of like, oh, am I underqualified for my job? Like, do I am I actually not as qualified as I think I am?” At the same time, Ayotola was able to keep her confidence up when she entered the interview process with a large tech company where she eventually received and accepted a full-time offer. She shared,

But by the time I got to the [large tech company name] one, I was very much like... positive reinforcement to myself. Like, you got this. This is it. This is yours. Like, they wouldn't keep entertaining you if they didn't want you.

After she got an offer with the company, Ayotola expressed what this meant to her confidence:

But I think that getting through those six interviews with (company name) was like, I guess a good confidence booster and also like reinforcement. Like, you absolutely know what you're doing and you're absolutely capable of working anywhere, especially like (company name).

Ayotola spoke about how the other companies did not see her potential, pointing out, “It was very much like you didn’t want me, but you know, this like billion-dollar, number one company in the world does, so it’s absolutely fine.” Ayotola felt validated by her job offer when before she doubted her abilities due to the constant rejections she faced.

The constant rejections coupled with a lack of feedback was particularly difficult. Binna spoke about this saying, “Then that still [feedback] helps me make sense of this rejection and accept it.” She then further elaborated, asserting,

Something that's so valuable about getting feedback is if I don't get it, that rejection definitely gets to my sense of self-worth. So, like, I feel like I as a whole, am not enough. I'm



not good enough, I am inadequate. But when I get feedback then I know, okay, I am enough. But I also have this room for improvement and I'm able to separate that feedback from my entire sense of self and worth.

Multiple participants spoke about how feedback let them separate rejection from self-worth and accept the process as fair; however, as discussed in theme one, feedback was usually absent. About this, Rea said,

Then you start to judge. So, then you go to the other side of the coin where the world is a terrible thing to you. It's like a coin swiveling, but there are lots of reasons, although there are lots of questions that you don't have answers to because of the no feedback. And those make you question both your self-worth, how you presented yourself, how you answered everything, and how you were judged.

Participants questioned themselves and their skills when they did not have feedback to help them understand rejections. Ayotola spoke about fixating on rejection saying, "The constant rejection, like the walking away, like 'I wonder what it was,' like that that's very heavy.... Like to be wondering constantly like, oh, like what went wrong? Like, did I do it, was it me?" It was easy to become fixated on rejections and their possible causes because participants did not know how to improve.

Unclear or misaligned expectations also contributed to a sense of injustice and losing hope in having a successful career search. A misalignment in expectations could negatively affect a participants' self-worth. Binna again touched on this with her remarks,

Sometimes they [expectations] are misaligned, and this is when I can either feel like I am not enough because the expectations were there, and I just might like misinterpreted, or they the expectations are way higher than what I am able to achieve. So, in that case, I fall into this category of being not enough.

Misaligned expectations felt unfair and if participants did not understand or know the expectations, they could also feel that it was their fault and blame themselves for not being good enough.

The constant rejection and hits to their self-worth at times lead to participants revising the expectations they had for their career. Parul said, "I only apply for jobs where I feel like satisfy most of the requirements. So yeah, the typical like, you know, under confident." When asked where this under-confidence came from, Parul observed,

I should... should be more like confident given that I've been here in the industry for a very, very long time. I don't know why. I don't know why it is, but it's probably because I've always had to work really, really hard at everything that I get.

Peyton also spoke about being under-confident, sharing,

I just immediately think because I don't have that type of experience, that's just I'm not going to be qualified. Yeah. So, it's been hard because I'm trying to navigate that tech landscape and not diminish what I have skill-wise, but it's been hard to find where I fit to be totally honest.

In this way, participants like Peyton overcame rejection and rigid standards by lowering their own expectations for their careers.

Another strategy participants shared to overcome rejection and meet rigid standards was filling gaps in their experience. Harper spoke about adding to her resume, saying, "I don't have any clearly stated data science experience, except I have worked with data science. So, I think that's a gap, but it's something I'm working on." Harper shared how she was considering taking a step down in level at her current company to gain technical experience. Many other participants also spoke about needing to get a foot in the door. Peyton expressed, "I guess I'm just going to have to earn less to try to get a foot in somewhere." Binna made a similar comment, noting, "even if I was getting low balled, if this would get my foot in the door, then that might have been enough incentive for me to just take it." Mia spoke about revising her expectations to get more experience, sharing,

What if I just instead of applying for a data scientist role, what if I aim for analyst role and just get into the company, get into the team that I really want to and then be promoted from there.

Again, rejection could lead to participants doubting their potential and seeking to overcome the gap in experience that career agents saw.

When participants were successful they did not always attribute the success to their own hard work or skill. Participants doubted themselves and could not see how their efforts led to success. Often this was because the career search process did not make sense. Participants could not understand the process and therefore could not see how they could be successful – it must be luck.

Saadri said, “Because it's such a black box to me, like in my head, I'm like, oh, there's definitely luck involved. Like maybe someone applied before me, and they got the interview.” Lissa said of her recent job offer, “I got it by accident because I got lucky.” Multiple other participants mentioned how luck, and not skill, played a deciding factor in their success.

### ***Ambitious: Recognition of Potential***

While they at times doubted themselves, participants also spoke about the potential they had to make a positive impact in a technology career. Participants spoke about efforts to showcase this potential to career agents. For example, common refrain was how participants tried to demonstrate to career agents that they could learn on the job. Saadri said, "When I was applying, I really tried to focus on the fact that I was capable with, with any, like throw any technology at me." Janet mentioned something similar. When speaking about her interview experience, she recounted,

They just asked me if I had experience in certain things.... And I just, I'm like, well, if I don't know, I can learn it. But demonstrating.... I faced a situation where I didn't know how to do something.

Participants tried to represent their potential confidently and help career agents recognize their value.

This strategy of demonstrating their potential was prevalent when the participants were asked about how they chose to represent themselves on their resume. For instance, Aiza shared,

Here's my impressive resume. I know the skill of, like, figuring it out. So, if I even don't know what you're asking me for, I can like, I can promise you that I can figure it out. So, I think that's, that's so far it has worked out.

Ayotola also described how she demonstrated potential on her resume, noting,

So, I think it represents, I guess, how versatile I am in my career or in this field. And then also I know that I'm pretty early in my career, so I kind of just wanted to come across that like I'm capable of a lot or like I can learn quickly.

Another time Ayotola spoke about her belief that her work would override bias and barriers she might face, saying,

Even with all the biases that could be I could be, I guess, potentially faced with, I really just really, like ride on the fact that my work will speak for itself. So then if someone did see my work and my name was too much, like my name overpowered, like the work that I've done, then it's not the place that I'm supposed to be.

Even though the participants like Ayotola knew they would face barriers, they hoped to present themselves well enough to overcome barriers.

Participants knew their own potential was valuable, and they simply had to find the companies that would recognize that fact. Rea spoke on this at length, mentioning, "I can see the other roles that will value the fact that I have this knowledge, this foundational knowledge that I can grow more." While she struggled with her career search, Peyton also sought out companies that wanted to develop and support their employees, which demonstrated to her that they would value her potential. She said, "It really says a lot to me if there's a capacity to develop people." At times participants also expressed how companies were missing out on their skillset because they failed to recognize the potential. Binna recalled,

My co-workers have told me I've never seen anybody ramp up so fast. And every time I hear that, I'd be thinking about all these job opportunities that I missed because they required this past experience and what they command. Like you guys missed out. Yeah, whatever you were asking didn't get you the results you wanted because this is who I am.

Participants like Binna recognized that it was not their fault that companies did not see their value. They had the skills and just needed to find a company that would recognize their skills.

Participants spoke about a believe in themselves and the valuable technical skills they possessed, even if these skills were not recognized in the career search process and during interactions with career agents. The participants were at times able to attribute their rejection to the process and not to their own skillset. For instance, Parul shared,

Like, so when I first started searching and I used to get rejected and no feedback, I would be like, I'm just not worth it. So, but I gradually realized that I started getting more acceptances, that it's more a matter of who's looking and what they're looking for and if I satisfy that, at that point; it's, it's not about me, you know.

Janet also spoke about trying to not let the search discourage her, sharing,

I tried to not let them discourage me because I guess it kind of put in that mind frame, like, you know, do I want to doubt myself so much that I just never take that chance as opposed to some other, you know, think of a guy who'd be like, well, I didn't get it. And then they'll keep on going, you know?

All participants recognized that they had value and worth in technology, and while the rejections could cause a lack of confidence in their abilities to navigate the career search, they still had confidence in their skills and aspirations in technology.

Participants were able to understand how the interviews did not always allow them to showcase themselves at their best. Wendy spoke about how interview processes that forced candidates to react in real-time, during high pressure situations, and made it so that candidates were not able to perform their best. She asserted,

They are discarding a lot of different personalities that can be very useful because not all of us like to be under pressure all the time. And because I live my life not to have that pressure, I am always on time. I plan things even I let myself some time to relax. That is real life for me. Not everyone is like me. But what about those personalities they're leaving them out.

Similarly, Teja related a technical interview experience that did not set her up to help her perform her best. The interview was time-bound, and she was tasked to complete four problems in a set period, but she was unable to complete the task in these conditions. When I asked Teja if she felt she could do the problems if there was not the extreme time restriction, she said, "Yes, definitively... Yeah, yeah, yeah, yeah, yeah, yeah." She mentioned later, "Interviewers is something that is out of your control, how they will say and how what they will say to make you comfortable." The interviews were often viewed by participants as an artificial and unrealistic environment for measuring their value as workers.

Rea shared how she saw most interviews as environments that made it difficult to be successful. She once forgot how to answer a question during a stressful interview. About this experience, Rea said, “I just forgot it because of her, her way of treating me. So eventually I was able to attribute it to something outside of me. Yeah. I don't know if that was a coping mechanism.” If participants were rejected after an interview, it may not be because they did not have the right skills or abilities, but rather that they were not able to showcase these attributes and abilities in the interview.

While it was hard when companies filtered them out, participants expressed how they thought they would eventually be successful, and it was a learning process they had to get through. They could learn to present themselves in the way that companies wanted to see them. Uma gave the advice, “Even if one interview does not work, does not mean it is the end of the world. It's a learning process. It's a journey. You learn something that you will be applying in the next job.” While not having feedback made the learning process difficult, participants used online resources and their social capital to make continual improvement and changes in their approaches.

Many participants spoke about how practice made them better. Wendy said, “I feel like you also develop a muscle for interviews... I think that practice is, I think, the key for all of this.” Parul mentioned how practice was useful to her, saying, “I believe preparation does make a big difference because I am so under confident.” It was a process they went through. Aiza summed this up, saying,

But it was definitely a learning process in terms of I had to learn what, how to present myself and what skills to highlight in order to be the best candidate. So, I think it started out as a struggle, but it got easier throughout.

Interviewing was not a natural experience, and with practice, participants became better at showcasing themselves in interviews.

The participants had confidence in their skillsets and many expressed how they felt they would eventually attain a fulfilling career in technology. Rea talked about her belief that she would be successful in realizing her ambitions and how the process challenged this belief. She said,

I mentioned that I'd never want to lose the grit and belief in the fact that I can work hard, do anything. I hope that never breaks, but there is a chance. I'm not. I'm not a saint. I'm not a rock, I'm not a mountain. I'm human and might break.

Rea also spoke about how next time she goes through a career search, she will hold on to her confidence. She said,

I will be more restrictive, and I will try to preserve my wellbeing and it's taught me that it's okay to do that. It's okay to refuse teams that are offering you certain things if they disrespect you because it's given me some amount of confidence that I can get others.

Once participants were successful in attaining the job, they had more confidence that they could be successful again.

While the career search process challenged them, participants overwhelmingly spoke about the confidence that, if hired, they could be successful in their chosen career field. Uma said, "I feel know your worth. What you are capable of. Have faith in you." When asked if she felt she could be successful, Peyton said decidedly, "Yeah, yeah," and then elaborated, "I do, I do... love it." The participants were invested in their STEM careers.

Participants spoke about how their classroom experiences gave them confidence in their skill set. Teja said, "I knew that I'm the best here because given the education and all the like, the [school name] degree and the kind of projects that I did during this." Oliva shared how a key classroom project gave her confidence, saying, "And so I think through that process, like I stepped up. I felt like I had to take greater ownership of the process and be more confident in my own abilities as a result." Wendy talked about how she learned to advocate for herself during her career search and stand up for her skillset. She asserted,

Because if we don't go for things, nobody's going to give that to us. And we should really go and ask for what we deserve. We should. We shouldn't be quiet. That's what I've learned. You think you need a salary increase? Go for it. And if they don't give it to you, there's going to be a company who actually gives that to you.

Participants had gained confidence through their graduation degree and were learning how to advocate for themselves as well as silence the doubts they had about their place in technology.

### **Theme Five: Aspirations as a Woman in Tech**

Participants expressed ambitious aspirations for their careers in technology, and **Theme Five: Aspirations as a Woman in Tech** is composed of two subthemes that represent those ambitions. The first subtheme is the **desire to fulfill my potential**. Participants spoke of desires for rich careers in technology where they could realize their potential and be leaders in their field. The second subtheme is desire to create change. Participants shared how they wanted to smooth the pathway for others (particularly women) to enter technology careers.

#### ***Desire to Fulfill My Potential***

Participants expressed being interested and invested in their technical careers, and they were confident that they had the skillset to be successful and fulfill their potential. Saadri touched on her career goals, saying, “But I do feel like I have what it takes to kind of be in a position where I'm able to design a solution, rather than kind of implement be the person implementing the solution.” While she was currently in a non-technical leadership role, Harper talked also about wanting to also fulfill her technical career aspirations: “I would really like to...be that technical person and also become a leader after being a technical person... I think that I really personally find value in that.” The participants were clear that it might take time to develop their careers, but they were committed to their goals. Wendy said, “I think that’s a never-ending process, but I think I want to do important projects for my career, for myself.”

Some participants expressed how they felt a need to ‘do justice’ to their educational journey and prove that they could realize their career goals. Teja shared that her graduate degree gave her



confidence and a meaningful skillset, and it was an injustice if companies were not able to recognize technical skillsets from students like herself. She spoke about how if students who went through her degree program were not able to reach their career goals, "...it will not be a justice to this [school] program." Peyton also conveyed how realizing her goals would prove that her journey had value. She said, "Like all the doors were shut. So, for me to still be on that journey but now have more time and more skills created specifically to get me there, it's going to be pretty monumental." Peyton added, it will "be confirmation that I can learn anything... getting teary eyed. It's empowering."

Getting a job in technology also provided validation that they belonged in technology and that their skillsets had worth. Olivia spoke about how getting job in technology was validating; she found it especially important to get a job at large technology company. She said,

I think on some level, ego driven because I wanted... for me, it's an accomplishment that despite having a nontraditional, I didn't come from a technical background, that I'm competent that I have... I can be confident my abilities because I'm a good fit in a technical role at a company known for the kind of work that I'm trained to do. That was important to me.

Olivia spoke about how she was the first in her family to go to college and secure a six-figure salary. She said "...it's been a big accomplishment to me to get from where I've been to where I am now." Similar to Olivia, the participants at times expressed how they felt they did not match the typical persona of a technology worker and realizing their aspirations validated that they belonged in the industry.

Most participants expressed how they wanted to continue growing their careers and fulfilling their potential. They placed a high value in working for employers where they would be continually learning. Rea expressed this desire, saying,

I hope that I never lose the grit and drive to work hard. It's unlocked a lot of things for me in life. It's unlocked all of the things that I have wanted. I hope I never lose that. So, nothing changes that. And I learn a lot. I also hope that learning rate is accelerated, is accelerated rate.

Nora talked about wanting to work with smart people on her team and one of the key factors driving Olivia's decision to accept her current role was that the company valued "employee professional growth." Peyton also expressed the desire to work for a company that fostered learning. She said, "I'm looking for companies that want people to learn, foster curiosity, have plans, or try to develop their... their talent, their hires." The participants had high aspirations for their career which did not end with the first job they took after graduate school. They desired to be with companies that would support their career growth.

### *Desire to Create Change*

Almost universally, participants expressed how they desired to create change in their career so that other women could fulfill their aspirations in STEM. Aiza mentioned, "I want people to have the opportunities that I didn't have." Wendy voiced the importance of making changes toward inclusion in STEM, sharing, "I feel I'm doing something important for my country, for my gender. And so that gives me a lot of happiness." Wendy was originally from Mexico, and she spoke about how important it was to inspire other women from her country, as well as women broadly. Participants like Wendy spoke about how it was important that they not only be successful for themselves, but that they help others as well.

One way that participants expressed creating change and easing the way for other women to enter technology careers was through sharing their stories. Ayotola said, "It [career search] was very difficult for me, but hopefully this study makes it less difficult for the next person." She went into more detail, remarking,

Hopefully it could help somebody else. I know this job search is probably a little bit harder for me than it would be for a man or someone who wasn't a person of color that was like looking for a job... But definitely I know there's a lot of bias in job search, like very strong biases that ultimately, I can't by myself do anything about. Like it's not my place. But like I think when people do studies and research like this, it definitely helps. Like if somebody shows you the numbers, like they can't refute that. So, I just want to kind of contribute to that, contribute to... I guess your efforts. It seemed like a study like that would be helpful to a lot of women and non-binary people.

Harper had similar thoughts about sharing her career search experiences for this study. Harper enjoyed her current role in leadership, but she wanted to transition to a career in technology. She shared,

I really just wanted to share my experience, even though I'm not kind of the die-hard looking for a new role. It's everything to me. I wonder if there are more people like myself. Sitting in roles like myself that if you don't talk to them, you wouldn't have the full picture. So that's why one should.

Participants talked about their stories creating change and serving as an inspiration. They expressed how they felt these stories might be hidden. Saadri mentioned how she did not always feel like society wanted to hear about the experiences of women building their careers in technology. She said this was a reason she volunteered for the study, noting,

I think why I volunteered is because, first of all, not many people really reach out to women and they're like, tell us about your experience. You know, really, no one really even cares. So, when I saw your email, it's like, "Oh my God, someone cares." Someone's doing this group or whatever, you know? So, I was like, that really was, was kind of was why it was like, okay, let's do it. I want to do it. But it's just yeah, that was my number one reason. Really. Yeah.

The participants felt that by sharing their stories they would help others not feel so alone and bring awareness to barriers facing women in technology.

Participants also spoke about creating change by serving as role models and helping to increase representation of women in technology careers. Nora said, "I really would like to be a role model for more women coming into the field." Of her career goals Harper said, "There's something about role modeling behavior so others see representation and encouragement. Something about helping others get there." The participants understood the value of role models and desired to use their experiences to serve as role models for others.

Gender representation was another area where participants wanted to contribute to change. Saadri said, "I think it's... representation is really important and if... if I'm able to show someone else that they can do it, then I think it would just make me really, really happy and proud." Ayotola also mentioned representing her gender and race in technology careers. She said,

I'd love to be like representation. Not just used as representation, but like I'd love to like get into a leadership role because I know there's not a lot of people that look like me and those people who are younger than me who don't have that representation. And I'd love to be that for someone.

It was important to participants like Saadri and Ayotola to represent their identities and perspectives in technology. At the same time, they did not want to be seen as token representation but as valuable contributors.

The participants talked about barriers they faced in technology careers and how they felt the need to help dismantle these barriers. Binna gave the advice for others who are interviewing to give feedback on the process, to let career agents know where the barriers existed either through surveys or crowdsourced websites, such as Blind or Glassdoor. She said,

That survey they send you after all of that [interviewing]. Use that to complain about your recruiter and condescending interviewers. Yes. Post about it on Blind. Post about it on Glassdoor there. Otherwise, yeah, somebody has to make a noise, and somebody will hopefully fix it.

Rea also said she wanted to help change the recruiting and interviewing processes, but from the inside; she shared,

Yeah, I think each level with the progression [of my career] will help me influence the process a little bit. And if I influence it for the hiring for the people that I'm responsible for, I'm hoping that it creates a ripple effect. And also makes it easier for my progression. I do think that's one of the barriers.

Wendy had similar comments about changing the interviewing process once she was able to establish her own career in technology. She said,

I think that there are many, many things inside the tech industry that are not correct. And I would like to help to correct that, obviously, because I think at some point, obviously, I will be new and everything. But at some point, if I get some level or position, I can say, hey, your interviews such let's just change the thing, you know?

The participants saw the career search process as something that could be improved, and they desired to share their experiences and use their positionality to recommend and bring forth changes.

While participants desired change, some also expressed the burden of creating change. Peyton said that the barriers in the career search which she experienced were often ignored – even when people knew the barriers were present. She gave the following analogy: “It’s an alarm, and you just put a bucket on it and don’t watch it or listen to it.” She expressed how needing to create change was hard, saying, “It is a burden to try to always be the change maker in the room all the time.” The need to create change and the experiences they had overcoming barriers became lighter as they shared their stories. Participants expressed gratitude for the chance to tell their story and focus group members appreciated their fellow participants. It was a form of emotional support communicated through laughter, tears, head nodding, and commiserating. Wendy articulated how her conversation made her feel more connected and less alone, saying,

I love that talking to the to the women in the program has been like has been very, very, very funny because even in that panel with you [focus group], I say that we have a lot of similarities, a lot of... and we don't even... I didn't know. Right? You feel alone and then but when you see you have people in common and doing this changes and that's a generational change.

The focus groups were unique experiences for these women to share their stories and learn from each other. They connected to each other and found value in that connection. They saw how their stories had potential for creating change by generating awareness of potential barriers as well as acting as sources of strength.

## **Chapter Summary**

In this chapter I explored the five themes that emerged from focus group discussions and individual interviews with female graduate students and alumni in tech. First, participants experienced their career searches as if navigating through a labyrinth. The career search process was obscure and time consuming, lacking in clear expectations or feedback on the participants’ performance. Participants struggled to gain information that would help them navigate their career

search, and their experiences were frustrating and exhausting; this is despite the fact that some participants had prior experience in the technical industry. Second, how participants were treated by career agents made a difference in their career search experiences, career progression, and career decision making. When participants were treated with respect and evaluated holistically, they felt comfortable with career agents and were able to make genuine connections and demonstrate their value. At other times, participants were treated with a lack of respect, interactions could be impersonal, and they were evaluated against rigid standards. At times the participants faced condescension, discrimination, stereotypes, and biases. Their performance under these situations was negatively affected, and participants questioned their ability to reach their career goals or find belonging. Third, both representation and social capital were significant to participants. Representation among career agents, including diversity in gender, ethnicity, and race, made a difference in most participants' interactions during the career search process. In addition, diverse representation in career agents gave indications of company culture and values. Social capital was valuable to participants as both a source of information for learning how to navigate their career search experiences and as a form of emotional support to persist and remain dedicated in their career goals. Fourth, participants expressed high confidence in their technical/STEM abilities but also doubts about their ability to attain their intended career goals. In other words, they had high STEM self-efficacy but at times, lower career self-efficacy. Fifth and last, participants were interested and invested in their STEM careers and desire to further DEI. Participants spoke of their aspirations as women in technology, including their desire to fulfill their potential as well as create change to make it easier for other women to engage in technology careers.

## **CHAPTER FIVE: DISCUSSION AND IMPLICATIONS**

### **Introduction**

This chapter addresses the findings of this study in the context of the research questions, conceptual framework, and existing literature. The chapter is organized into six parts. Below I first provide a short summary of the study, including the purpose and research questions. I then discuss a synthesis of the findings within the context of the research questions. Next, I review how these findings propose a revision to my conceptual framework. Following this are practical implications as well as limitations and considerations for future research. I end with a conclusive summary including key scholarly contributions and a reflection on how this study has impacted my work as a researcher, scholar, and practitioner in career development.

### **Summary of the Study**

The purpose of this qualitative study was to center the voices and perspectives of women who were going through a mid-career change, which they felt was often unseen and unnoticed, and in this study, I considered the career search experiences of female graduate students and alumni to highlight how their experiences and in particular interactions with career agents, affected career decision making and progression in STEM careers. To arrive at five emerging themes, I conducted focus groups and interviews with female students and recent alumni from a data science graduate program in the Silicon Valley. All participants had recently conducted a career search and interacted with “career agents,” which I defined as applicant tracking systems (i.e., software program that receive job applications), recruiters, interviewers, and hiring managers. The participants were united in that they sought to grow their technical careers toward roles in leadership or with recognized positional power such as managers or technical leads. During participant selection, I sought out individuals from diverse backgrounds, including different racial/ethnic identities. Interviews and

focus groups were analyzed using thematic analysis. The themes painted a picture of the participants' career search experiences, including supports and barriers they encountered.

### **Research Questions**

1. What are the career search experiences of mid-career female data science graduate students and recent alumni seeking to advance toward leadership roles in the STEM industry?
  - a. How do mid-career female data science graduate students and alumni make sense of these experiences, particularly interactions with career agents?
  - b. In what ways do these interactions affect career decision making and career progression?

### **Findings Synthesis**

This study found that participants experienced both barriers and supports during their career search experiences and interactions with career agents. Together, the barriers created a career search labyrinth that participants felt they had to navigate while trying to establish and advance in their technical careers. Originally used by Eagly and Carli (2007) to describe the barriers that women face in building their careers toward leadership, the labyrinth metaphor is an apt descriptor in career search experiences as well. While there are common routes through a labyrinth toward the end goal, the pathway is unknown and obscure to those who initially enter. Labyrinths differ from pathways in that they have barriers which force travelers to make uninformed decisions and navigate through twists and turns to reach the end. Similarly, during their career search, participants experienced barriers in the process that were unexpected and created an uncertainty about goal attainment. The supports that participants relied upon or sought out were ways to dismantle or overcome barriers in their career search experiences and interactions with career agents.



The following synthesis will first explore the barriers found in the career search labyrinth and then review the effect on career decision making and career progression. The career search barriers and supports fall under two general categories: those that are related to the process of the career search, and those related to culture, climate, and community. In reviewing the effects of career search experiences on career decision making and progression, I will discuss impacts on career self-efficacy, or the confidence participants had to achieve their career goals, and motivation. Barriers in the career search labyrinth were found to impact participant decision making and career progression through affecting career self-efficacy and the participant's desire to create change.

### **Career Search Process Related Barriers**

#### ***Expectations***

Findings from this study illuminated how a lack of information regarding expectations for applications, interviewing, and job performance created a barrier during the career search process; conversely, when expectations were transparent, they helped to support the female participants in their career search. The literature also describes a lack of transparency in career search expectations (Behroozi et al., 2020a; D. Ford et al., 2017). While this study focused on graduate-level participants, many of whom had previous professional experience in technology fields, much of the literature focuses on undergraduate candidates who are completely new to technology (Lunn, 2021; Lunn et al., 2022; Lunn & Ross, 2021a). Despite the participants of this study having relevant experience, they still lacked clarity around expectations in the career search process. Participants described attempting to use resources, such as job descriptions, to learn about interview and job expectations, however they found job descriptions to be overwhelmingly vague and not useful. This tracks with literature which notes job descriptions are frequently reused, not tailored for specific roles, and may be overstuffed with unnecessary requirements (Fuller et al., 2021). The participants in my study struggled to gain information about recruiting processes, even when they asked career agents for

assistance. Findings from a white paper by Gartner (2021) suggested that men are more likely to receive help on their applications and receive relevant information during the recruiting and hiring process. Indeed, the female participants in my study recalled how they struggled to receive help on their applications or information that could help them navigate their career search.

My study found that a lack of clarity in expectations made it difficult to prepare and manage time and effort in the career search, which contributed to the process feeling frustrating and exhausting and could also lead individuals to opt out of job opportunities when there was a perceived low return on investment for efforts. The literature also showed that job candidates find the career search process in tech to have overwhelming time demands that create frustration and anxiety (Behroozi et al., 2019; Lunn et al., 2022; Lunn & Ross, 2021a). Participants often described not knowing how to proceed or spend their time, which is similar to findings related to undergraduate students having a lack of insight into interview preparation (Lunn, 2021). (Lunn, 2021). Most study participants were working professionals, some with significant others and family members. They described having to tightly balance demands on their time and de-prioritize career opportunities where they perceived significant competition or barriers. This concurs with research findings showing that if women do not feel they will be successful, they may be prompted to opt out of the process (Schuster & Martiny, 2017; J. L. Smith et al., 2013).

My study found it could be difficult to acquire information about open roles that could help prepare thoughtful responses and generate questions to use during interactions with career agents. This lack of information also made it difficult to make career decisions. Generally, there was a lack of information specific to open positions to which participants were applying, including job performance expectations, expectations from the potential work team, and expectations related to overall company culture. This finding on the a lack of job related expectation information is consistent with research showing that undergraduate women struggle to access information from

career agents that help them make decisions (Lunn & Ross, 2021a). There were notable exceptions, times that participants in my study recalled career agents helping them to fully understand open roles; these were recalled as enjoyable and enriching experiences that aided participant career decision making.

### ***Feedback***

A lack of feedback throughout the process was also a significant barrier preventing female job applicants from learning from their experiences. Participants in this study revised their career search strategy throughout their journey and described an iterative approach, which is a recommended strategy in career search processes (Burnet & Evans, 2016). However, their career search revisions were at times uninformed as they did not receive feedback from career agents on their performance. Receiving feedback is an essential component to iteration and strategic decision making in the career search (L. Thompson & Schonthal, 2020). However, research by Behroozi et al. (2020a) and Lunn et al. (2022) shows that while feedback is strongly desired by technical job candidates, it is also largely absent. The absence of feedback creates a barrier toward understanding and navigating a career search. This prevented participants from making informed decisions and resulting in a loss of trust in the career search process.

The study participants overwhelmingly experienced variability in their career search, and without feedback this variability was unexplained; participants were therefore unable to predict when or why their applications or interviews would result in success. The literature on feedback is varied, with some studies showing that low performers do not learn from feedback ratings on their performance because they have a lack of self-awareness (Ehrlinger et al., 2008; Hacker et al., 2000). However, high variability in results was found to prevent learning from past performance (Geraci et al., 2023). Explanatory feedback could make all the difference in explaining the variability, allowing participants to be reflective of their experience, and to make informed iterations and improvements.

Participants related a few instances where they received feedback and how they incorporated what they learned into their application and interview preparation; these were instances where participants felt in control of their performance. A study on improving learner metacognition in health professionals concurred with the literature above as well as my study, noting that improving awareness of performance requires transparent and relevant expectations, concrete, timely feedback, and the ability to be reflective and ask questions of the feedback provided (Medina et al., 2017). The participants in this study expressed a desire for this type of feedback to help them make informed decisions in navigating their career search.

Another way the absence of feedback created a barrier was by causing participants to lose trust in the career search process. A 2022 North American Candidate Experience Benchmark Research report by TalentBoard (2022) found that providing feedback to candidates can increase perceptions of fairness, and conversely an absence of feedback could create a sense of unfairness or lost trust. study findings highlighted how job candidates are frequently left to wonder what happened to prevent their application moving forward resulting in feeling disrespected in the process (Behroozi et al., 2020a; Burge III et al., 2021). When applicants could not understand the process, they lost trust that the process was logical, fair, or comprehensible by anyone.

### ***Evaluations***

The experiences of participants being evaluated by career agents was often described as rigid evaluations, a practice that started at the application stage where candidate resumes were often evaluated by an ATS software program. Utilization of an ATS is standard practice and research on Fortune 500 companies show that 99% use an ATS (Qu, 2023), with midsize enterprises also shown to extensively rely on an ATS (Fuller et al., 2021). Most participants felt the ATS did not have enough flexibility or leave room for interpreting transferable skills that may have been gained through academic or past work experience outside of the technology industry. There are many

pathways into technology careers, and women often have transferable experiences (Twine, 2018); participants felt this experience was discounted in the application screening process. Research agrees that job applicants find diverse and transferable experiences to be discounted (Behroozi et al., 2019; Fuller et al., 2021). In a 2020 employer survey with 2,275 respondents, it was found that 88% of employers vetted out high skilled candidates from the job pipeline due to rigid evaluation criteria, including college degree(s) and possession of precisely described skills (Fuller et al., 2021). Participants in my study actively worked to avoid having their application filtered out during the application stage through an ATS.

Rigid expectations during interviews requires job applicants to provide demonstrate their technical competency in very specific ways. For example, participants spoke about needing to provide specific and exact answers to technical questions. This is similar to findings in a 2019 qualitative study reviewing over 45,000 comments on HackerNews related to technical interviewing (Behroozi et al., 2019). Participants shared how it was challenging to perform under rigid conditions where they had to code and complete technical problems in front of a reviewer while simultaneously explaining their thought process. This performance process has been described as similar to the Trier Social Stress Test (TSST) (Behroozi et al., 2020b), which is a research tool used to produce an acute stress response under experimental conditions and considered the “gold standard” for examining acute stress in humans (Allen et al., 2016). Accordingly, while participants spoke about how they enjoyed and felt comfortable coding, performing this same practice in front of an interviewer caused them to freeze and experience high levels of stress and anxiety. This feeling is consistent with experiments conducted around coding in private versus coding in front of an audience (Behroozi et al., 2020b, 2022). Together, needing to provide exact answers under specific and artificial conditions was found to be difficult.

Overall, a common feeling among participants in my study was how their potential to make a positive contribution in technology careers was discounted by career agents who focused on rigid evaluation standards. This is similar to findings in a 2020 study on recruiting at large tech companies, which found that candidates often had to match rigid expectations during interviews and demonstrate fit through social connections, education, and impact-oriented communication that demonstrated industry experience, and personality (Chua & Mazmanian, 2020). Participants in my study described feeling a lack of respect or consideration for their skills and knowledge gained from their education as career agents instead focused on their specific experience (or lack of experience) in technical companies. Research has shown that underrepresented workers can see their potential as discounted, with employers focused on matching candidate backgrounds to rigid standards rather than considering the value, or potential, a candidate may possess (Fuller et al., 2021). Some research also found that women may be rated lower than men on potential in evaluations despite higher job performance (Benson et al., 2021) and women seen to face higher scrutiny in performance (Correll et al., 2020). In this study, participants described feeling like career agents were seeking ways to find fault rather than seeking to understand how the participants could add value.

Of particular concern is how participants faced evaluation of their personality and if or how it matched the cultural norms of the company. This practice is seen by job candidates as subjective and potentially biased (Behroozi et al., 2019), and it can also be discriminatory. One participant in my study was told she was rejected because she was not “googly” enough. This practice is one for which Google is currently facing a lawsuit for discriminatory employment practices and policies (Nayak & Bloomberg, 2022). The lawsuit was brought forth by a former recruiter at Google who stated, “Hiring managers viewed Black candidates as not ‘googly’ enough and interviewers ‘hazed’ Black candidates and asked them ‘level-inappropriate questions’ to hurt their hiring prospects” (Nayak & Bloomberg, 2022, para. 6). Experts in DEI and social justice have identified how

companies have cultures biased toward white supremacy cultural practices and furthermore, there is bias in general professionalism standards that are commonly upheld in the United States (Gray, 2019; Kim, 2021).

Building on the work of many racial justice activists and scholars, Tema Okun (1999) developed a list of characteristics of white supremacy culture, and these characteristics were seen in the evaluation practices experienced by participants in my study. For example, participants often mentioned how they were expected to solve technical problems in the exact method that the career agent was seeking, which fits the white supremacist characteristic of “only one right way” (Okun, 1999). The participants also experienced white supremacist characteristics such as “paternalism” and “power hoarding.” One participant spoke about how if you interview at Amazon, you must demonstrate an explicit match with their principles of leadership; some of these principles can be mapped directly to white supremacist cultural characteristics. For example, Amazon’s principle “bias for action” relates to the white supremacist characteristic of “sense of urgency,” and their principles “insist on the highest standards” and “are right, a lot” relate to the white supremacist characteristic of “perfectionism” (*Leadership Principles*, n.d.; Okun, 1999). A recent survey of tech workers conducted by the *LA Times* found that half of survey respondents found tech not inclusive of people from diverse backgrounds (Bhuiyan et al., 2020), and studies showed that students feel tech needs to improve inclusivity (Behroozi et al., 2019; Lunn et al., 2022). This concurs with the findings in my study regarding rigid evaluations regarding cultural fit, which at times were not felt by participants to be inclusive or equitable.

On the other hand, at times participants in my study described holistic evaluations where career agents sought to understand their potential related to their education, diverse work experience, and overall capacity to add value. In these situations, study participants found they could use projects from their education in lieu of industrial or work experience. It must be noted that it is

possible that participants were afforded this opportunity due to either prior vetting through social connections or that their degree was highly valued due to the school's prestige. Both social connections and school prestige have been found to make a difference in the evaluation of job candidates (Chavez, 2020; Chua & Mazmanian, 2020). Under holistic evaluation, participants also found they did not have to demonstrate correct answers, rather their potential to find answers and think through problems while under pressure (Behroozi et al., 2018, 2022; Behroozi & Parnin, 2018) was valued. Participants found this still difficult task to be easier than overcoming the barrier of not knowing exactly what answer the interviewer might want to hear under rigid evaluation practices.

### ***Interactions***

Participants often felt interactions with career agents to be critical, impersonal, and lacking in respect, which is consistent with findings in research showing that interviews in the tech industry are generally lacking in a welcoming atmosphere or interviewer disposition (Behroozi et al., 2020a; Lunn et al., 2022). Participants spoke about condescending interviewers who were looking for mistakes and overly critical. Frequently, participants used the word interrogation to describe interviews, recalling meetings with career agents who just wanted to get the interaction over with and not spend additional time making a genuine or friendly connection. Participants could feel that career agents were treating them like a headcount instead of a real person – they did not feel respected. This is consistent with a report on Black engineering students, where participants described feeling a lack of respect from interviewers ((Burge III et al., 2021). The practice of ghosting was experienced by participants in my study, and this contributed to an overall feeling that career agents did not respect their time and effort; this was also cited in relevant literature on interviewing in the technology industry (Behroozi et al., 2020a; Lunn & Ross, 2021b).

Study participants cited that their performance was negatively affected when interactions with career agents were critical, impersonal, or lacking in respect. They shared how they became



more anxious and forgetful; they were unable to solve problems they previously had studied and to which they knew the answers. There is a lack of research on how the behavior of career agents impacts the behavior of interviewees (Latu & Schmid Mast, 2016). That said, one 2016 study found that male interviewers' dominance (lack of friendliness) predicted lower self-evaluations and interviewer evaluations of the interviewee's performance (Latu & Schmid Mast). This is in line with the findings of my study which found that the career agents' behaviors affected participants. When a career agent was critical and dominant, the participant was generally more anxious and often had lower performance. In addition, recent studies on technical industry interviews showed that stress (or anxiety) can impact cognitive load and is correlated with not being able to solve technical problems (Behroozi et al., 2020b, 2022).

Most studies showed a correlation between anxiety and lower interview performance (Mastrella et al., 2023; Powell et al., 2018). For example, job applicant performance is negatively perceived when job applicants demonstrate nonverbal cues related to anxiety, which can include the use of filler words (e.g., um, ah), fidgeting, lack of eye contact, and lack of smiling (Mastrella et al., 2023; Naim et al., 2018; Powell et al., 2018). The literature showed that interviewers rate interviewees who are comfortable and confident during the interview as having higher performance during the interview and having higher hire-ability (D. Ford et al., 2017; Chua & Mazmanian, 2020; Naim et al., 2018). Even in situations where interviewees had identical performance (e.g., the same answers to interview questions), the interviewees who exhibited anxious nonverbal behavior were given lower interview performance ratings (Mastrella et al., 2023). Study participants felt aware of situations where their anxiety led career agents to become less interested in the interview and more critical; in these moments participants sensed their anxiety resulted in the career agent giving them lower performance ratings, which then fed into the participant's sense of anxiety and stress. Even

though participants were often negatively perceived when they exhibited signs of anxiety during an interview, this has not been found to predict future job performance (Mastrella et al., 2023).

While participants could feel anxiety and stress resulting in lower performance during critical interactions with career agents, they could also be found to feel comfortable and confident during collegial and collaborative interactions. That is not to say these interactions were not intellectually challenging, but rather that participants felt more comfortable making mistakes, explaining their thought processes, and asking the career agent clarifying questions. In these situations, participants described feeling supported and connected to the career agents; there was a sense of camaraderie.

### **Culture, Climate, and Community**

#### ***Stereotypes, Biases, and Discrimination***

Stereotypes, biases, and discrimination were an ever-present mental load for participants in this study. Most participants did not recall concrete examples, but they often wondered if these factors played a role in their interactions with career agents. Some participants recalled how they were aware that stereotypes, biases, and discrimination played a role in their career search experiences, even if they could not see exactly how. Research concurred that stereotypes and biases are a key factor in the career journeys of women in technology (Hill et al., 2010), including at the application stage (Hareli et al.; Parasurama & Sedoc, 2022). In fact, some research found that when gender is made salient, career agents find women to be less desirable candidates (Friedmann & Efrat-Treister, 2023; Rattan et al., 2019). A qualitative research study of female engineers representing diverse racial and ethnic backgrounds indicated women can be reluctant to call out stereotypes, biases, and discrimination (Doerr et al., 2021). These previous findings are supported by my study, where participants felt stereotypes, biases, and discrimination played a role in their career search, even when they often could not or did not want to identify specific instances.

That said, a few examples of gender bias were mentioned by participants. One participant spoke of her experience with discrimination in evaluations, noting she had faced salary discrimination and was told she was a diversity hire. Research has demonstrated earning a lower salary and being treated less competently are both issues women face (Botella et al., 2019; Pew Research Center, 2018). Other participants recalled being treated differently during interview processes, such as facing paternalistic behavior. One Black female participant described an experience of stereotype threat when she spoke about not wanting to fulfill a negative stereotype a career agent had about women. Stereotype threat can harm career progression for women in technology, as when they are feeling the pressure of stereotype threat, they may perform to lower standards (Corbett & Hill, 2015; Shaffer et al., 2013).

A few participants also mentioned concerns about stereotypes due to women being perceived as caregivers and having reduced time or capacity for work. One participant proactively addressed this by telling career agents she did not have a husband or children. One study found that male career agents displayed a preference for men in hiring and were worried about women's availability to work longer hours (Friedmann & Efrat-Treister, 2023). This study also found that when women added a note to their resume about having full-time childcare, men displayed less bias against female candidates. Other participants spoke about needing to establish their careers before starting families, as they were concerned about any perceived bias they might face if they were seen as caregivers for children.

Race also plays a role in the career search and some participants mentioned concerns specifically in this area and felt it was an additional barrier to overcome. Others described microaggressions, such as not being expected to speak English. Women of color may face a double bind of being confronted with stereotypes and biases related to both race and gender (Ireland et al.,

2018; L. Malcom & Malcom, 2011) with research also finding microaggressions more commonly faced by women of color in the workplace (McKinsey & Company, 2019).

Some participants shared that even if stereotypes, biases, and discrimination were present, these factors could be overcome with hard work. The belief that hard work can overcome these factors are ways to assert control over the situation, along with dismissing that stereotypes, biases, or discrimination exist in the first place. Research shows that these are strategies used by women in STEM to make progress and make sense of their situations (Doerr et al., 2021). The technology industry and STEM fields are considered meritocratic; that with hard work anyone can be successful (Doerr et al., 2021). However, STEM fields are based on the experiences and perspectives of white men, and therefore, they marginalize women and minimize their ability to control success in these areas (Doerr et al., 2021). While dismissing stereotypes, bias, or discrimination or believing they may be overcome with hard work can lead to a sense of control for women, multiple studies show that there is a real and persistent gender bias toward male candidates for technical roles (Fernandez & Campero, 2017; Friedmann & Efrat-Treister, 2023; S. J. Lunn & Ross, 2021a).

To counteract stereotypes and biases, other participants chose to modify their behaviors. A few mentioned modifying the pitch of their voice or choosing to adopt a more serious and stern tone. These are agentic behaviors that tend to be thought of as more aggressive and dominant and are stereotypically ascribed to men (Amon, 2017; Carli et al., 2016). Research revealed that when women adopt agentic behaviors, they are found to be a more favorable fit for positions that are traditionally thought of as male (Wessel et al., 2015). However, even when women adopt agentic behaviors, literature notes they may still be seen as less favorable than men (Juodvalkis et al., 2003), which may be related to the double bind that women face in needing to seem both likable and assertive, or communal and agentic (Amon, 2017; Carli et al., 2016; Cowgill et al., 2021).

## *Social Capital*

Social capital was found to be an essential component of the career search experience, even though there could be barriers to accessing social capital. Social capital was important for networking, as an information source, and as a form of emotional support. Most participants used their school networks for referrals as they found that applying to jobs online was not an effective strategy. This was difficult for some participants, and that aligns with research that shows women have less access to social capital in male dominated professions, such as engineering (Shantz et al., 2011; Twine, 2018) and that men are referred to open positions more often through their networks (Bian et al., 2018; Fernandez & Rubineau, 2019; Rubineau & Fernandez, 2013). Social capital was also deemed useful for insights into the career search process and mentorship, although again some participants found it difficult to access their network in this way and felt isolated. Research also shows that social capital is useful as an information source (Lunn, 2021; Shantz et al., 2011; Twine, 2018) and for mentorship, which can be critically important for women in technology (Ireland et al., 2018; Makarem & Wang, 2020; Ong et al., 2018); however, there can be barriers to accessing networks in this way in part due to the lack of diverse representation in technology, which can leave women out of the loop (Ireland et al., 2018; Twine, 2018).

Participants overwhelmingly spoke of their social networks as a form of emotional support, especially leveraging familiar capital to help overcome the stress of the career search. When participants did not have social capital related to the technology profession, they turned to friends and family members for support. Research shows that familial capital is often used by female students to overcome obstacles (Lunn, 2021) and having social capital for emotional support increases persistence and confidence (Lunn et al., 2021b). When they doubted themselves, social capital in the form of emotional support helped participants to stay strong and persist in their goals.

## ***Representation***

Interactions with career agents mirrored current research on the technology industry revealing an overall lack of gender, racial, and ethnic representation where job applicants were most likely to meet with white or Asian male career agents (Lunn & Ross, 2021a). Study participants expressed meeting with mainly white and male career agents. A few participants mentioned being desensitized to seeing a lack of representation in career agents, but almost all noticed the lack of diversity. It made a difference in how comfortable they felt and in how they evaluated the company.

The lack of representation can lead to a feeling of isolation. The literature documented that women in technology frequently reported feeling this way, and these feelings often were amplified for women of color who have even less representation (Cabay et al., 2018; Cowgill et al., 2021; Ong et al., 2018). One participant, who was female and Muslim, mentioned how she looked specifically for other Muslims or women during her interactions, resulting in generally feeling isolated.

Participants spoke about how interacting with male career agents was more intimidating than female career agents and that they felt their identities as capable and valuable individuals in technology were threatened. Experiencing gender identity threat during career interactions, which can lead to less confidence or decreased performance, is also documented in the literature (C. M. Steele, 1997; van Veelen et al., 2019). Participants also mentioned that interacting with female career agents brought them confidence. A Black female participant mentioned how interacting with a Black female career agent gave her a feeling of belonging and value while another participant mentioned how women help other women to thrive. This sentiment was also found in the literature on benefits of gender diversity in technology teams (Kohl & Prikladnicki, 2022).

My study found that women wanted to work at places where they felt safe, which to them meant workplaces that supported diversity and had policies in place to address equity and inclusion. Study participants found diverse representation among career agents to be one signal of a company's

commitment in this area. Research also found that workers value democratic and innovative companies which have practices and policies in place that support diversity (Kohl & Prikladnicki, 2022) and that candidates with underrepresented backgrounds seek out signals that companies respect and value diversity (Klysing et al., 2022). Participants described wanting to avoid “bro” culture, or chilly environments where incivilities and microaggressions against women are common and where women can be excluded and harmed professionally (K. Miner et al., 2019). This type of culture is more common in environments that have a lack of gender diversity; literature showed that ‘brogrammer’ culture and chilly environments are a negative factor in technology companies (Kohl & Prikladnicki, 2022).

## **Decision Making and Career Progression**

### ***Impact on Career Self-Efficacy***

While the participants in my study expressed they had high self-efficacy for their technical skills, the barriers women encountered in their career search and interactions with career agents affected their sense of career self-efficacy, or their confidence that they could achieve their career goals. The literature indicated that interactions with career agents can cause women to have career-related doubts (Carlone & Johnson, 2007; Ireland et al., 2018; Lunn & Ross, 2021a; Makarem & Wang, 2020). For example, a study by Carlone and Johnson (2007) found that when women are not recognized for their talents and potential, their career self-efficacy is negatively affected, and they experience disruption in their career pathways. A few participants in my study became less active in their career search due to reduced career self-efficacy; they stopped applying as they were unclear how they could be effective. Importantly, they did not stop believing in their career goals or confidence in their STEM skills, but their career search was disrupted.

Especially when identity factors such as gender and/or race were made salient, participants doubted their potential and place in technology and their career self-efficacy was negatively

impacted. For instance, when participants faced career agents who were male and white, participants expressed lower confidence in their ability to attain a role where they could apply their skills. Gender and race can also impact sense of belonging in STEM, particularly if gender and/or racial bias are present (Carlone & Johnson, 2007; Moss-Racusin et al., 2018; Rainey et al., 2018). Overall, literature agrees that gender-related barriers can cause women to doubt their place and role in technology.

A few of these participants noted they felt imposter syndrome, because they could not understand why they were not making progress in their career search or why they were facing constant rejections. Other research also showed that, in interactions with career agents, such as technical interviews, women demonstrated high levels of imposter syndrome, more frequently than men (Burge III et al., 2021). As part of experiencing imposter syndrome, participants were concerned about being exposed as frauds who were not able to deploy their skills in the industry, particularly during career agent interactions.

One way participants held to the aspirations to fulfill their potential was to seek out workplaces where they felt their potential would be recognized. The decisions on where to apply were often affected by how successful participants felt they would be in the interactions with career agents at a particular company or in a particular industry. For example, some participants chose to peruse technical roles in non-technical companies, as they felt the career search process in these companies allowed them to better demonstrate their value. Again, studies showed that women seek out places of belonging in technology, and environments where women do not have a sense of belonging is a key reason why many leave technology careers (Corbett & Hill, 2015; Ong et al., 2011, 2018). Participants in this study cited a sense of belonging as a sense of being valued and recognized for their potential. In addition, participants in this study sought workplaces that demonstrated commitment to diversity and inclusion. Participants desired a role within a company where they felt they could be successful, and signals of commitments to DEI indicated they would be valued.



Literature showed that women desire to be in a workplace where they can thrive (Glassdoor, 2021; Handshake, 2021; Klysing et al., 2022).

### ***Impacts on Motivations***

While participants expressed doubts in their career self-efficacy and ability to find belonging in a technical company, they did not express doubts about their technical skills and abilities and in fact, were highly motivated to fulfill their potential. They had high self-efficacy related to their data science and technical skills, indicating high STEM self-efficacy. Participants mentioned loving technology and learning about new ways to apply their skills. Research showed that even when the potential of women on STEM is not recognized by career agents, they retain confidence in their skills and aspirations to fulfill their career goals and potential in STEM (Carlone & Johnson, 2007; Lunn, 2021). As such, the confidence in STEM self-efficacy and the aspirations to fulfill their potential seen in this study and in concurring research indicate women persist in their career development, despite facing barriers. When women in this study were met with barriers, they both doubted their career self-efficacy and were motivated to push harder to develop skills and persist in building their careers.

Women in my study also spoke about their desire to create change in the technology industry, to make it more diverse, equitable, and inclusive. There was an almost universal desire to create change so that other women could fulfill their aspirations in STEM. They spoke about wanting to evolve the career search process, including interactions with career agents, so that the process allowed candidates to showcase their skills and strengths more effectively in relation to the job requirements and didn't automatically shut out candidates with underrepresented identities or diverse work experiences. For example, participants spoke about influencing interview processes to account for a candidate's transferable skills and ensuring that hiring criteria was realistic and matched the real-world job requirements for technology roles. This perspective concurs with

findings that female managers do more to further company efforts in DEI (McKinsey & Company, 2021). To be successful, women in my study not only wanted to fulfill their own career aspirations but help others as well.

### **Conceptual Frameworks**

As theorized, my study found that structural or contextual factors along with individual or psychosocial factors (figure 3, pg. 29) interplayed with career search experiences to drive outcome expectations and career choice; however, a complexity was revealed around the individual/psychosocial factor of self-efficacy which deepens our understanding of women's experience in the career search. In Social Cognitive Career Theory (SCCT), self-efficacy is the driving individual factor affecting career progression (Lent, 1994). In SCCT, learning experiences can affect self-efficacy; for example, a negative STEM classroom learning experience can have a correspondingly negative affect on self-efficacy and lead to a woman opting out of STEM. My study revealed how learning experiences in different areas (e.g., skill development versus career search) have unique effects on self-efficacy; this concurs with other research around female career development (Carlone & Johnson, 2007). For example, an individual may have high STEM self-efficacy from completing their graduate degree and taking the lead on technical projects. They may feel confident in their STEM abilities to overcome barriers in learning technical skills and leverage educational support systems. At the same time, an individual may have low career self-efficacy from barriers present in the career search labyrinth, for example facing continual rejections without feedback to help them improve. In other words, women can have both high STEM self-efficacy, or high confidence in their STEM skillsets, while at the same time they may possess low career self-efficacy, or low confidence in their ability to be successful in their career search or career progression. Recognizing the complexity around self-efficacy is significant because it highlights the distinct effect of career search experiences on a female career progression.

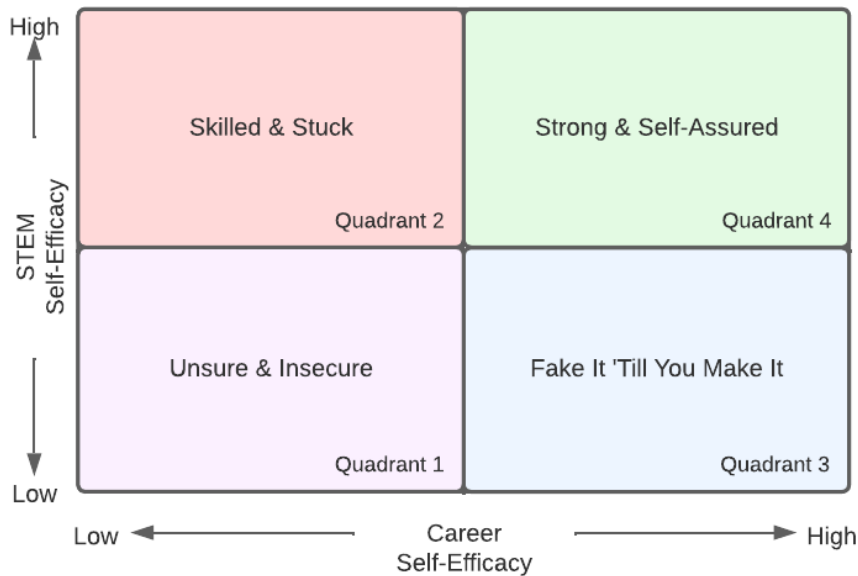
A model showing the relationship between self-efficacy, learning experiences, and structural/contextual factors is displayed in Figure 4. This model showcases findings from this study of how STEM self-efficacy and career self-efficacy interplay to affect career progression. It builds on the SCCT model as well as other research examining the career building experiences of women in STEM. In the model, I noted structural/contextual factors as either barriers or supports. In my study, structural/contextual factors showed up as barriers, such as lack of feedback, or supports, such as timely and actionable feedback. The presence of barriers was found to lead to low career self-efficacy, while the presence of the support condition led to high self-efficacy. While it was not the focus of this study, in the SCCT model it is found that if a woman had barriers present during STEM learning experiences, she could experience low STEM self-efficacy, versus supports during STEM learning experiences producing high STEM self-efficacy (Lent, 1994). In Figure 4, four quadrants of how barriers/supports affect STEM self-efficacy and career self-efficacy are identified.

The four quadrants in Figure 4 depict the effects of STEM and career self-efficacy. In quadrant 1, there are barriers in STEM experiences and career search experiences which lead to low STEM and low career self-efficacy. Quadrant 1 is labeled “Unsure & Insecure” as in this situation a woman might feel unsure in terms of their STEM skillset and insecure about their place in the career landscape. In quadrant 2, structural/contextual factors show up as forms of support in STEM learning experiences, but as barriers in career search experiences which may result in women feeling they are skilled in STEM but stuck in their career search. This situation can halt career progression and even lead to women opting out of STEM careers. Quadrant 3 displays the situation where there are barriers in STEM learning experiences but supports in career search experiences. This leads women to feel less confident in their STEM abilities, but confident in their abilities to be successful in career development; I labeled this situation as “Fake it ‘Til’ You Make It.” The last quadrant (4),

depicts support structures in both STEM learning experiences and career search experiences, resulting in women feeling confident in both areas – or “Strong & Assured.”

**Figure 4**

*Self-Efficacy in STEM & Career Learning Experiences*



	Unsure & Insecure	Skilled & Stuck	Fake It 'Till You Make It	Strong & Self-Assured
<b>Self-Efficacy Status</b>	Low STEM & Low Career Self-Efficacy	High STEM & Low Career Self-Efficacy	Low STEM & High Career Self-Efficacy	High STEM & High Career Self-Efficacy
<b>Structural/Contextual Factors</b>	Barriers in STEM Learning Experiences & Career Search	Supports in STEM Learning Experiences, Barriers in Career Search	Barriers in STEM Learning Experiences, Supports in Career Search	Supports in STEM Learning Experiences & Career Search
<b>Impact</b>	Women feel like imposters in STEM skillset & career progression.	Women feel confident in STEM skillset, but unable to establish their tech career.	Women do not feel confident in STEM skillset, but can progress in their career.	Women feel confident in STEM skillset and ability to make progress in their career.

### Practical Implications

This study has practical implications for how universities and technology companies support women in their technology career search experiences. Specifically, the findings point toward

recommendations to transform structural/contextual factors from barriers to supports in the career search, helping women to develop high self-efficacy in their career search. In other words, these recommendations can be used to help dismantle the career search labyrinth and develop career search pathways. Table 10 provides a description of barriers that were identified during this study in the career search labyrinth, as well as descriptions for building toward the adoption of the corresponding support. In the following narrative discussion, I will review the barriers as well as the recommended supports. In this section, I will also put forth recommendations on actions companies and universities can take to transform barriers into supports. I will end with a suggested framework career agents and universities can use to audit their career search and recruiting systems to foster the creation of sustainable change, thereby transforming the career search labyrinth into career search pathways.

**Table 10**

*Recommendations for Transforming Barriers to Supports in the Career Search Process*

<b>CAREER SEARCH PROCESS</b>	
<b>Barriers</b>	<b>Supports</b>
<p><b>Unclear, Misaligned Expectations</b></p> <ul style="list-style-type: none"> <li>- Lack of clarity on expectations for job applications and interviewing (e.g., vague/generic job descriptions, interview questions are unknown).</li> <li>- Recruiting expectations feel misaligned to expectations for successful job performance (e.g., must demonstrate knowledge or experience unnecessary to fulfill role or responsibilities, evaluated under artificial conditions such as solving time-constrained technical problems and simultaneously communicating thought process in front of an interviewer, a practice known to increase stress).</li> <li>- Lack of open, bidirectional communication.</li> </ul>	<p><b>Transparent and Relevant Expectations</b></p> <ul style="list-style-type: none"> <li>- Transparent expectations for job applications (e.g., clear and tailored job descriptions, skillset expectations are mapped to application and interviewing rubrics) and interviewing (e.g., interview questions and interviewing expectations are provided).</li> <li>- Recruiting expectations are aligned to what is necessary for successful job performance (e.g., interview questions are connected to real-world tasks and responsibilities).</li> <li>- Open, bidirectional communication and support is available (e.g., open office hours, hosted Slack teams, practice interviews, resume reviews).</li> </ul>
<p><b>Unclear or Absent Feedback</b></p> <ul style="list-style-type: none"> <li>- Subjective or absent feedback on application or interview performance.</li> <li>- Frequent “ghosting” or rejection without explanation.</li> <li>- No opportunity to provide feedback on the recruitment process or interactions with career agents.</li> </ul>	<p><b>Timely and Actionable Feedback</b></p> <ul style="list-style-type: none"> <li>- Specific, timely and actionable feedback is provided on application and interview performance, including reasons for rejections.</li> <li>- Follow-up with all candidate communication, expressing empathy and respect.</li> <li>- Invite anonymous feedback from all candidates (including rejected candidates) on the recruiting and hiring process.</li> </ul>
<p><b>Rigid Evaluations</b></p> <ul style="list-style-type: none"> <li>- Rigid set of qualifications to evaluate applications and performance during interviews (e.g., direct match to certain criteria such as related work experience and years of experience).</li> <li>- Specific correct answers are required for problems that have multiple solutions.</li> <li>- Rigid set of qualifications to demonstrate cultural fit.</li> </ul>	<p><b>Holistic Evaluations</b></p> <ul style="list-style-type: none"> <li>- Expand criteria used to evaluate qualifications and look for demonstrated potential and transferable experience (e.g., career agents seek to understand a candidate’s potential related to their education, diverse work experience, and capacity to add value).</li> <li>- Focus is on understanding a candidate’s thought process instead of their ability to provide exact answers.</li> <li>- Flexibility in how candidates demonstrate their ability to contribute to the organization’s culture; seek out diverse perspectives, personalities, and work styles (e.g., cultural add instead of cultural fit).</li> </ul>
<p><b>Critical Interactions</b></p> <ul style="list-style-type: none"> <li>- Interactions with career agents are impersonal and career agents are often disengaged.</li> <li>- Interactions are lacking in respect (e.g., interviewers and hiring managers feel condescending).</li> <li>- Career agents are overly critical, seeking to find and interrogate candidate mistakes.</li> </ul>	<p><b>Collegial Interactions</b></p> <ul style="list-style-type: none"> <li>- Career agents seek to create personal connections and a welcoming and friendly atmosphere; career agents are fully engaged and present during interactions.</li> <li>- Career agents actively try to demonstrate respect for the candidate’s skillsets, time, and efforts.</li> <li>- Career agents are supportive and collaborative during interview interactions, understanding that interviews are inherently stressful, and candidates may exhibit signs of anxiety, make mistakes, and struggle to perform their best under interview conditions.</li> </ul>

<b>CULTURE, CLIMATE, AND COMMUNITY</b>	
<b>Barriers</b>	<b>Supports</b>
<b>Stereotypes, Biases, &amp; Discrimination</b>	<b>Equity &amp; Inclusion</b>
<ul style="list-style-type: none"> <li>- Presence of stereotypes related to gender, race, ethnicity, and other identity-based factors (e.g., microaggressions, usages of biased cultural norms, discrimination in terms of evaluation or salary).</li> <li>- Inability to ask question on topics which may lead to bias or discrimination (e.g., work life balance).</li> <li>- Signals are present which indicate weak commitment to diversity, equity, and inclusion.</li> </ul>	<ul style="list-style-type: none"> <li>- Career agents are engaged in regular, ongoing dialogue and reflection around the potential for stereotypes, biases, and discrimination, including how they show up, how they may affect candidates and career agents, and how they can be addressed.</li> <li>- Ensure information around topics which may lead to bias or discrimination is provided without prompting.</li> <li>- Embed throughout the process signals that demonstrate genuine commitment and value for diversity, equity, and inclusion.</li> </ul>
<b>Lack of Social Capital</b>	<b>Availability of Social Capital</b>
<ul style="list-style-type: none"> <li>- Lack of access to networks for information or assistance in the career search process.</li> <li>- Candidates are not able to gain referrals or credibility as job candidates through professional networks or social networks.</li> <li>- Candidates are isolated as they move through their career search experiences.</li> </ul>	<ul style="list-style-type: none"> <li>- Access is provided to networks for information and assistance in the career search process (e.g., candidates are directed to resources and activities for building professional networks to gain information, mentoring, emotional support, and career search assistance).</li> <li>- Referrals are used sparingly as a form of recruitment, with a recognition that they may perpetuate lack of representation and excluded marginalized groups.</li> <li>- Candidates can connect to career agents in informal, social settings so that they may ask questions and gain credibility by developing relationships with career agents and gaining fluency in the technology industry nomenclature and culture.</li> </ul>
<b>Lack of Representation</b>	<b>Presence of Representation</b>
<ul style="list-style-type: none"> <li>- Lack of gender, racial, ethnic, or other diverse identities represented among career agents.</li> <li>- Diverse representation and commitments to diversity, equity, and inclusion are not addressed during interactions with career agents.</li> <li>- “Chilly” environment pervades and sends cues that women are unwelcome.</li> </ul>	<ul style="list-style-type: none"> <li>- Seek to have diverse representation in career agents, while not tokenizing or overly burdening workers with marginalized/underrepresented identities.</li> <li>- Career agents proactively and thoughtfully (with education, support, and reflection) address topics such as diversity in the workforce and commitments to diversity, equity, and inclusion.</li> <li>- Examine the recruiting and hiring process for signs of a chilly environment and seek to send signals of inclusion.</li> </ul>

**Recommendations for Moving Career Search Process-Related Barriers to Supports**

The first career search process-related barrier is unclear and/or misaligned expectations, which includes limited visibility of job requirements and the processes of recruiting and hiring, particularly for under-represented groups (Behroozi et al., 2019, 2020a; Lunn et al., 2022; Lunn & Ross, 2021a); this can be transformed into transparent and relevant expectations. For companies, this would start with establishing relevant expectations for applications and interviews which are

mapped to realistic job requirements (e.g., real-world tasks and responsibilities). These requirements would then be shared with candidates through clear and tailored job descriptions and recruiting expectations, which could include application or interview rubrics and sample interview questions. In addition, there can be an open line of communication for candidates to ask questions, such as regular office hours, a general email, or other forms of messaging systems (e.g., Slack). Candidates should be encouraged to ask questions and companies can strive to create a welcoming atmosphere and establish trust so that candidates feel safe asking questions without penalty. Options for the evaluation of technical abilities that mirror job expectations and are not artificially associated with stress or anxiety could be considered, including retrospective think-alouds (Behroozi et al., 2020b) or asynchronous completion of technical tasks and presentations (Behroozi et al., 2022).

The role of universities in establishing transparent and relevant expectations lies in advocacy and education. Universities can advocate to companies/career agents for transparency, ask questions to ensure they understand expectations before sharing job opportunities with students, and engage in dialogue around why artificial interviewing practices are harmful. Universities can also provide clarity around expectations by creating “frequently asked questions” (FAQ) documentation on recruiting and hiring, prompting students to share their career search experiences, and establishing lines of communication with students and employers. Finally, universities can provide opportunities for practice and skill development so students can overcome barriers created by the lack of information or relevancy in expectations.

Unclear or absent feedback is the second barrier; feedback is largely absent from the career search process, making it difficult for candidates to make iterative improvements (Behroozi et al., 2020a; Lunn & Ross, 2021a); it is recommended this be replaced by the support structure of timely and actionable feedback (Behroozi et al., 2020a; Lunn & Ross, 2021a). Companies can establish timely and actionable feedback by ensuring they follow-up with all candidates regarding their



candidacy and include information on the candidate's performance related to expectations. All follow-up communication should be timely, actionable, and express empathy and respect for the candidates. For example, if an application is rejected, candidates should be provided with a reason so they can revise their career search strategy. Companies can also invite anonymous feedback on the recruiting and hiring process from candidates, including those who are rejected, then follow-up on concerns (TalentBoard, 2022). Universities can advocate for the process of providing feedback by creating opportunities such as interview practice sessions with feedback or industry mentors who can help candidates interpret interactions with career agents and provide their perspective on materials such as resumes.

Rigid evaluations are the third barrier and refer to a rigid set of qualifications often used to evaluate a candidate's application and performance during interactions with career agents (Fuller et al., 2021). These rigid evaluations many times include checking qualifications to determine how a candidate demonstrates cultural "fit" with a company – which is often biased, subjective, or based on cultural practices rooted in white supremacy (*The Bias of 'Professionalism' Standards (SSIR)*, n.d.; Chua & Mazmanian, 2020; Twine, 2018). Instead, it is recommended that companies consider adopting a holistic evaluation process. This includes assessing the candidate as a "whole person," seeking to recognize a candidate's potential by taking into consideration their unique qualifications, including transferable skills, and how they may add value, diverse work experience, and capacity for growth. Holistic evaluations also emphasize on seeking to understand a candidate's thought process rather than focusing on their knowledge of exact solutions to technical or situational problems. This practice requires career agents to not only ask candidates to explain their problem-solving process but to ask clarifying questions and use paraphrasing to check understanding. Finally, holistic evaluations require companies to move away from cultural fit and toward cultural add, seeking to

understand how a candidate's perspective and way of working with benefit the team/company (rather than conform to existing ways of work).

Holistic evaluations are more time-consuming but can increase diversity (Maude & Kirby, 2022). Some university admissions, particularly in the health sciences, have adopted holistic evaluation and seen a successful diversification of their applicant pool and admitted students (Maude & Kirby, 2022). At the same time, caution should be used with this approach as holistic evaluations can decrease transparency as they are more complicated and difficult to explain. Therefore, it is suggested that a framework and/or rubric be adopted for holistic evaluations to ensure consistency and transparency (Maude & Kirby, 2022). Universities can advocate for holistic evaluations and share their experiences with holistic admissions, including the challenges and benefits. Universities can also provide learning opportunities for students to build experience in the application of their technical skills to real-world problems and settings, as well as build knowledge of technical industry organizational structures and practices— thus helping students to better demonstrate transferable experience to career agents. Finally, universities can guide students in checking to ensure common understanding with career agents so students can ensure their thought processes and ways of working are understood.

Critical interactions are the fourth and final process-related barrier, which includes interactions with career agents that are impersonal, lacking in respect, and/or condescending. Such interactions are common and have a lasting, negative impact on candidates (Behroozi et al., 2020a). Instead of critical interactions, collegial interactions could be adopted as a form of support whereby career agents seek to create a welcoming and friendly atmosphere (Behroozi et al., 2020a; Lunn et al., 2022). Under collegial interactions, career agents are supportive and collaborative, understanding that it takes the efforts of both the career agent and the candidate to have a successful interaction. Career agents understand that interviews are inherently stressful and that candidates may exhibit

signs of anxiety, but this does not mean they would perform poorly on the job (Mastrella et al., 2023). Career agents can take time to make authentic connections with candidates and start questions at a level where candidates can be successful and build confidence while providing supportive real-time feedback. Universities can help students see career agents as real people and help students develop strategies to form connections and approach interactions in a collegial and collaborative manner.

### **Recommendations for Moving Culture, Climate, and Community-Related Barriers to Supports**

The first barrier related to culture, climate, and community is the presence of stereotypes, biases, and discrimination. It is recommended that a support system for equity and inclusion be established. Stereotypes, biases, and discrimination can manifest in a myriad of ways, including microaggressions (Ireland et al., 2018; K. Miner et al., 2019), bias in evaluations of cultural “fit” (Chua & Mazmanian, 2020; Twine, 2018), gender-related bias including potential family obligations and childcare (Correll et al., 2007; Friedmann & Efrat-Treister, 2023; Fuegen et al., 2004), and discrimination often seen as lower salary or even less consideration as a viable job candidate (Pew Research Center, 2018). Even if stereotypes, biases, and discrimination are not obvious, these factors can act as a barrier if candidates do not trust that a company is actively addressing them.

Moving toward equity and inclusion in the career search process, requires an ongoing effort to engage stakeholders, including career agents, in creating systemic change in recruiting and hiring and cannot be solved with one-time actions such as required training (Dobbin & Kalev, 2016, 2018). Career agents should be engaged in identifying potential stereotypes, biases, and discrimination and enacting solutions (Dobbin & Kalev, 2018). This work should be reflexive, with ongoing dialogue and education with concrete examples of stereotypes, biases, and discrimination to make the education grounded and relevant (Nelson & Zippel, 2021). Cultural norms and values should be

evaluated for how they may support stereotypes that center white perspectives and white supremacy (Gray, 2019; Okun, 1999). Standard recruiting and interviewing rubrics can be used to prevent discrimination; however, these should be revisited often to check their efficacy, and career agents should be involved in their creation. Candidates may not feel comfortable asking questions about stereotypes, bias, and discrimination or questions related to their positionality, such as information about parenting or work-life balance; companies can proactively seek to provide this information for candidates to review independently. Finally, companies can build trust by making an ongoing, genuine, and public commitment to equity and inclusion (Wang et al., 2023), including how it relates to the career search process. Universities can help students by assisting in company education and raising awareness of the various forms of stereotypes, biases, and discrimination that exist for students during the career search. Universities can also provide students with resources to gauge a company's commitments and efforts in equity and inclusion.

The second barrier is the lack of social capital available, in the form of professional development, information sources, and emotional support; the corresponding support would be to establish the presence of social capital. Companies can offer candidates resources and ongoing activities to build personal and professional networks to gain information, mentoring, and guidance through their career search process. Companies can ensure referrals are used sparingly and with caution since research shows referrals perpetuate the exclusion of underrepresented groups (Fernandez & Campero, 2017; Fernandez & Rubineau, 2019; Twine, 2018). Finally, companies can give candidates the opportunity to connect with career agents in social settings so candidates can ask questions about the career search process. This would help candidates develop credibility by increasing their exposure to career agents, as well as develop an understanding of technology nomenclature and culture. Universities can also help students find resources to build their social capital and assist in making connections with career agents. Universities can also ensure companies

are aware of the importance of social capital and how it can be either a barrier or a support for students depending on who holds the capital and how it is used.

The third barrier is the lack of diverse representation in career agents (Kohl & Prikladnicki, 2022; Lunn & Ross, 2021b), which leads to chilly environments for female job candidates (Makarem & Wang, 2020; Wynn & Correll, 2018). Companies should seek to have diverse representation in their career agents; however, caution must be taken to not tokenize or burden women or other workers with marginalized identities. When possible, career agents should proactively address topics of representation and their company's commitment to diversity. Further, companies should take a critical lens to recruiting and hiring practices and seek out signs of a chilly environment so that a welcoming and inclusive community can be established. This activity involves reflection and feedback, so it should be a continual, ongoing process. Universities can help by making the concept of a chilly environment tangible by providing concrete examples. Universities can also facilitate avenues for all women to share their experiences, obtain emotional support, and transfer knowledge of successful ways to navigate when there is a lack of diverse representation.

### **A Framework for Auditing Systems and Creating Sustainable Change**

Research finds that awareness of problems in diversity, equity, and inclusion alone does not create sustainable change (Dobbin & Kalev, 2016, 2018); instead, what is required is ongoing reflection and action. The information shared about the female job search experiences in STEM, along with the career search barriers and supports, can be used within a reflection and audit process to drive action and grow awareness rooted in real-life situations and practices. The paper "Model Cards for Model Reporting" proposed a framework to encourage transparent reporting of the intended use cases for machine learning models and performance characteristics across different cultural, demographic, and intersectional groups (Mitchell et al., 2019). This paper's framework was previously adapted to audit product design inclusivity (Fadrigon et al., 2023). I took this as

inspiration to adapt the framework for creating an audit consisting of reflection questions to examine career search and recruitment systems. The audit I developed prompts users to consider career search or recruiting system design and an investigation of the seven structural/contextual factors identified in this study, which may be present as supports or barriers. Also included in the audit are overall reflection questions for individuals and teams or working groups. The intended users of this audit process are university staff or faculty who are administering career development programs supporting career searches by women in technology as well as career agents working with recruiting systems (e.g., recruiters, hiring managers, and interviewers). The audit process is displayed in Table 11.

**Table 11**

*Audit process for examining Career Search and/or Recruiting Systems*

<b>Auditing Career Search / Recruiting Systems</b>
<b>System Details</b>
<ul style="list-style-type: none"> <li>- What is the current recruiting or career development system?</li> <li>- What person or organization developed the current system? What perspective is missing?</li> <li>- When was the current system developed? How does this current version differ from past versions?</li> <li>- Where can resources for more information be found? Where can stakeholders go to get more information?</li> </ul>
<b>Intended Use</b>
<ul style="list-style-type: none"> <li>- What is the primary intended use or goals?</li> <li>- Who are the current stakeholders? Who could be missing? What is the role of the job seeker as a stakeholder?</li> <li>- What is the experience of stakeholders/users (and how have you validated this experience)? How are intersectional identities and diverse backgrounds taken into consideration in understanding the experience of stakeholders?</li> <li>- What are the out-of-scope use cases?</li> </ul>
<b>Metrics</b>
<ul style="list-style-type: none"> <li>- What are the primary metrics collected on performance of the system? How do they relate to the intended use?</li> <li>- Why were these metrics selected?</li> <li>- How do metrics take into consideration the job seeker's experience? For example, how do metrics relate to structural/contextual barriers or support which may exist?</li> <li>- How is feedback collected from stakeholders/users and used in performance metrics?</li> </ul>
<b>Training Data</b>
<ul style="list-style-type: none"> <li>- What decisions are made in the design or process? (E.g., decisions on hiring or recruiting activities)</li> <li>- What information is used to validate decisions in the system design or process?</li> <li>- How do you ensure past information used to validate future decisions is not rooted in biased perspectives?</li> </ul>

<b>Ethical Considerations</b>
<ul style="list-style-type: none"> <li>- What risks exist in the system design and implementation? Include potential recipients, likelihood, and magnitude of harm.</li> <li>- How is risk identified and who was involved in identifying risks? What could be missing?</li> <li>- What risk mitigation strategies are used?</li> </ul>
<b>Auditing Structural / Contextual Factors</b>
<b>Expectations</b>
<ul style="list-style-type: none"> <li>- How are expectations for job applications and interviewing made transparent to job seekers? How do you know that job seekers are able to understand and utilize this information to make informed decisions?</li> <li>- Are interview procedures and questions made available to candidates? Are expectations for interview questions clear (and how do you know)?</li> <li>- Who developed the current expectations around applications and interviewing? What perspective could be missing?</li> <li>- Are recruiting expectations (e.g., applications, interviews) aligned to what is necessary for successful job performance (e.g., interview questions are connected to real-world tasks and responsibilities)?</li> <li>- Is bidirectional communication and support available for job seekers?</li> </ul>
<b>Feedback</b>
<ul style="list-style-type: none"> <li>- Do job seekers have a way to get specific, timely and actionable feedback provided on application and interview performance, including reasons for rejections?</li> <li>- How do job seeker communications receive follow-up? Do communications to job seekers express empathy and respect? How are communications and interpreted by job seekers?</li> <li>- Can candidates provide anonymous feedback on the recruiting and hiring process? How is this feedback utilized?</li> </ul>
<b>Evaluations</b>
<ul style="list-style-type: none"> <li>- What are the evaluation criteria in the recruiting and why was it selected? Who developed the current evaluation criteria? What perspective could be missing?</li> <li>- How do stakeholders understand and use the evaluation criteria?</li> <li>- How does evaluation criteria consider a holistic view of the candidate (e.g., potential related to education, diverse work experience, and capacity to add value).</li> <li>- How does evaluation criteria focus on understanding a job seeker's thought process instead of their ability provide to exact answers?</li> <li>- What flexibility exists in how candidates demonstrate their ability to contribute to the organization's culture?</li> <li>- How do you purposefully seek out diverse perspectives, personalities, and work styles (e.g., cultural add instead of cultural fit)?</li> </ul>
<b>Critical Interactions</b>
<ul style="list-style-type: none"> <li>- How are personal connections created during the process?</li> <li>- How do you establish and ensure a welcoming and friendly atmosphere? What are the job seeker's perceptions?</li> <li>- How is respect for the candidate's skillsets, time, and effort demonstrated?</li> <li>- How are interactions a collaborative process, a dialogue?</li> <li>- How are job seekers supported during interview interactions?</li> <li>- How do you take into consideration the inherent stress involved with interviews and how candidates may exhibit signs of anxiety, make mistakes, or struggle to perform their best under interview conditions?</li> </ul>
<b>Equity &amp; Inclusion</b>
<ul style="list-style-type: none"> <li>- Are stakeholders engaged in regular, ongoing dialogue and reflection around the potential for stereotypes, biases, and discrimination, including how they show up, what effect they may have (on each stakeholder), and how they can be addressed?</li> <li>- Is information around topics that often prompt bias or discrimination provided without prompting? For example, information around family-friendly workplace practices, employee resource groups, benefits, etc.?</li> <li>- What are the career search/recruiting diversity, equity, and inclusion commitments? How are these measured?</li> <li>- Does the process include signals that demonstrate genuine commitment and value for diversity, equity, and inclusion?</li> </ul>

<b>Availability of Social Capital</b>
<ul style="list-style-type: none"> <li>- How do job seekers have access to networks for information and assistance in the career search process?</li> <li>- How are referrals used in the process? How do you ensure these do not perpetuate lack of representation or exclude marginalized groups?</li> <li>- How can job seekers connect to other stakeholders in the process?</li> <li>- How can job seekers develop relationships with stakeholders and gain fluency in the technology industry nomenclature, culture, and career opportunities?</li> </ul>
<b>Presence of Representation</b>
<ul style="list-style-type: none"> <li>- What is the representation among stakeholders? How can you increase representation without tokenizing or overly burdening workers with marginalized/underrepresented identities?</li> <li>- What elements of a chilly environment could the career search or recruiting process have? How do you know?</li> <li>- What signals of inclusion are you sending? How are these received and felt by job seekers?</li> </ul>
<b>Overall Reflection Questions</b>
<b>Personal Reflection</b>
<ul style="list-style-type: none"> <li>- What is your positionality? In what ways do you have privilege? How does this affect your view?</li> <li>- How can you be mindful of your positionality and privilege?</li> <li>- How do you understand the experiences of stakeholders (e.g., job seeker)? What are you missing? How can you expand your perspective?</li> <li>- How do you advocate for job seekers who represent marginalized identities? How can you encourage others?</li> </ul>
<b>Within Teams / Working Groups</b>
<ul style="list-style-type: none"> <li>- What positionalities does your team represent? How does this affect their view? What is missing?</li> <li>- What does the team do to understand the experiences of stakeholders (e.g., job seekers)? What is missing and what can they do to learn?</li> <li>- How does your team advocate for job seekers who represent marginalized identities? Are they aware of career search barriers that may exist for women in technology?</li> <li>- What does equity and inclusion mean to your team? What are your commitments related to equity and inclusion? How does equity and inclusion play an active role in recruiting interactions and decisions? How is this measured?</li> <li>- When do you have conversations around equity and inclusion? Is this sufficient?</li> </ul>

### **Limitations and Considerations for Further Research**

Like all studies, there are limitations to this research and areas for consideration. First, the participants in this study presented a wealth of information on their experience with structural/contextual barriers, but more information is needed on the experiences with structural/contextual supports. While the interview protocol had a neutral approach to understanding the career search experiences and interactions between participants and career agents, many of the participants chose to focus on barriers rather than supports. This could be because participants had recently had interactions that were weighted towards barriers, and they found these to be more significant. I have made recommendations of supports that can be implemented based on participant narratives, however, more information is needed on how these supports work in real-



life and their effects. This study showcases limited experiences with career search supports and how they can be implemented effectively.

Second, participant narratives revealed the presence of individual/psychosocial factors, but the factor which was consistently highlighted as affecting career progression and decision making was self-efficacy related to STEM learning experiences and career search experiences. More information is needed to understand how self-efficacy interplays with other individual/psychosocial factors, such as a sense of belonging and identity; further research could consider how these factors are related or distinct. While SCCT has proven to be a reliable model for examining career search experiences, lending credibility to the idea that STEM self-efficacy and career self-efficacy drive career progression, more information is needed to see how the other individual/psychosocial factors fit within a theoretical framework of female STEM career progression and career decision making.

Third, this study looked only at career search experiences at the time of launch from graduate degree to technology career. Although women mentioned STEM learning experiences (e.g., classroom learning), this could be an area for further consideration to examine and test further the model of STEM self-efficacy and Career self-efficacy. This study is limited in how it looked at how STEM career search experiences affected career decision making in isolation of STEM learning experiences, which may also be taking place. In addition, further studies could consider examining other points of a woman's career progression (e.g., promotions) and the impacts of interactions at those times on self-efficacy.

Fourth, while this study sought maximum variation in participants, more participant perspectives should be heard. This study had individual women who represented their identity, but more identities and voices need to be included to develop a fuller picture of how career search experiences affect career progression. For example, this study included only participants from a large and prestigious university in the Silicon Valley, and these students are privileged to have access to a

network within a geographic area that is well connected to the technology industry. The experiences of students from geographic areas outside of technology and/or from universities that are less well-known in the industry need to be included.

Fifth and lastly, this research only considered the career search experiences from the perspective of the female student/alumni job seeker; more research could look at career search experiences from the perspective of career agents. This would be useful to further develop an understanding of why barriers exist, how they can be dismantled, and how supports can be implemented. In addition, hearing from career agents may illuminate strategies that women can employ to overcome barriers or make use of existing supports when going through career search and career development activities.

### **Conclusion**

At the 2018 Grace Hopper Conference, I addressed a crowded ballroom with an attentive audience of female technologists, sharing my knowledge of authentic personal branding for career development. It was not my first Grace Hopper Conference, but it was my first time attending as a speaker and I was blown away by the diversity I saw represented in the attendees, all united in their interest in STEM. While I appreciated being able to share my wisdom and experience, I also became disillusioned and unsatisfied with helping women navigate what I saw as a broken system – a career labyrinth full of barriers.

This study is the result of my investigation into the career search experiences of women seeking leadership roles in technology and how we can eliminate the career labyrinth. Prior literature around women seeking to establish careers in technology focused primarily on developing interest in STEM careers (Friedmann & Efrat-Treister, 2023) or ensuring persistence in STEM education and degree attainment. Prior research on career search experiences overwhelmingly focused on undergraduate students and not part-time graduate students who are working professionals, even

though female engagement in graduate degrees is increasing (National Center for Science and Engineering Statistics (NCSES), 2023; National Science Foundation, 2021). This study looked at a previously underrepresented perspective in literature— part-time, female graduate students and recent alumni who were already committed to the STEM field and seeking leadership roles in technology.

This study makes several contributions. First, to my knowledge, this is the first study to present and explore the career search stories of female graduate students with a focus on interactions with career agents. Few other studies focused on interactions with career agents and the effect these had on career progression and career decision making. I am also not aware of any study that focused on female technology graduate students. Second, this study identified seven structural/contextual factors that may present as barriers or supports in the STEM career search process. Understanding these factors is important for both universities and technology companies that are invested in supporting women in technology careers. These factors can be used to audit career search related programs at universities as well as recruiting systems and practices within technology companies. Third, this study validated and added depth to the Social Cognitive Career Theory (SCCT). The study identified how structural/contextual barriers can affect self-efficacy, which in turn can affect career progression and decision making. This is an important finding that can be used in conceptualizing career progression and decision making and in developing frameworks to support female career search processes in technology.

I am honored by the women who shared their stories with me, and now as a scholar-practitioner, I will try to do justice to their experiences. If we listen to the stories of women, there is hope for systemic change. Five years ago, I spoke at the Grace Hopper Conference about how women could develop their personal brands to be successful in the technology recruiting process. This year, I am returning to Grace Hopper, and instead will be talking to company representatives about how they can modify their recruitment processes to recognize and support women. The

knowledge I gained in this study is helping to advocate for sustainable change. Our liberations are bound together, and I am committed to the ongoing work of transforming barriers into supports so we can dismantle the career search labyrinth and create career pathways for women in technology.

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## Appendix A: Sample Recruitment Emails / Slack Messages

### *Initial Message, recruiting for focus group participants*

Hello,

This is Rebecca, Sr. Director of Career Development, wearing another hat: doctoral candidate in Educational Leadership at UC Davis, where my research is focused on equity in tech careers.

My dissertation is examining the interactions female graduate students have during their career search – including interactions with recruiters, hiring managers, interviewers, etc. My goals include learning how these interactions affect career decision making and career progression.

If you are a woman in data science who has recently undergone a career search, I invite you to join this study! I am starting with focus groups, and you will be compensated with a \$30 gift card for your participation. Please fill out the recruitment survey ([link](#)) and I will follow-up with all volunteers.

Participation is voluntary. Please read the letter of information ([link](#)) for more details on confidentiality.

Thank you for reading and considering. If you have any questions, please do not hesitate to reach out.

Warmly,

Rebecca

Rebecca Andersen, Doctoral Candidate | UC Davis

### *Follow-up Message, recruiting for interview participants*

Hello everyone!

I hope you are having a great summer. I am nearing the end of data collection for my study on the career search experiences of female grad students in tech. I'd love to chat with a few more students!

**If you are a woman in data science and have undergone a tech job search and interviewed at US based tech companies in the past 6 months, I would love to chat!** I am seeking participants for 90min. interviews about your recent career search; you will receive a \$30 gift card for your time and my gratitude.

Please fill out the recruitment survey ([link](#)) OR send me an email ([link](#)) if you would like to participate and/or have any questions. Please read the letter of information ([link](#)) for more details on confidentiality.

Thank you so much.

Warmly,

Rebecca

Rebecca Andersen, Doctoral Candidate | UC Davis

## Appendix B: Letter of Information

### UC Davis Letter of Information

**Title of study:** Underrepresented and Underestimated: Impact of Interactions during the Career Search Process on Female STEM Graduate Students

**Investigator:** Rebecca Andersen

#### **Introduction and Purpose**

You are being invited to join a research study. The purpose of this study is to consider how the career search experiences of mid-career female graduate students, specifically interactions between “career agents” (e.g., job application portals, recruiters, hiring managers, interviewers) and students, affects career progression and career choice. This study will seek greater understanding of these interactions by focusing on the student’s lived experiences, the meaning they make of these experiences and how this affects their choices and agency. If you agree to be in this research, you will be asked to complete a short survey and, if selected, participate in a focus group with the researcher above. Your taking part in this research should take about 5 minutes for the survey and another two hours if selected for the virtual focus group. Some focus group participants will be invited to take part in a follow-up individual interview; if selected and if you agree to this follow-up interview, it will take an additional hour and a half of your time.

When you take part in this research your participation will be recorded on the zoom platform (audio & video). The recording will be transcribed, but your name will not be included on the transcription. There is a minimal risk of loss of confidentiality.

**Taking part in research is completely voluntary.** You are free to decline to take part in the project. You can decline to answer any questions and you can stop taking part in the project at any time. Whether or not you choose to take part, or answer any question, or stop being in the project, there will be no penalty to you or loss of benefits to which you are otherwise entitled.

#### **Questions**

If you have any questions about this research, please feel free to contact the investigator at 650-796-5244 or [rkandersen@ucdavis.edu](mailto:rkandersen@ucdavis.edu)

## Appendix C: Recruitment Survey

**Title:** Recruitment Survey: Impact of Interactions during the Career Search Process on Female STEM Graduate Students

### Introduction:

My name is Rebecca Andersen. I am a doctoral student in Educational Leadership at the University of California, Davis, and the Senior Director of Student & Alumni Career Development at the UC Berkeley School of Information. My research focus is on equity and access of career development for female graduate students in technology.

As part of my dissertation work at UC Davis, I will be conducting a focus group and limited follow-up interviews with female Master of Information & Data Science (MIDS) students who have recently undergone or are currently going through a career search. I am interested in interactions female students have during their career search—including interactions with recruiters, hiring managers, interviewers, etc. My goal is to learn what meaning students make of these interactions and how these interactions affect career decision making and career progression.

I would greatly appreciate the opportunity to share more about this study with you and answer any questions. Participation is voluntary and anything you submit in this screening survey will be kept confidential.

If you are interested in participating, please fill out the screening survey below which will determine eligibility in this study. I appreciate your time and energy and will follow-up with all volunteers.

Thank you!

### Questions:

1. Email?
2. What is your current graduate degree program?
3. What is your anticipated graduation date?
4. How would you describe your gender identity?
  - a. Male
  - b. Female
  - c. Trans Male / Trans Man
  - d. Trans Female / Trans Woman
  - e. Genderqueer / Gender Non-Conforming
  - f. Different Identity
  - g. Decline to State
  - h. Other:
5. How would you describe your ethnic/racial identity?
6. Please describe your career goals following your graduate degree.
7. Knowing that things change, please describe potential long-term career goals.
8. Have you recently (within the past 6 months) engaged in a career search for a new job at a technology company where you had multiple (>2) phone, virtual, or in-person interactions with hiring managers, recruiters, or interviewers?
  - a. Yes

- b. No
  - c. Other:
9. Thank your willingness to volunteer! For contact purposes, please note your full name.

## Appendix D: Focus Group Interview Protocol

Date/Time of Focus Group:

Interviewer Name: Rebecca Andersen

Participant Names:

**Title:** Underrepresented and Underestimated: Impact of Interactions during the Career Search Process on Female STEM Graduate Students

### **Introduction:**

Use the following below as a guide to conversationally / informally introduce the interview:

The purpose of this study is to consider how the career search experiences of female graduate students, specifically interactions between “career agents” (e.g., job application portals, recruiters, hiring managers, interviewers) and students, affects career progression and career choice. This study will seek greater understanding of these interactions by focusing on the student’s lived experiences, the meaning they make of these experiences and how this affects their choices and agency. The focus group is scheduled for 2hours today.

Some focus group participants will be invited to take part in a follow-up individual interview; if selected and if you agree to this follow-up interview, it will take an additional hour and a half of your time. When you take part in this research your participation will be recorded on the zoom platform (audio & video). The recording will be transcribed, but your name will not be included on the transcription. I will be asking you in a follow-up email if you’d like to select a pseudonym. There is a minimal risk of loss of confidentiality.

You will have a chance to review drafts of findings and any quotes that are used, although you are not required to review these items. And of course, I will share the final study with you all!

**Taking part in research is completely voluntary.** You are free to decline to take part in the project. You can decline to answer any questions and you can stop taking part in the project at any time. Whether or not you choose to take part, or answer any question, or stop being in the project, there will be no penalty to you or loss of benefits to which you are otherwise entitled.

**Letter of Consent (share link in the zoom chat)**

### **Research Questions**

1. What are the career search experiences of mid-career female data science graduate students seeking to advance toward leadership roles in the STEM industry?
  - a. How do these students make sense of career search experiences, particularly interactions with career agents?

- b. How do career search experiences and the meaning students make affect career decision making and career progression?

## **Beginning**

I would love to start with introductions, where we can each learn about each other. Can you go around and introduce yourself, including your name, pronouns, and one word to describe your career search.

### **Section 1: *What are their career search experiences?***

As I mentioned, I'm really interested in learning about the career search experiences of women in tech. I would love to hear just a little bit about how you approached the career search process. **Can each of you just walk us through what you were looking for and what the process looked like for you?** Who would like to begin?

- Potential follow-up questions:
  - How did you engage with the process (apply or approach companies, engage with career agents)? What worked / what didn't? Why?
  - How did you get to the interview stage? What did you need to do?
  - How did you get to the offer stage? What did you need to do?
  - As you reflect on your experiences, what stands out to you?
  - Did it impact you in any way?

**How would you describe interactions with career agents** (recruiters, hiring managers, and/or interview panelists)?

- Potential follow-up questions:
  - **Did you see representation** (gender, racial, etc.) on the interview panels or in the hiring managers they met with? What was the effect of this? Did this impact you in any way?
  - **How did you interact with career agents:** how did you get to the interview stage, what various interaction points did you have (how did you get in front of the recruiters / hiring managers / interview panelists)?
  - **How would you describe the tone of the interviewers?**
  - **What skills/strengths did you need to display** to be successful through the interview process? Beyond technical skills, what questions were asked, what skills/strengths/values did career agents ask about or test on?
  - **When career agents spoke about the company/role, what did they say or highlight?** How did this make you feel?

**Were you met with any incidents of gender bias or stereotypical perceptions of others in your career search interactions?**

- Potential follow-up questions:
  - OR did you encounter gender bias or any stereotypical perceptions during your career search?



**Section 2:** *How do they make sense of these experiences?*

**How did you get feedback on how the process was going?**

- Potential follow-up questions:
  - Did you feel you were evaluated fairly?
  - Did you feel like you were able to show up as the best version of yourself?
  - Did you feel interviewers got a good sense of the skills/strengths/value you would bring?
  - **Through the interview process, did you get a sense that you could be successful in the role/company?** (Was this important to you / effect)

**How did you feel during the process** - did you enjoy the process; did you feel they were able to communicate who you were?

**Section 3:** *How does this affect career decision making / progress?*

**Did what they were looking for change during the job search process; why?**

- Potential follow-up questions:
  - **Did interactions with recruiters, hiring managers, or interview panelists change your career goals** OR what you were looking for?
- **What advice would you give to a female friend who was going to embark on the same type of job search?**

**Anything else related to what we talked about today that you would like to share?**

**Conclusion and Next Steps**

- That was the final question, and the focus group is now concluded. **[END RECORDING]**
- Thank you all very much for sharing your experience with me and for contributing to this research.
- As a reminder, your names will not be included in the transcription of this interview, and I will keep your identity confidential. I will give you each a chance to choose a pseudonym that will be used when I report findings.
- Also mentioned earlier, you will have a chance to provide feedback on early drafts of findings to confirm data collected and analysis is an accurate reconstruction of your experience and perspective. I will email you that information when I have it.
- Finally, I will be reporting my overall findings as part of my doctoral dissertation. I will make a copy of the dissertation available to you. Thank you again for your time and contributions.

## Appendix E: Individual Interview Protocol

Date/Time of Interview:

Interviewer Name: Rebecca Andersen

Participant Names:

**Title:** Underrepresented and Underestimated: Impact of Interactions during the Career Search Process on Female STEM Graduate Students

### **Introduction:**

Use the following below as a guide to conversationally / informally introduce the interview:

The purpose of this study is to consider how the career search experiences of mid-career female graduate students, specifically interactions between “career agents” (e.g., job application portals, recruiters, hiring managers, interviewers) and students, affects career progression and career choice. This study will seek greater understanding of these interactions by focusing on the student’s lived experiences, the meaning they make of these experiences and how this affects their choices and agency.

- I have prepared **questions** for this semi-structured interview, which will not exceed **90 minutes**.
- I will be making written notes and recording the interview so I can transcribe and analyze interview data to identify themes and report findings. All recordings and notes will be kept in a secured, locked location or in an encrypted and password protected digital storage location for the duration of this project and securely archived upon the completion of the dissertation. You will have a chance to provide feedback on the transcription and early drafts of findings to confirm data collected and analysis is an accurate reconstruction of your experience and perspective.
- Your participation in this interview is entirely voluntary and you may discontinue at any time.
- Your specific answers to the interview questions will be kept confidential. They will not be linked to you or your organization.
- [if they participated in a focus group] - I may ask you some questions that are like those we went through in the focus group, but this is to go into more depth and get a better understanding of your unique experiences.
- Do you have any questions for me before we begin?

**Letter of Consent (share link in the zoom chat)**

**[BEGIN RECORDING]**

**INTERVIEW QUESTIONS**

- 1) I'd love to start by learning a bit more about you & your career story.
- 2) How did you apply or approach companies, engage with career agents, etc.? What worked / what didn't? Why?
- 3) How did you get to the interview stage / what did you need to do? Offer stage?
- 4) As you reflect on these experiences, what stands out to you? (What influence has the career search had on your career goals / career story)
- 5) What are your career goals / how have they changed?
- 6) How has background or who you are as a person (identity) played a role?
- 7) Where do you see yourself in tech? Goals for the future?
- 8) What would it mean to get there?
- 9) Resume/LI: how does this fit? How does this represent you?
- 10) Expectations from when you started...How'd you think it would go? Did reality fit?
- 11) With everything you have expressed, what do you think about your role in tech?

### **Open Invitation to Share**

Is there anything else related to what we just talked about that you would like to share?

### **Conclusion and Next Steps**

That was the final question, and the interview is now concluded. **[END RECORDING]**

Thank you very much for sharing your experience with me!

Also mentioned earlier, you will have a chance to provide feedback on early drafts of findings to confirm data collected and analysis is an accurate reconstruction of your experience and perspective. I will email you that information when I have it.

Finally, I will be reporting my overall findings as part of my doctoral dissertation. I will make a copy of the dissertation available to you. Thank you again for your time and contributions.