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A Narrative Approach to Understanding Career Attrition for Women Engineers

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Walden University
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Abstract

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MPhil, Walden University, 2019

M.S., University of Washington, 1990

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Dissertation Submitted in Partial Fulfillment

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Abstract

More women exit the engineering profession than enter, leaving a talent void that incurs lost business value from unrealized business revenues. Without new insights about how to address the continued attrition of women engineers, the profession is unlikely to sustain the human capital needed to achieve competitive advantages through innovation, increased productivity, and improved firm reputation. This qualitative narrative inquiry explored the career attrition phenomenon of six former women engineers in the Northern Tier States region of the United States who left engineering within the past 4 years and were either an engineer-in-training or professional engineer. The conceptual framework for this study was based on Bourdieu's concepts of habitus, capital, and field to discover a more nuanced meaning about women engineers' career exit experiences. The research questions focused on understanding the experiences of six former women engineers as told through their narrative stories of consideration for leaving and a final decision to leave the profession. Data were collected in semi-structured interviews; the resulting transcripts were hand coded using initial and pattern coding to ascribe meaning to story segments grouped in cohered themes. Results suggest that women engineers become disillusioned and leave their careers as resilience is surpassed by uncertainty about sustaining professional and life aspirations in response to incongruent hegemonic-male work cultures. These findings can enable engineering stakeholders to develop ways to retain more women. Positive social change could be realized by improving the lives of women engineers and their communities while enhancing the profession's ability to deliver innovative and creative solutions to the most vexing problems facing humanity.

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Dedication

To all past and present women engineers that I have had the privilege of working with during my time in the profession. You have inspired me to be a better engineer, leader, and most importantly, a better human being who wants to create a future engineering culture where women and men are valued equally, are inspired toward excellence and want to stay.

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Chapter 1: Introduction to the Study

Gender diversity in the science, technology, engineering, and mathematics (STEM) workforce is vital for U.S. companies to maintain and grow their global competitiveness and economic viability (Noonan, 2017). Adding women in technology fields could boost business value by $320 to $390 billion by increasing enterprise valuation and enabling higher returns on investments and invested capital (Thomas et al., 2016). The challenge is that technology companies struggle to acquire and retain enough women STEM professionals (ManpowerGroup, 2018), in part, because of a forecasted labor shortage resulting from a 6.5% growth in the STEM job market between 2014 and 2024 (Fayer et al., 2017). Exacerbating this talent void is the reality that while women constitute 48% of the entire workforce, they only hold 24% of STEM jobs (Neal & Smith, 2018). The situation becomes even worse for the engineering field, where women make up just 18% of the workforce and 15% of the leadership ranks (Predescu & Chen, 2017). A major part of the gender imbalance in the engineering field is more women choosing to leave than enter (Fouad et al., 2017). The attrition of valuable talent leaves engineering companies at risk for costly talent discontinuity, unrealized business revenues (Society of Women Engineers (SWE) Blog, 2016), and lost productivity and innovation (Roh & Kim, 2016). While prior research has generated valuable findings about workplace contexts that may precipitate a woman engineer's decision to exit (Cardador & Hill, 2018), there is still a need for further research with varied methods that might generate a more nuanced understanding of this persistent phenomenon (Fouad et al., 2017; Meiksins et al., 2018). This study focused on addressing gaps in the literature

by exploring the stories of women engineers who abandoned their profession to gain a richer meaning about their decisions to leave.

Chapter 1 begins with background information, including a statement of the research problem underpinning the study. In the chapter, I also provide the study's purpose, the research questions that guided the study design, the conceptual framework that outlined the construct for meaning-making, and the nature of the study section that contains a description of the methodological approach. Definitions of key concepts, assumptions, limitations, and delimitations are introduced as foundational elements that helped to articulate study boundaries. The chapter concludes with the significance of the study, followed by a summary and transition statement to the next chapter, the Literature Review.

Background

Scholarship regarding the underrepresentation of women in STEM is an extensive body of knowledge spanning nearly 5 decades and focused predominately on acquiring and retaining more women in the STEM academic pipeline (Kanny et al., 2014). In the last decade, there has been more interest in research about women's turnover intentions in STEM careers (Cech & Blair-Loy, 2019). Inquiries seeking to understand the career attrition phenomenon for women engineers emerged as a major area of interest in response to the engineering subfield having the highest turnover rate of women compared to their male peers of all the STEM career fields (Hunt, 2016; Kahn & Ginther, 2015; Singh et al., 2013). The literature about career exits for women engineers comprised a substantial amount of research, including many methodological approaches and original

contributions to a growing body of knowledge. While there have been substantive advances in attaching meaning to a woman engineer's decision to abandon their chosen profession, there is still much to learn.

A review of the relevant literature highlighted two dominant meta-themes that helped explain what might contribute to a woman engineer's turnover intentions. First, that a woman engineer's career exits can be explained by their socially and culturally influenced way of being (see Buse et al., 2013; Cech, 2015; Fouad et al., 2016; Maltese & Cooper, 2017; Singh et al., 2013; Singh et al., 2018), or second, that they leave because of unsupportive and noninclusive, male-dominated engineering cultures (see Beddoes, 2018; Fouad et al., 2017; Singh et al., 2013; Singh et al., 2018; van Veelen et al., 2019). While the supporting research underpinning these meta-themes has advanced the body of knowledge, two critical gaps emerged.

First, future research designs needed to mitigate better common method biases from single-source data and self-report measures (Cardador & Hill, 2018; Singh et al., 2018; van Veelen et al., 2019) and establish causal links that might help to explain how complex workplace mechanisms interact and relate to women engineers' career exits (Cardador & Hill, 2018; Maltese & Cooper, 2017; van Veelen et al., 2019). While filling these gaps could further support prior findings by helping to rule out the possibility of alternative explanations (Fouad et al., 2016), results may not be sufficient to generate a more holistic understanding of the complex and socially situated nature of the phenomenon (Reilly et al., 2019). A second gap in the literature was that there is a need for other research approaches that can uncover more fine-grained and profound meanings

from the career exit experiences of former women engineers (Cech, 2015; Fouad et al., 2017), including organizational factors that contribute to the differential attrition (Cech & Blair-Loy, 2019; Hunt, 2016; Singh et al., 2018) and how a woman's work experiences evolve and change over time (Kahn & Ginther, 2015; Maltese & Cooper, 2017). These gaps in the literature, coupled with the persistent attrition phenomenon for women engineers, demonstrated opportunities to generate new knowledge. The current study addressed some of these gaps by employing a research approach that uncovered more complex and nuanced meanings from former women engineers' departure stories. Advancing the scholarship in this way could generate the kind of knowledge that engineering stakeholders require to promote meaningful changes in their profession that could establish a workplace culture where women feel welcomed, valued, and want to stay.

Problem Statement

The loss of valuable talent from departing woman professionals has contributed substantially to the technology industry's forfeiture of over $16 billion per year (Scott et al., 2017) by limiting the profitability and technological edge of STEM firms (Scott et al., 2017; U.S. Chamber of Commerce Foundation, 2015). The social problem is that women remain underrepresented in the STEM professions and specifically in engineering, accounting for just 24% (Noonan, 2017) and 18% (Predescu & Chen, 2017) of the workforce, respectively. Since 2009, some STEM professions have gained ground in the race for female talent, but the engineering profession has remained flat (Noonan, 2017). The specific management problem is that more women are exiting the engineering

profession than are entering (Fouad et al., 2017), resulting in a net drain on female talent that incurs lost business value from talent discontinuity and unrealized business revenues (SWE Blog, 2016). There is a gap in understanding why this differential loss of female talent from the engineering workforce persists (Fouad et al., 2017). Without more meaningful insights about how to address the continued attrition of valuable female talent, the engineering profession is unlikely to sustain the human capital necessary to achieve competitive advantages through innovation, increased productivity, improved firm reputation, and enhanced business performance (Fouad et al., 2016; Roh & Kim, 2016; Smith-Doerr et al., 2017). To address this gap, I employed a qualitative narrative inquiry design to explore the stories of former women engineers from the Northern Tier States region as the most appropriate way to uncover the deeper meanings behind a decision to leave their careers. The Northern Tier States Region (Public Utility Regulatory Policies Act, 1978) includes the states of Washington, Oregon, Idaho, Montana, North Dakota, Minnesota, Michigan, Wisconsin, Illinois, Indiana, and Ohio.

Purpose of the Study

The purpose of this qualitative narrative inquiry study was to explore the experiences of former women engineers in the Northern Tier States region of the United States through their narrative stories of consideration for leaving the profession and their final decision to leave.

Research Questions

Central Research Question

RQ: What are the recounted experiences of former women engineers as told through their narrative stories of consideration for leaving the profession?

Supporting Research Question

SQ: What are the recounted experiences of former women engineers as told through their narrative stories of final decisions to leave the profession?

Conceptual Framework for the Study

This study's conceptual framework incorporated and integrated the concepts of *habitus, capital,* and *field*, first introduced in Bourdieu's (1972/1977) germinal work, *Outline of a Theory of Practice*. In *Outline of a Theory of Practice*, Bourdieu established a systematic framework for thinking about the actions of people engaged in a myriad of social contexts differently. Bourdieu's concepts of habitus, capital, and field offer an effective way to understand how individuals internalize meaning while being conditioned by past experiences shaped by the everyday practice of reenacting them in varying contexts. Over time, studies employed the concept of habitus to help describe the perceptions of an individual's life experiences and the choices that result, sometimes involving rational but unconscious thought (Vilhjálmsdóttir & Arnkelsson, 2013). Sieweke (2014) added that when applied to management and organization studies (MOS), habitus referred to one's ability to fit into conventions, that capital can equate to the often intangible benefits of belonging to a particular group, and that field is associated with learning the *rules of the game* for one's profession.

Bourdieu's (1972/1977) concepts of habitus, capital, and field have been combined to form an established conceptual framework used in MOS (Sieweke, 2014). They have recently emerged in engineering management research as a congruent way to explore individuals' complex experiences in the workplace, including women engineers (Fernando et al., 2018). While Chapter 2 includes a more detailed treatise, the use of habitus, capital, and field allowed me to view former women engineers' experiences through the lens of their socially constructed engineer identity and how certain workplace factors might have precipitated a decision to leave their careers. The engineering workplace culture constitutes a "field" where a woman's engineering "habitus" and "capital" combine to create a storied experience of professional life where some women persist, and others chose to leave. A review of the literature in which Bourdieu's practice framework was used suggested that there might be complex and undetermined mechanisms in engineering that exist at the nexus between a woman's socially constructed way of being and the work culture that can have a considerable influence on career decisions.

The conceptual framework of habitus, capital, and field complemented the use of a narrative inquiry design, which I employed seeking to view the storied lives of participants as a continuum of interrelated experiences, told in a relational context, and as the result of social influences in their environments (see Clandinin, 2016). Used together, the narrative way of collecting and analyzing data and the conceptual framework aligned well with the purpose of the study to fill a gap in the literature by answering the research questions, and specifically, developing a more nuanced understanding of how former

women engineers might construct their stories of consideration for leaving the profession and their final decision to leave as well as how those discoveries could contribute new knowledge that could enable meaningful social change.

Nature of the Study

Many researchers investigating the career departure phenomenon for women engineers have relied on quantitative methods using large longitudinal survey data sets (see Cech, 2014, 2015; Fouad et al., 2017; Glass et al., 2013; Hunt, 2016; Kahn & Ginther, 2015; Navarro et al., 2014; Sassler et al., 2017; Singh et al., 2013; Singh et al., 2018; van Veelen et al., 2019). Complimenting the quantitative scholarship is a few qualitative studies that also advanced the knowledge about the career departure phenomenon for women engineers. These relevant qualitative works used a variety of designs such as grounded theory (Buse et al., 2013), case study (Mallette, 2017), and phenomenology (Fernando et al., 2018), and while narrative inquiry designs were absent for the specific phenomenon of interest, they were present in some related engineering and STEM research literature. While prior research has contributed much to the body of knowledge by offering insights about possible reasons for a woman engineers' turnover intentions, there is still a need for a more nuanced understanding of the phenomenon (Fouad et al., 2017; Singh et al., 2018).

To advance the contributions from prior research and address a literature gap, I selected a qualitative narrative inquiry approach. The frameworks of qualitative studies are administered by social researchers to explore and describe phenomena to understand and explain the complex nature of things by collecting descriptive data (Taylor et al.,

2016). Quantitative or mixed-method approaches were not pursued because the problem statement, purpose, and research questions did not align with the need to scientifically test theories or conduct empirical investigations of variables (see Babbie, 2016). Qualitative approaches were the most appropriate means of addressing the stated research gap because they can be used for theory-building and enable exploring complex meaning-making processes of people and how they interact with their natural environments (see Babbie, 2016). Babbie (2016) added that the nonnumerical data generated through qualitative methods offer a deep understanding of a phenomenon that quantitative methods are less suited to address. The qualitative approach best aligned with this study's objectives because it could uncover the rich, thick meaning underlying why women continue to leave the engineering profession.

A narrative inquiry study design was the most appropriate choice for this study. Narrative inquiry frames experience through stories, emphasizing the "how," the "what," and the contextual aspects of the narratives, which, when analyzed, allows researchers to form a full meaning (O'Toole, 2018). The triangle formed by these three dimensions constitutes the framework by which people internalize their experiences (Clandinin, 2007), also called storied phenomenon (Clandinin, 2016). While phenomenology is also used to explore attitudes, beliefs, and feelings about experiences (Percy et al., 2015), it was not selected because the design does not focus on acquiring and elucidating the meaning and structure of a specific experience across all participants' perceptions (see Patton, 2015). Instead, the design of the current study included an extension of the phenomenological paradigm of understanding experiences by analyzing narrative

fragments or terms (see Patton, 2015) by cocreating meaning from more nuanced interpretations of complete stories or passages about an experience told over time and in varying contexts (Riessman, 2003; Taylor et al., 2016). While a phenomenological approach could have uncovered new insights about how women engineers experienced their career exits, the narrative inquiry design offered the advantage of acquiring deeper and richer interpretations of their storied experiences about considering and making a final decision to abandon the profession.

A key feature of narrative inquiries is that the story is the primary data element (Patton, 2015), which influences the choice of a data collection instrument. For this study, I chose a semistructured interview approach. In the interviews, I used a limited number of open-ended questions and potential probes to collect data from a purposeful sampling of qualified participants. The semistructured interview paradigm best facilitated a balance between wanting to maintain a narrowed research focus and needing to minimize researcher influences by remaining engaged and emotionally attentive to the storytelling process (see Clandinin, 2016). The semistructured interview approach was the most suitable way to collect narrative data from a purposeful sampling of six former women engineers from the Northern Tier States region recounting stories of their career exit experiences.

Collecting and analyzing data for narrative inquiries is a crucial part of the understanding process. Data or *field texts*, including cocreated transcripts and other relevant participant memorabilia, form the foundation for unlocking meaning from a storied phenomenon (Clandinin, 2016). Clandinin (2016) added that the analysis of field

texts involves an iterative process of unfolding the many dimensions of what was captured from participants, sometimes requiring additional conversations with them, but ultimately resulting in a final research format suitable for completing a study.

In contrast to some data analysis forms, narrative analysis is an immersive process that allows for the systematic study of personal experience and meaning-making (Riessman, 2003). Furthermore, analyzing data narratively deviates from standard data-reduction analytics by shifting the focus away from coding and categorizing words and phrases to enable generalizations across participant inputs to instead, emphasizing a holistic coding schema, which is a hallmark of narrative inquiries and assigns meaning to entire passages in a story (Riessman, 2008). While narrative analysis is a single overarching approach for analyzing and interpreting data generated through narrative inquiry, there are some variations in the process.

For narrative inquiry, the transition from field texts to research texts is a complex process of reading and rereading field texts to construct a summary accounting of their contents. In this way, the analysis process could involve the writing of many interim texts that can take many forms and serve as instruments to share and negotiate interpretations with participants before establishing a final research text (Clandinin & Connelly, 2000). Narrative analysis usually involves thematic, structural, a combination of thematic and structural, or dialogic approaches to interpreting data or field texts (Riessman, 2008). I selected the thematic analysis approach for this study because it offered a better result than having to master a more challenging dialogic or structural approach used by more

advanced narrative researchers and was still consistent with unlocking meaning from the storied narratives of former women engineers.

In this study, I applied the thematic analytic paradigm of Braun and Clarke's (2006) six-step process that included familiarization with the data, initial coding, searching for themes, theme review, and naming themes. Using established methods, such as a trusted data analysis paradigm, helped demonstrate dependability by introducing rigor and structure, enhancing the study's trustworthiness (see Nowell et al., 2017).

Definitions

This section contains the key terms, concepts, and constructs used for this study.

Capital: A concept that extends the most commonly understood economic exchange form to include social, cultural, and symbolic capital, which identifies and emphasizes other constructs and ways to wield one's power and influence in social settings (Bourdieu, 1972/1977).

Characterization: A storied event told by an individual and interpreted by the narrative inquirer (Clandinin & Connelly, 2000).

Conversation: For narrative inquiries, the term conversation serves to differentiate between a typical interview involving a question and answer exchange between the researcher and participant, and the narrative inquiry interview where the goal is to cocreate meaning from the storytelling process (Clandinin & Connelly, 2000).

Field: The contextual boundaries where the interaction between habitus and capital plays out in many social settings. Fields can be networks of objectively defined

institutional authorities or positions that impose structure and other demands on its agents and actors who seek access to its rewards (Bourdieu, 1972/1977; Bourdieu & Wacquant, 1992).

Field texts: In narrative inquiry, the term field text is synonymous with the term data. It emphasizes the data collection process's co-composed nature during the investigation, including researcher notes and journals about the storied experience and interview transcripts (Clandinin, 2016).

Habitus: A system of cognitive mechanisms for how people internalize the social forces that act on them over time and in varying contexts, including how those internalizations can influence the sense-making process of future lived experiences (Bourdieu, 1972/1977).

In the midst. For narrative inquiries, the phrase "in the midst" helps visualize the process of a researcher imagining themselves in the participants' storied experiences (Clandinin, 2016).

Living: How participants live out their stories (Clandinin, 2016).

Microaggressions: Everyday incidents, comments, or actions that create an unwelcome workplace environment toward a member of a marginalized group (Nilsson, 2017), often exposing one's implicitly held stereotypes (Sekaquaptewa, 2019).

Place: Narrative inquiries are characterized by the researcher thinking in three dimensions, where place is the dimension that refers to the physical and topological boundaries where storied events occur (Connelly & Clandinin, 2006).

Reliving: How a participant, when retelling stories, may begin to relive the retold stories and even restory lived experiences (Clandinin, 2016).

Research puzzles: In narrative inquiry designs, research puzzles can be used synonymously with research questions (Clandinin & Connelly, 2000).

Retelling: The narrative inquiry term for when the researcher inquires into the participant's lived and told stories, and the participant retells those stories (Clandinin, 2016).

Sociality: In the three dimensions of thinking used by narrative inquirers, sociality means attending to the continuous cycle of construction from both an individual's social and personal conditions based on emotions, culture, experiences, and events (Connelly & Clandinin, 2006).

STEM: STEM is an acronym used to mean all academic and career fields related to the disciplines emphasizing science, technology, engineering, and mathematics (Nadelson & Seifert, 2019).

Telling: In narrative inquiries, telling refers to the process of a participant telling the stories of their living (Clandinin, 2016).

Temporality: When researchers think three-dimensionally about narrative inquiries, temporality means attending to the recursive nature of the past, present, and future of people, place, things, and events under study (Connelly & Clandinin, 2006).

Wakefulness: The process of on-going reflection throughout the narrative inquiry process, in which the researcher remains vigilant to emergent possibilities regarding the

generation of knowledge as a way to preserve the trustworthiness of narrative inquiry (Clandinin & Connelly, 2000).

Assumptions

An assumption refers to a critical condition of a study that is taken for granted and not within the full control of the researcher (Leedy et al., 2016). I made the following assumptions in this study:

1. The study design, including the interview guide and the formulated interview questions, was sufficient to elicit telling stories that contained rich and thick meanings about the participant's experiences of leaving, allowing for meaningful analyses and results.
2. A snowball sampling strategy would generate a sufficient number of willing participants to satisfy a sample size adequate to achieve data saturation.
3. The participants would recount their stories thoroughly and transparently without being deceptive or dishonest.
4. Sufficient researcher reflexive capacity existed to meaningfully engage with participants and interpret former women engineers' stories about their career departures.

Scope and Delimitations

The scope identifies the characteristics specified for the expert group applicable to the study, and delimitations narrow the study parameters to bound and make feasible the attainment of the research purpose by explicitly stating what was included (Crawford et al., 2016). The following scope and delimitations applied to this study:

1. This study was delimited to the timeframe of employment as an engineer and not to decisions to enter the profession and choices made after exiting the profession.
2. This study was delimited to only women professional engineers living in the Northern Tier States region of the United States who left their careers and did not return. This choice limited transferability but ensured the critical alignment between the specific management problem and the research questions that sought to explore the stories of women who shared similar, geographically based social and cultural contexts.
3. This study's literature review was delimited to include only relevant research on women engineers in career contexts and settings and not their male counterparts in the engineering workplace who have chosen to leave. While the body of research examining a man's engineering career exits could offer valuable insights, it was not congruent with exploring women engineers' career experiences.
4. The study was delimited to a qualitative narrative inquiry design. I did not choose a quantitative tradition because the goal was to explore and describe participants' storied experiences to understand and explain the complex nature of things through the collection of descriptive data.
5. The study was delimited to the conceptual framework because other potentially relevant theories and frameworks introduced previously by other

researchers examining the same phenomenon were incongruent with the objectives of this study.

Limitations

Limitations refer to possible weaknesses in the study design or methods beyond the researcher's control (Crawford et al., 2016). The following limitations applied to this study:

1. This study was limited to recruiting participants from only one region, with unknown applicability to other states or regions. This limitation could not be easily overcome due to the infeasibility of locating participants outside of the stated geographic area where I had access to ample numbers of network seed contacts needed to generate the required sample size using a snowball sampling strategy.
2. The small sample size for this study, coupled with the potential aspects of the participant sample's final demographic profile, limited the transferability of study findings to other populations of women engineers.
3. The narrative inquiry design introduced study limitations regarding researcher and participant biases due to the close relational aspects of collecting data and cocreating meaning, including me as the researcher being from the same career field as participants. The use of reflexivity and wakefulness throughout the study process reduced the effects of these kinds of biases.
4. The bounded selection criteria for participants, focusing on women engineers who have departed the engineering profession within the last 4 years,

introduced limitations regarding the study's trustworthiness, emanating from the effects of common method biases from self-reported data. To mitigate biases, I reminded participants of their protections, including privacy and confidentiality, and the need for their transparency and honesty when telling and attributing meaning to their storied experiences.

Significance

The specific management problem addressed by this study was that more women are exiting the engineering profession than are entering (see Fouad et al., 2017), resulting in a net drain on female talent that sustains lost business value from talent discontinuity and unrealized business revenues (SWE Blog, 2016). With women making up just 18% of the engineering workforce and 15% of the leadership ranks (Predescu & Chen, 2017), their attrition incurred unplanned costs for engineering companies from untapped technological advances (Holtzblatt & Marsden, 2018). While there have been some meaningful advancements in understanding why women may exit their careers (Cardador & Hill, 2018), there is little research that explored the workplace culture of engineering and its effect on a woman's decision to abandon their career (Meiksins et al., 2018). Through a review of the literature, I also identified the need for further inquiries that can produce a deeper and more holistic understanding of a woman engineer's career experiences and their decision to exit the profession (see Fouad et al., 2017). The current study results narrowed the gap in understanding the career attrition phenomenon for women engineers by contributing new knowledge about their experiences with the engineering work culture and how it precipitated a choice to abandon the profession. The

resulting findings and recommendations have implications for practice, scholarship, and positive social change.

Engineering stakeholders can use the current study findings and recommendations to pursue interventions that could promote organizational climates where women feel valued, excel, and want to stay. Retaining more women engineers in the workforce could improve business performance outcomes by increasing productivity and innovation (Roh & Kim, 2016). Having more women in the engineering profession could also increase the potential for developing more innovative and creative ways to address some of the most vexing problems facing society and the planet (Duran & Lopez, 2015). Practitioners, especially those in responsible charge of others, could leverage the research findings to develop; acquire through benchmarking; and adopt tangible new policies, procedures, and best practices that might reduce or eliminate workplace barriers that disadvantage women engineers and contribute to their persistent career attrition. By addressing the over advantaging of men in engineering, engineer leaders could begin to cocreate a more equitable career path and work environment for women professionals (Anicha et al., 2020). Practitioners could adopt a stance that acknowledges the likely presence of gendered norms and behaviors in the workplace as a way to begin a dialogue about how men might unknowingly benefit from sexism, including engagement sessions that include detailed data and examples (Anicha et al., 2020).

As another stakeholder group, engineering educators could also benefit from the results of the current study. Findings from the current research reinforced the need for administrators, career counselors, and faculty to promote, design, and offer programs that

raise awareness about the gendered workplace to help build coping strategies for students, especially women, who may encounter incongruent work contexts and climates (see Wilkins-Yel et al., 2020). Engineering program designers and instructors could further promote resilience in engineering careers by ensuring program curriculums do not contain gendered learning outcomes that disadvantage women. By pursuing these kinds of meaningful change strategies that increase gender diversity, nurture supportive and inclusive organizational environments, and unlock its engineers' full potential, the profession could realize the benefits of having an egalitarian culture where both women and men are supported, valued, and want to stay.

Contributions from the current study could additionally promote meaningful outcomes for future research. This qualitative narrative inquiry study added to the body of knowledge about the career attrition phenomenon by providing an in-depth understanding of lived exit experiences that exposed the feelings and perceptions of former women engineers concerning their interaction with engineering career contexts. Future inquiries could replicate this study's methodological stance as a valuable way to view career exit experiences for women in other settings to enable a deeper and more complete understanding of the temporal complexities of navigating work cultures that may disadvantage them and precipitate a choice to leave.

Finally, the new knowledge presented in the current study about how women perceive their workplace experiences in the broader engineering culture has implications for realizing positive social change by improving women's personal and professional lives. Contributions from this study could increase the awareness of women who intend

to enter a gendered engineering career field and help those women already in the engineering workforce to improve their career experiences. As more women choose to enter and remain in the engineering career field, the higher the economic benefit they might realize from a high-paying profession, which could also contribute to more sustainable and healthier communities.

Summary

The purpose of this qualitative narrative inquiry study was to explore the experiences of former women engineers in the Northern Tier States region of the United States through their narrative stories of consideration for leaving the profession and their final decision to leave. A review of the literature revealed gaps in understanding that supported the need for future research that includes employing new methodological choices to gain a full meaning about the persistent and multifaceted attrition phenomenon for women engineers. Without this new knowledge that can inform meaningful strategies and interventions to address the loss of valuable women engineers, the engineering profession will be ill equipped to attract and retain the female talent necessary to sustain competitiveness in a global marketplace. I designed this study to explore former women engineers' storied experiences to contribute new knowledge about the attrition phenomenon.

In this chapter, I presented the basis for methodological implementation, beginning with a conceptual framework employing Bourdieu's (1972/1977) *Outline of a Theory of Practice* concepts of habitus, capital, and field. The chapter continued with a discussion of the rationale for selecting the qualitative research tradition and the narrative

inquiry design. Definitions of key terms, concepts, and constructs and a presentation of the assumptions, delimitations, and limitations that bounded and delineated the nature of the study were included. The importance of the current research for scholars and engineering stakeholders, including potential positive social change implications, was also provided.

In the next chapter, I present a review and synthesis of the relevant scholarship that formed this study's basis. Chapter 2 also includes the search strategy used to locate prior research that established the intellectual foundation and current scholarly conversation regarding the phenomenon of interest, the conceptual framework, and the research method. A summary of the literature gaps is then described, and Chapter 2 ends with a summary and transition to Chapter 3.

Chapter 2: Literature Review

This chapter contains a review of the existing literature related to the research problem. The social problem is that women remain underrepresented in the STEM professions and specifically in engineering, accounting for just 24% (Noonan, 2017) and 18% (Predescu & Chen, 2017) of the workforce, respectively. Since 2009, some STEM professions have gained ground in the race for female talent, but the engineering profession has remained flat (Noonan, 2017). The specific management problem is that more women are exiting the engineering profession than are entering (Fouad et al., 2017), resulting in a net drain on female talent that is incurring lost business value from talent discontinuity and unrealized business revenues (SWE Blog, 2016). The purpose of this qualitative narrative inquiry study was to explore the experiences of six former women engineers in the Northern Tier States region of the United States through their narrative stories of consideration for leaving the profession and their final decision to leave.

While prior research on the departure phenomenon for women engineers has generated valuable findings about workplace contexts that may precipitate a decision to exit (Cardador & Hill, 2018), there was a need for further research that could generate a more nuanced understanding (Fouad et al., 2017; Meiksins et al., 2018). This study's results addressed this gap in the literature by revealing the more profound and subtle meanings found in former women engineers' stories that could offer new insights about the persistent attrition phenomenon.

Chapter 2 contains five sections, beginning with a description of and reasoning for the literature review's search strategy. Next is a treatise on the selected conceptual

framework and its appropriateness for the study. In the third section, I provide a review and synthesis of the most current and relevant literature related to the problem statement, including a summary of what was known and not known about the career attrition phenomenon for women engineers. The next section includes a summary of the most current and relevant methodological literature. The chapter concludes with a summary of the literature review, conclusions, and a transition to Chapter 3, the research methods chapter.

Literature Search Strategy

This study's relevant historical literature originated from varied disciplines, including business and management, education, psychology, and information systems and technology. Most of the literature reviewed focused on relevant works published after 2015, with a smaller proportion dated before 2015 devoted to germinal authors and establishing historical contexts for crucial concepts.

My search for relevant literature focused on peer-reviewed articles. Research-specific, controlled vocabulary terms and phrases used individually and in combinations formed the basis for searching Business Source Complete, Computer and Applied Sciences, psycARTICLES, psycINFO, Education Source, and ERIC databases as well as Google Scholar. The keyword search terms used for this study were *women or female or women engineers, STEM, gender diversity, gender bias, gender inequality, inclusiveness, career or work or occupation or profession or role identity, leave or attrition or turnover or exit or abandon, work or workplace or organization culture or climate or environment, narrative inquiry method, narratives, narrative research, stories, storied*

experiences, storytelling, habitus, and *theory of practice*. I made controlled searches composed of keyword strings that yielded the most relevant literature about the departure phenomenon for women engineers. For instance, when searching library databases, the string "female OR women OR females OR woman and engineer* and quit* OR leav* OR turnover OR attrit*" yielded 431 results. I then narrowed the search to articles published since 2015 using the same search terms and databases, producing 127 results. An additional review narrowed these results further by removing sources that contained research subject matter that did not align with the phenomenon of interest (e.g., literature about attrition from engineering degree programs). In Google Scholar, I employed the controlled search string "women OR females AND "STEM" AND "engineering" AND barrier OR problem OR issue OR leave AND career OR job -college -university -education –"higher education" –"stem cell," yielding 379 results. As with the Google Scholar search parameters, the library database search was augmented by adding the limiter "NOT educat$ OR school$ OR teach$ OR student$," resulting in 54 potentially relevant articles. The titles and abstracts from both the refined Google Scholar and library database searches were further inspected to determine that results were germane scholarship pertinent to the study. After completing fieldwork, I repeated these same search protocols to locate and incorporate any new and relevant research from the literature published since the initial review before submitting this manuscript for approval. The final list of references selected for inclusion was annotated and synthesized to create the literature review. Walden University's subscription to *Ulrich's Periodicals Directory* was also employed to verify that articles were from a peer-reviewed journal.

While most articles were peer reviewed, a limited number of non-peer-reviewed sources were included as necessary to augment the study's content. Table 1 summarizes the relevant literature chosen for this study but does not include germinal works and other thought-leader resources that anchored this research in the scholarly heritage.

Table 1

Summary of Germane Resources: Category and Year of Publication

Category	2020	2019	2018	2017	2016	2015	Prior	Total
Peer-reviewed journal articles	7	10	14	13	16	8	16	84
Books	1	0	1	2	10	4	21	39
Other non-peer-reviewed sources	0	1	6	5	2	2	0	16
Total	8	11	21	20	28	14	37	139
Percentage of total	6%	8%	15%	14%	20%	10%	27%	100%

Conceptual Framework

The phenomenon of interest for this study was the storied experiences of former women engineers regarding their consideration for leaving the profession and their final decision to leave. The research puzzle was: Why do women engineers continue to abandon their careers at higher rates than their male counterparts and those found in other STEM fields? The scholarship regarding career attritions for women engineers encompassed a large body of literature, divided between those inquiries with congruent frameworks and those that used other theoretical or conceptual foundations for deriving meaning. While the latter inquiries may not have aligned with the framework chosen for

the current study, it was essential to summarize the theoretical and conceptual foundations used and contributions made to understand better the phenomenon of interest in this study. In the following subsections, I cover the most relevant of the latter body of literature first, followed by the works that undergird the framework for this inquiry.

Other Frameworks

The most common framework employed in quantitative research examining a women engineer's career aspirations was the social cognitive career theory (SCCT). SCCT states that a person's confidence in completing tasks can lead to an interest in specific careers that could influence career-aligned choices related to education and occupations, furthering an individual's self-efficacy perceptions and intentions to persist in their jobs (Lent et al., 1994). In studies using SCCT as a primary lens for understanding, women engineers who have abandoned their careers showed lower self-efficacy and diminished expectations for positive career outcomes (Fouad et al., 2016; Maltese & Cooper, 2017; Singh et al., 2013) but also cited the presence of embedded workplace barriers and lack of supports as reasons to leave (Fouad & Santana, 2017; Singh et al., 2013). Although qualitative in approach, Buse et al. (2013) used SCCT to generate meaning from interview data acquired from 31 working or nonworking women engineers. Buse et al. found that women with strong engineer identities and resilience to incongruent engineering work cultures persisted, adding that women who chose to exit cited hostile work environments as a primary consideration. While these works share the common theme that a woman engineer's decision to stay or go depended on the interaction between the work environment and their self-identity and perception of career

fit, they do not illuminate whether possible influences from other mechanisms described in the literature affected career choices.

To explore women engineers' reasons for leaving, Fouad et al. (2017) used the theory of work adjustment, which says that if an individual's needs are met at work, they will be more likely to stay (Davis & Lofquist, 1984). Fouad et al. found that women engineers exit because of a lack of fit between their needs and organizational values, primarily stemming from three factors: comfort or working conditions, safety or fairness in the workplace, and achievement or having meaningful work. Complementing Fouad et al.'s theory of work adjustment-based examination of turnover intentions were inquiries that used organizational support theory and social exchange conceptual lenses to understand the effect of supportive work cultures on a women engineer's career aspirations.

To understand why so many women leave the engineering profession, Singh et al. (2013) employed organizational support theory, which states that supportive work climates increase organizational commitment and reduce turnover intention (Eisenberger et al., 1986). Singh et al. found that career-exit risks were mitigated by women engineers who experienced higher self-efficacy, outcome expectations, and job attitudes resulting from developmental opportunities available at work. Singh et al.'s results were later corroborated by a qualitative inquiry that explored a similarly male-dominated hospitality sector regarding advancement and retention risks for women professionals using a social exchange conceptual framework. To find meaning from interviews conducted with female hospitality executives, Walsh et al. (2016) used the work of Blau (1964), who

argued that organizational leaders that invest in an employee's development are more likely to see increased commitment and less attrition. Walsh et al. found that women are more likely to stay in their careers if they have a clear path for advancement, more women executives to serve as role models, and midcareer support mechanisms that enable balancing work and family demands. Institutionalizing this type of integrated support strategy can promote a work climate that values and supports a women's career aspirations (Walsh et al., 2016). Singh et al. and Walsh et al. provided compelling arguments for why supportive work cultures and climates are essential to retaining more women. Singh et al. added that it also matters how women internalize workplace support features through their attitudes, expectations, and beliefs, although the authors provided limited insights about the many other possible causal mechanisms and contexts.

Cech (2015) applied the identity control theory to understand the gendering of professional identities, which stated that an individual's occupational identity is shaped by both positive and negative social and cultural cues at work, including to what degree people internalize engineering traits that are expected, valued, and rewarded (Robinson, 2007). Compared to their male counterparts, women engineers' self-conceptions and engineering identities were often less congruent with those familiar to the engineering profession (Cech, 2015). Building on the values-based aspects of women internalizing their identity in the engineering profession, Maltese and Cooper (2017) paired their quantitative design with both SCCT and the expectancy-value theory, which states that a person's success and the value placed on it correlates with their task persistence and achievement satisfaction (Battle, 1965). Maltese and Cooper argued that combining

SCCT and expectancy-value theory could offer new insights for understanding why some individuals persist in STEM pathways compared to others. They found that initial STEM interest was sex-neutral, but males generally reported more self-generated interest than females, who typically attributed their interest as coming from others. Maltese and Cooper added that STEM interest was the best predictor of persistence despite the sex differences in the origins and levels of interest. The internalized aspects of reinforced positive or negative interest were further examined the following year by Singh et al. (2018) when they introduced the conservation of resources theory as an overarching framework for understanding the career departure phenomenon for women engineers. The conservation of resources theory originated to explain the influence that stress exerts on conflicting life-demands, like work interference with family and family interference with work, stating that people will focus their time and energies on what they value most (Hobfoll, 1989). Singh et al.'s findings showed no significant relationship between work interference with family and turnover intentions, but that family interference with work was positively associated with plans to leave and that perceived organizational support was negatively associated with thoughts of leaving. The works of Cech, Maltese and Cooper, and Singh et al. suggested that organizations with inclusive and supportive work environments are less likely to drive away women engineers, even in the face of external stressors like work-family interferences and lower levels of self-generated STEM interest.

Most recently, van Veelen et al. (2019) sought to understand better why more women than men continued to exit their STEM careers by using social identity theory

(SIT), which argues that employees from the same social groupings will share similar attitudes and beliefs about workplace contexts that may include feelings of being devalued because of their group-based social identity, like being a woman (Tajfel & Turner, 1979). Through the lens of SIT, van Veelen et al. determined that women engineers working in male-dominated workplaces experienced higher gender identity threat levels than their counterparts in non-STEM roles, which could help understand why women continue to opt-out of STEM careers, like engineering. Compared to other frameworks, SIT becomes another way of generating meaning from the complex interplay between an individual's socially constructed identity and the existing work culture with all its inherent mechanisms, norms, and beliefs.

In a complementary SIT-based study, Hall et al. (2018) examined the more subtle aspects of gender-based threats to understand women engineers' impacts in the workplace. Using quantitative methods to analyze survey data and diary entries of daily interactions between male and female engineers, Hall et al. showed that work environments with gender-inclusive policies realized lower perceived identity threats and greater feelings of identity safety for women. Hall et al. argued that their findings suggested that having more gender-inclusive policies benefitted women more than their male peers by creating an environment where women felt more valued and accepted as professional engineers. Both van Veelen et al. and Hall et al. agreed that gender-based threats experienced in work cultures directly impact women engineers' sense of belonging and engagement. While Hall et al. argued that structural mechanisms like

policies were linked to how women perceive threats to their engineering identity, van Veelen et al. asserted that a causal connection was not clear.

Contributing to this debate about the effect of workplace policies on a woman's persistence in STEM careers was the argument that some institutional structures present in the work environment may be inadvertently disadvantaging women but hidden from the mainstream scholarship. For instance, Beddoes (2018) adapted the *study up* paradigm to look at how engineering professors view the relationship that policies have on the underrepresentation phenomenon for women in engineering both in education settings and academia. The *study up* conceptual framework generates meaning by exploring research settings through the lenses of upper social power structures and their actors to understand how power and accountability affect the phenomenon of interest (Nader, 1974). Beddoes found that academia's policies focused primarily on increasing numbers of female faculty and providing support mechanisms to balance work-life challenges but not to address the underrepresentation of women in the student pipeline. Beddoes added that the faculty interviewees saw policies as separate and distinct from the workplace culture. This faculty perspective has merit, as the findings from Beddoes, Hall et al. (2018), and van Veelen et al. (2019) point to the need to see workplace cultures as all-encompassing constructs, including structured policies, that continuously exerts influence on individual agents as they experience work through a multitude of dyadic and group interactions in varied temporal contexts.

Theory of Practice Conceptual Framework

This study's conceptual framework incorporated and integrated the concepts of *habitus, capital,* and *field,* which were first introduced in Bourdieu's (1972/1977) germinal work, *Outline of a Theory of Practice*. Pierre Bourdieu was a French philosopher and sociologist, who argued that neither structure nor agency held all the answers to understand human behavior (Calhoun & Wacquant, 2002). The *Outline of a Theory of Practice* established a systematic framework for thinking about the actions of people engaged in a myriad of social contexts differently (Bourdieu, 1972/1977). Bourdieu did not subscribe to either the dominant structuralist or objectivist paradigms of the time as stand-alone epistemologies and ontologies, hypothesizing instead that there was a third and more holistic way to view human action or practice. Because Bourdieu's theory amounted to a rejection of the dominant thinking of that time and the writings had not fully matured, the *Outline of a Theory of Practice* was not considered a comprehensive treatise, resulting in criticisms that persisted for many years (Calhoun & Wacquant, 2002; Edgerton & Roberts, 2014; Lau, 2004). Bourdieu was also critical of social scientists who claimed objectivity in their observations of human activity without acknowledging their part in the process of understanding and the biases that result (Bourdieu, 1972/1977). Despite the many critics, Bourdieu continued to build a case for redefining social reality as a myriad of hidden and obscured mechanisms that influence human activity that cannot be objectively measured or explained by people's independent acts (Bourdieu, 1972/1977; Calhoun & Wacquant, 2002). Further, and of relevance to the current study, in the years leading up to Bourdieu's death in 2002, these well-developed

theoretical paradigms about society enabled Bourdieu to actively champion and realize positive social change (Calhoun & Wacquant, 2002).

Bourdieu's (1972/1977) central organizing concept of practice relied on a multidimensional paradigm for finding meaning from people's lived experiences over time and in varying contexts and incorporated the key foundational concepts of habitus, capital, and field. These concepts, discussed below, offer an ideal framework for generating a more nuanced understanding of why women engineers abandon their careers by serving as the lens for how women might construct their stories of leaving and how those discoveries could contribute new knowledge that enables meaningful social change.

Habitus

The term habitus stemmed from Aristotle's *hexis* and was later translated to its current Latin form by Thomas Aquinas, where it found limited use by authors like Max Weber (1952) and Thorstein Veblen (1899), before being adapted by Bourdieu in the 1960s (Wacquant, 2006). Bourdieu (1972/1977) elucidated the concept of habitus, defining it as a system of mechanisms for how people internalize the social forces that act on them over time and in varying contexts, including how those internalizations can influence the sense-making process of future lived-experiences. The recursive nature of habitus, when viewed as a process of meaning-making, was central to unlocking new insights about human attitudes, perceptions, and actions by arguing that human internalizations can be continuously altered, forgotten, and replaced when acted on by new social stimuli (Bourdieu, 1972/1977, 1990). Through these internalized schemes, individuals' social practices are influenced and guided when navigating everyday life

complexities through time and in different settings (Bourdieu & Wacquant, 1992). Habitus is then an unconscious process where the internalization of culture can manifest itself in individuals' actions. For this study, the concept of habitus helped to make more accessible and observable the meaning from woman engineer's stories of incongruency with the engineering workplace through perceptions, beliefs, and attitudes leading up to the act of abandoning their career.

Capital

Bourdieu's concept of capital extended the most commonly understood economic exchange form by introducing the variants of social, cultural, and symbolic capital to emphasize that there are other ways to wield one's power and influence in social settings (Bourdieu, 1972/1977). Bourdieu equated social capital to a person's connectedness in personal and professional networks; cultural capital to things like an individual's physique, education, intellect, and achievements; and symbolic capital to one's prestige, position, and recognitions. Capital and habitus are closely linked as determinants of human actions or practice, carried out in response to a *field*, a final concept from Bourdieu's *Outline of a Theory of Practice* discussed in the next section. For the current study, the concept of capital complements habitus as a way to understand women engineers' practices in response to a male-dominated profession where they may experience differential access to, or accumulation of, certain forms of capital. The devaluing of women engineer's capital can take many forms in a work setting. A review of the literature revealed that women engineers were more likely than men to follow a managerial career path, which was not valued as highly as technical paths (Cardador &

Hill, 2018). Women engineers with strong communicative skills were also less valued than men with only strong technical skills (Mallette, 2017). When viewed together, a woman engineer's habitus and how they use various forms of capital may offer insights into understanding their turnover intentions.

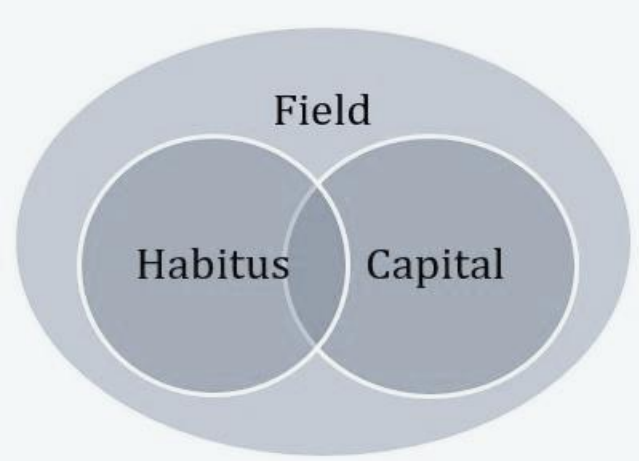
Field

The third sub-concept from Bourdieu's (1972/1977) *Outline of a Theory of Practice* was field, which served as the contextual boundaries where the interaction between habitus and capital plays out in a myriad of social settings. Bourdieu, and Bourdieu and Wacquant (1992), added that fields could be networks of objectively defined institutional authorities or positions that impose structure and other demands on its agents and actors who seek access to its rewards.

Figure 1 provides a relational diagram of how field encompasses and influences the interaction between habitus and capital. Bourdieu (1990) described the field as a social arena where agents are engaged in a contest for resources and position. When considering former women engineers' stories, field represents the hegemonic masculinized engineering culture with its many contexts, settings, environments, and attributes that influenced their career choices.

Figure 1

Diagram Showing how the Key Concepts of Bourdieu's (1972/1977) Outline of a Theory of Practice Relate and Provide a Framework for Understanding



Bourdieu (1972/1977) ascribed to the belief that understanding the human condition required a more critical interpretive paradigm that accounted for the many complexities of human existence. Based on the purpose and guiding research questions for this study, Bourdieu's conceptual framework outlined in the theory of practice was well suited for generating a more profound meaning from women engineer's stories of leaving and can be further understood by reviewing its application in crucial works in management and organization studies, including engineering management.

Use in Management and Organizational Studies

Bourdieu's research paradigm was slow to take hold in the U.S. sociology field overall. While not widely used or universally accepted, Bourdieu's contributions have inspired many scholars to employ the practice theory to generate new meaning and

extend the body of knowledge (Lamont, 2012). In MOS, Bourdieu's (1972/1977) habitus, social capital, and field are established frameworks that have become more prevalent since 1980 (Sieweke, 2014). While Bourdieu's concepts are both employed individually and as integrated frameworks for understanding in MOS, the net contributions realized from studies relevant to the interests motivating this research about former women engineers' career choices are noteworthy.

The process of understanding what mechanisms and factors may influence individuals' career choices was a central theme in the current study and benefited from employing Bourdieu's practice concepts. When examining occupational trajectories of groups of individuals who share different socially constructed likes in music, fashion, and literature, Vilhjálmsdóttir and Arnkelsson (2013) devised a study that compared the relationship between the habitus of 19 to 22-year-old youth in Iceland and their choice of a career. Vilhjálmsdóttir and Arnkelsson found that the young people's habitus strongly influenced their career choices and that these culturally based group patterns were also linked to social variables like gender, class, and place. While habitus was a defined variable in this study, capital and field were also employed to attribute deeper meaning to the results. Vilhjálmsdóttir and Arnkelsson's research made an important contribution. It indicated that career choices comprise influences from the internalization of constructs from social fields, one's co-constructed habitus, and the capital individuals leverage for their benefit. While Vilhjálmsdóttir and Arnkelsson offered essential insights about the value of Bourdieu's concepts to understand a person's career path choice, they did not

necessarily translate to an understanding of the different choices made by men and women while employed.

McKenna et al. (2016) collected interview and focus group data from Australian male and female government and financial sector managers and non-management professionals, including lawyers, accountants, architects, and engineers, to explore differences in how men and women make career choices related to work-life balance. McKenna et al. employed Bourdieu's concepts, in part, to find meaning about the influence of fields and capital on decisions associated with prioritizing responsibilities at work versus home. McKenna et al. found that men and women differed significantly on two main points, first on the degree of responsibility attributed to matters at home and work, and the degree of career choices available to deal with work-life balance issues. For instance, more than women, men responded with a higher degree of choice in balancing work and home. Women participants communicated a higher responsibility to address all demands at work and home than their male peers. McKenna et al. concluded that while participants did not label their practices as gendered per se, the data reflected inherent inequalities with perceived responsibility and choice. When viewed through the lens of Bourdieu's concepts, the results suggest that a woman's socially constructed way of being (habitus), coupled with higher levels of capital related to practices at home, all playing out in a field with gender-reinforced *rules of the game,* can create a work culture where gender-based practices can be misrepresented and misinterpreted as lifestyle choices.

While not a MOS, it was vital to highlight one of Bourdieu's later works that focused the practice theory on the phenomenon of male dominance in society's structures. Bourdieu (2001) called for a reflexive examination of male domination in society and why those disadvantaged by its influences often accept gender differences as the natural order of things. Bourdieu argued that to understand gender inequalities in modern society better, it was essential to explore institutional roles to ascribe new meaning to how they reproduce and sustain gendered mechanisms and practices. Bourdieu added a plethora of knowledge about how familial forces can contribute to gender imbalances, but less was known about religious and educational institutions' impacts. Used as a case study in the book *Masculine Domination*, Bourdieu drew on prior ethnographic research about the Berbers of Kabylia and described how male and female members' gendered habitus saw gender differences and inequalities inherent to their social order. Bourdieu suggested that despite the many positive advances seen for women, that some of the same paradigms observed in Kabylia may still be present in modern society as a reinforcing cycle of gendered practices. Sustaining positive social change can be achieved by exposing institutional structures of male domination that persist in society.

Styhre et al. (2018) interviewed 35 men and women working in the Swedish video gaming industry to explore the impact of low numbers of women (approximately 16% of the workforce) on its economic viability. Styhre et al. found that women and men in the gaming industry in Sweden have recognized the business value of the social and cultural capital women bring to the industry to improve the bottom line. Although the availability

of women's choices to access the full spectrum of occupational roles was limited to those that leveraged their market knowledge of female gamers over those in the core gaming roles dominated by men.

A final important application of Bourdieu's concepts was understanding the differential effects that working women can experience from temporal limitations that affect their ability to acquire needed social and cultural capital. Vincent (2016) interviewed 25 self-employed human resource professionals (17 women and eight men) in the United Kingdom to explore the effect that time at work may have on their capital conferred between social fields of work and home. Vincent found that more women than men were disadvantaged by a socially constructed habitus that placed a higher demand on their time to meet domestic responsibilities. Women professionals were less likely to find adequate time for capital-creating activities like business development and networking. Vincent argued that while there were many forms of capital that women could avail themselves of, the net result was differential trade-offs needed to balance the socially induced expectations on their non-work lives with their economic well-being needs.

The application of Bourdieu's framework for understanding in MOS had potential implications for this study. First, male-dominated *fields* may limit women's career aspirations by reinforcing a male and female gendered *habitus* that places differential value on gendered *capital* (McKenna et al., 2016; Styhre et al., 2018). Second, a *field* and its institutional constructs emanating from certain external norms of society can negatively influence a woman's career (Vilhjálmsdóttir & Arnkelsson, 2013; Vincent, 2016) and negatively impact business outcomes (Bourdieu, 2001).

Use in STEM and Engineering Studies

While limited in application, Bourdieu's practice framework emerged recently in STEM scholarship and engineering management research as a valuable tool for exploring gendered experiences, including women engineers' experiences in the workplace. At the STEM level, gaps in understanding the persistent underrepresentation of women in specific STEM career paths have generated calls for research designs that employ novel ways of viewing human phenomenon to generate the kind of new knowledge that could result in meaningful change. In response, researchers have introduced habitus, capital, and field as meaningful conceptual frameworks to better understand gender imbalances in STEM degree programs and careers.

As a subtopic in STEM gender studies, Alfred et al. (2019) explored the underrepresentation phenomenon for women of color. Their search of the literature revealed many explanations for the pipeline deficit for all women, like low quality public education, education programs that inadequately prepare students for industry, and STEM attrition in general. Still, there was little research to explain why White men persist more than women. Based on this gap, Alfred et al. argued that to understand better the impacts that STEM cultures have on women of color, future researchers should employ Bourdieu's concept of social capital as a vital component of the conceptual framework. Alfred et al. further contended that by viewing the origins and types of social capital held by a woman of color, a full meaning could emerge that might address how their identities of race, class, gender, and others intersect with the underrepresentation phenomenon.

Based on secondary research, the authors made an original contribution to the conversation by identifying the absence of research using frameworks that can conceptualize how the lack of gender diversity in engineering might result from women lacking access to the kinds of capital necessary to succeed in their chosen occupation.

Turnbull et al. (2019) sought to understand the low numbers of women physics majors that persist compared to the near-equal representation of women completing physical sciences degrees by examining the choices of courses in (vertical) and between (transverse) different degree programs. Turnbull et al. created a network of courses taken over 6 years at a New Zealand university by approximately 9,000 undergraduate physics students and interpreted the results by employing Bourdieu's concepts of habitus, capital, and field. Specifically, the authors viewed the student's choices in coursework in relationship to the social fields operating in each degree program, the scope and magnitude of capital held by a student, and how their habitus influenced their practices and choices. Turnbull et al. found that more women than men made transverse course selection choices, were more likely to pursue life sciences degrees, and were not as welcome in the physics degree program due to a social field that aligned more with a male's capital than a female's capital. These results' value centers on the reinforcement of why it was vital to combine Bourdieu's practice theory's key schemas into one lens for understanding the gendered workplace in STEM fields.

In the most relevant application of Bourdieu's framework, Fernando et al. (2018) sought to understand what influences a woman engineer's choice to remain in the profession. Fernando et al. used a qualitative approach to explore how institutional

support mechanisms might contribute to women engineers staying in their occupation. Fernando et al. collected data from semistructured interviews with 34 British women engineers in their early, mid-, and late careers and used the habitus schema to find meaning about a women's choice to persist in their profession. The interviews entailed the participants recounting their career experiences and responding to prepared questions regarding why they had endured their careers. They recorded and transcribed the interviews. The data analysis included coding at both an initial descriptive level that uncovered specific themes and a second time when identifying the final thematic categories. Fernando et al. found that women engineers framed their career persistence around four support mechanisms: care and peer support, performance feedback, growth and advancement opportunities, and access to role models. Fernando et al. argued that the interaction between a woman engineer's life-experiences and an organizational climate that supports them formed an *engineering habitus* that translated to a choice to stay.

When viewed as a field, the engineering workplace culture is where a woman's engineering habitus and capital combine to create a storied experience of professional life where some women persist, and others chose to leave. Employing Bourdieu's practice paradigm also introduced the idea that ascribing meaning to women's career departures involves understanding how their agency (habitus plus capital) may play a role in the efficacy of how they positioned themselves for success. A review of the literature regarding the use of Bourdieu's practice framework suggested that there are multi-faceted mechanisms, some possibly undetermined, in the engineering profession, that depending

on how and to what degree a woman's socially constructed way of interacting with that culture, can have a major influence on career decisions.

Literature Review

Historical Context

Research regarding the premature departure of women engineers from their careers remains a relatively new field of study. Still, its intellectual roots stretch back nearly 40 years beginning with gender imbalance studies that focused on the general fields of what we now call STEM, an acronym first coined by the National Science Foundation in 2001 (Marick Group, 2019). As such, there was limited research focused on gender differences in STEM career attrition (Cech & Blair-Loy, 2019) because the majority of gender-related research, covering the 1970s, 80s, and 90s, focused on the underrepresentation of women in the STEM academic pipeline (Kanny et al., 2014). Many of the underrepresentation phenomenon inquiries tended to problematize women without considering other factors like organizational policies and culture (Beddoes, 2018). While limited in some ways, these early investigations formed a foundational body of knowledge about the STEM gender gap phenomenon, including concepts or themes that still receive scholarly attention today. These first works also enabled the evolution of understanding about women's inclinations and aspirations to pursue a STEM career path and, ultimately, whether they decide to stay or go.

Familial Factors

A meta-theme that has persisted in studies concerning gender differences in STEM is familial contexts that influence women's STEM interests. Early on, the body of

literature emerged as two primary categories, namely a woman's *gender-role socialization* and *self-concept* (Kanny et al., 2014). Gender role socialization comprised many lenses of what society expects of women, including how females are raised in various family contexts like whether a mother works outside of the home (Tangri, 1972), or how they are socialized in the home, including unequal access to computers and gendered views of technology application (Levin & Barry, 1997). Understanding the impacts from mechanisms of self-concept determination to predict STEM interest precipitated an expanded view of the family-based research focus, which looked at the effects of relational influences from parents. One of these phenomena was how a parent's occupation, like engineering, contributed positively to a female child's STEM aspirations (Sax, 1994) or that women who felt less parental pressure to pursue STEM studies were less likely to seek out those career paths (Besterfield-Sacre et al., 1997). Building on the parental influence theme were other studies that considered the espoused beliefs of parents about their child's math or science abilities, showing that a child's level of STEM self-concept was directly related to the credence held by parents regarding those perceived abilities (Leedy et al., 2003). By 2017, there was increased attention placed on the hypothesis that a woman's career aspirations and choices were influenced by their desire to get married and start a family. Results showed that differences in marriage and family expectations held by women did not affect their decisions to enter STEM jobs, which brought into question assertions that credited equal opportunity laws for relegating all gender segregation to just women's choices (Sassler et al., 2017). Sassler et al. added that men, more than women, benefitted from these family-building intentions and that a

large part of the remaining gender gap for women entering STEM occupations was yet unexplained. These contributions added meaningfully to a growing body of research regarding other possible factors that could influence a woman's STEM career choices and supported the hypothesis that there were yet unexplained relationships between some variables that might hold a complete understanding of decisions persist or depart.

Social and Psychological Factors

An area of promising research that emerged was gender-based STEM inquiries that explored whether social conditioning, such as a woman's perceived aptitude in math, could explain their interest in STEM fields. Early study results provided some evidence that positive social reinforcement about STEM congruency could explain why more males than females pursued and excelled at mathematics, a core STEM competency (Meece et al., 1982). Other research found no significant relationship between women's mathematics proficiency and their social conditioning during the same period, arguing that the gender difference was unclear (Benbow & Stanley, 1983). In response to this scholarly stalemate, research emerged that sought to understand the effect that psychological factors might have on a woman's STEM choices, including measures of their confidence, self-identity, and sense of belonging as it related to their STEM education engagement and persistence. For instance, based on their self-conceptions, female engineering students were more likely than their male peers to see themselves as emotional and illogical, which often conflicted with identifying as an engineering professional, usually believed to be proficient at technical problem solving (Cech, 2015). These socially constructed gendered beliefs about one's occupational alignment may not

just influence a woman's persistence related to degree attainment but also explain career choices following college graduation. Through the 1990s, the body of research about social and psychological effects on STEM women was the most cited when explaining the gender imbalance. It was often characterized by large quantitative longitudinal studies focused on finding meaning from statistically analyzed national databases (Kanny et al., 2014). During this same period, Hall and Sandler (1982) published their seminal report introducing the concept of a "chilly climate" that existed for women in college education settings. While chilly climates were not specific to STEM learning environments, some of its attributes, like male-dominated contexts, highlighted the challenges women faced both in the classroom and in organizational settings, thus propelling the conversation about the gender imbalance in the STEM pipeline. As the scholarship evolved, the accumulation of many diverse theories and findings of how to explain the STEM underrepresentation phenomenon suggested that instead of a finite set of discrete factors, there existed an array of interrelated and complex mechanisms that varied greatly based on different contextual and temporal factors. Researchers began considering a myriad of other paradigms for viewing STEM-based gender studies.

Career Fit

One emerging research direction involved understanding a woman's perception of their ability to align with a STEM career, including their prospects of navigating the degree attainment path and succeeding in the workplace. Initially, authors looked at tangible barriers to a woman's perceived possibilities in navigating the STEM pipeline, like the impacts from considerable financial and time investments needed to pursue

STEM careers as predictors of choices not to participate (Mohrman, 1987). Later, there was a shift in focus to consider the effects of contextual factors on a woman's decision to pursue STEM, using the metaphor of a "leaky pipeline" to highlight the differential exits of more women than men from learning and work climates that might disadvantage them (Blickenstaff, 2005). These works contributed new knowledge about the general gender gap in STEM, and when paired with continued federal investments in STEM education and outreach (Corbett & Hill, 2015; National Science and Technology Council, Committee on STEM Education, 2018), helped to increase the intake of more woman into the STEM pipeline, but did little to help retain more women in their STEM jobs.

Between 1993 and 2017, the number of women awarded STEM degrees doubled. However, they were still underrepresented in the workforce, at 29% versus 52% for the entire college-educated workforce (National Science Foundation, National Center for Science and Engineering Statistics, 2017). Before this period, research at the sub-field level was rare (Kanny et al., 2014). Still, with more and better data, the discovery of differential gender gaps at the sub-field level ushered in need for a closer inspection through further inquiry. One of these new subfield research areas emerged in response to the disproportionately high number of women who exited their STEM careers than their male counterparts. The body of knowledge regarding differential departures from STEM degree programs was extensive and its relevance and use in understanding gender-based career persistence in the workplace offered great promise. Still, they had not been widely applied or tested in the various STEM career settings.

Turnover Intentions for Women in STEM

Through the 1990s, much of the STEM underrepresentation research continued to focus on increasing the numbers of women entering the STEM academic pipeline, which led to an increase of women attaining STEM degrees and entering the STEM workforce. Notably, for some of the STEM subfields, the percentage of women in the workforce had approached or even exceeded that of the general workforce. Women comprised 59 % of the workforce in the social sciences, 48% in the life sciences, and 42% in mathematics (National Science Foundation, National Center for Science and Engineering Statistics, 2017) and yet for the entire STEM workforce, women showed a significantly higher tendency to abandon their occupational professions than their non-STEM peers (Byars-Winston et al., 2015; Glass et al., 2013). When studying STEM women's work engagement and turnover intentions as separate concepts, Reilly et al. (2019) found that: (a) increased age correlated with lower retention rates but was unrelated to worker engagement; (b) unhealthy coping mechanisms like depression were related to lower work satisfaction, and that one's moods, feelings, and attitudes about one's work and thoughts of leaving their career are affected by psychological factors differently; (c) STEM women who believe they receive less pay than their male counterparts may still be engaged at work but will have more thoughts about leaving their job; and (d) a deep awareness of stigma and stereotype threats placed on women in STEM had an inverse relationship between work engagement and intent to leave one's job. In sum, the research suggested that the underrepresentation of women was likely the result of workplace environments where stereotype threats, gender bias, microaggressions, and socially

constructed factors were commonplace. Still, there remained an active debate regarding the ideologies employed and the basis for how to understand and affix meaning to the persistent underrepresentation of women in STEM. Recently, some researchers had challenged the prevailing wisdom by arguing that the underlying mechanism for explaining women's underrepresentation is more likely rooted in nation-level gender-equality dynamics that permeate its societal bounds (Geary & Stoet, 2020; Stoet & Geary, 2018, 2019, 2020). However, Richardson et al. (2020) challenged Stoet and Geary's works, putting forth a contrasting statistical treatise that shed doubt on the existence of a causal relationship between nation-level measures of gender equality and women in STEM. While it is unknown when and how this scholarly debate might be resolved, there is still much to be explored and understood about a woman's experiences with STEM career paths.

What had confounded scholars was that compared to other professions, women in STEM careers shared many similar work experiences and levels of satisfaction but earned more, had a more egalitarian view of gender, had slightly better access to work-life balance mechanisms; and yet they still left at higher rates (Glass et al., 2013). Glass et al. (2013) added that after 12 years working in their chosen STEM fields, half of the women had left for other careers, compared to just 20% for non-STEM women, and were also the most unlikely to return to STEM employment. To this last point, STEM women who experienced career disruptions and attempted to return were often disadvantaged because of deep-rooted male-dominated cultural norms that persisted in their professions (Herman, 2015; Kaushiva & Joshi, 2020). These findings suggested that other factors

specific to STEM occupations may be responsible for the differential rate of female career exits in STEM fields than the total workforce, leading scholars to focus research efforts on discovering new insights about the phenomenon. The need for more knowledge about the persistence of women abandoning their professions was particularly germane to the male-dominated engineering workplace, which had one of the lowest female participation rates (Michelmore & Sassler, 2016) and also more women choosing to leave than were entering (Fouad et al., 2017).

The Attrition Phenomenon for Women Engineers

For STEM careers, computer science shares a distinction with engineering as a male-dominated profession with a gendered culture that can disadvantage women. Hanappi-Egger's (2013) computer science-focused inquiry found that women computer scientists who abandoned their careers pointed to one or more of four aspects of gendered work cultures as the primary reasons for their choice to leave. These aspects were: gendered-role expectations that placed conflicting demands on women; organizational climate factors such as sexism, bullying, unequal pay, and differential promotion opportunities; instances of males not accepting women as supervisors; and male managers that condoned acts of sexual harassment toward women from clients (Hanappi-Egger, 2013). Workplace harassment also included doubting a woman's legitimacy and competence, hostilities directed at their demonstrated proficiency at performing in traditionally male careers, and other gender-induced obstacles meant to denigrate women (Dresden et al., 2018; Taylor, 2016). Further, women in computer science and engineering continued to earn less than their male peers (Michelmore & Sassler, 2016).

These authors highlighted that the most male-dominated STEM workplaces like engineering could possess climates where women are not welcomed and valued as equals compared to their male counterparts, which can precipitate a decision to abandon their chosen profession over time. A review of the literature revealed some key concepts associated with a woman engineer's turnover intentions.

Career Progression

Once in the workplace, women engineers' career path can play a crucial role in whether they stay or go because their job assignments may disadvantage them compared to men. In engineering careers, women were significantly more likely than men to pursue managerial paths associated with having diminished engineering identities, perceived respect from others, and access to work that matters, while showing the highest levels of turnover intentions (Cardador & Hill, 2018). Cardador and Hill (2018) added that women who pursued managerial roles in engineering firms were at risk of having a lower professional and work-related satisfaction level, leading to career exits. While not specific to engineering managerial roles, Frkal and Criscione-Naylor (2020) corroborated Cardador and Hill's assertions, finding that women in corporate leadership are more likely to exit if they cannot be authentic and contribute meaningfully to their work. New female entrants in the engineering workforce could also be disadvantaged by exhibiting valuable business strengths but not generally recognized as a core skill for success as an engineer. For instance, women engineers who demonstrated strong communicative skills, like writing, could shoulder a disproportionate amount of writing tasks compared to their male counterparts, which could make them feel under-appreciated as an engineer because

technical tasks are more highly valued, and ultimately lead to a decision to leave the profession (Mallette, 2017). The engineering profession has long valued technical competency over social and communicative skills, which can have unintended consequences for many women. When considering a women engineers' self-conception and its relationship to professional engineer identities, they are less likely to value those traits with a technical focus over those that offer managerial opportunities (Cech, 2015) and work that makes a difference in the world (Bossart & Bharti, 2017; Cech, 2015). When viewed together, the works of Bossart and Bharti (2017), Mallette (2017), and Cech (2015) portend that the norms often found in the engineering culture may be undermining a woman's self-conception of what it means to be an engineer, thus creating a kind of career dissonance that if left unchecked can precipitate turnover intentions. These cultural norms that can devalue specific needed and desired engineering skillsets are essential mechanisms to understand. Other cultural features may also place unwarranted stress on a woman's choices about career-life balance.

Familial Influences

Contemporary research regarding influences from familial contexts on a woman engineer's career choices persists but has less merit as a dominant feature unique to engineering. When examining engineering cohorts that graduated and entered the workforce between 1985 and 2010, some gender retention rates remained constant when controlled for family influences (Kahn & Ginther, 2015). These insights complemented other findings that signaled a move away from considering family-related choices as a central influencer for why women leave the engineering workforce. Glass et al. (2013)

found that there was no statistical difference between women engineers' plans for marriage and childbearing and those of other professional women. Further, Hunt (2016) found that family-related constraints were not a statistically significant factor for why women engineers exited the profession in general. Singh et al. (2018) determined that while there was no significant relationship between interferences from work on a woman engineer's family-based career choices and their work commitment or intentions of leaving, family interferences with work were correlated with lower commitment and increased intentions to leave. The distinction was important, as it pointed to ubiquitous societal influences that may have a greater impact on a woman's career decisions in general than inherent features in the engineering or STEM workplace. In contrast, some findings indicated otherwise for STEM professionals. Most recently, Cech and Blair-Loy (2019) found for the STEM workforce, at 4–7 years after the birth or adoption of a first child, nearly twice the number of new mothers than new fathers quit their full-time jobs, many abandoning their STEM careers altogether.

New mothers and fathers working in STEM fields are significantly more likely than their childless peers to leave full-time employment, and while most new mothers and fathers continued working full time, a large portion chose full-time non-STEM jobs (Cech & Blair-Loy, 2019). Research findings seemed to indicate that career impacts related to starting families for women were common across the general workforce but may present some differential challenges for women in STEM and, more specifically, in the engineering field. Said another way, all career women may share specific societal pressures related to their family-based career decisions. Still, women engineers may

experience additional stressors embedded in the professional culture and workplace climates that co-contribute to their choice to leave.

Unsupportive Work Cultures

As the body of knowledge about a woman engineer's career persistence evolved, there was a growing consensus that the role played by unwelcoming and unsupportive engineering cultures/workplace climates were more meaningful than initially believed. This notion that cultural mechanisms were at work in the engineering profession surfaced from the many research attempts that sought to find meaning about the early career departure phenomenon for women.

One reason for early exits was women's socialization to believe that the engineering career field's demands were not compatible with their life aspirations, resulting in a lack of confidence to excel as a professional engineer (Cech et al., 2011). This socialization process that can introduce thoughts of leaving begins before a woman's entry in the profession by reproducing sex segregation embedded in engineering academic settings that mimic the professional engineering culture (Seron et al., 2016; Seron et al., 2018). Once in the workplace, a women's thoughts about leaving engineering were linked to their self-efficacy beliefs and outcome expectations, such that women with access to developmental opportunities that promote higher self-efficacy, outcome expectations, and improved attitudes toward work, may be less likely to develop turnover intentions (Singh et al., 2013). More recently, Fouad et al. (2017) found that a woman engineer's workplace congruency feelings were strongly influenced by their perceived lack of *organizational fit* regarding working conditions, safety, fairness, and

having meaningful work. In terms of fair treatment, a woman engineer's dissatisfaction with promotion opportunities and pay accounted for half of the differential gender gap and increased departures rates, although not at statistically higher rates compared to women in other male-dominated fields like economics and finance (Hunt, 2016).

While not unique to the engineering workplace, female engineers also reported experiences with microaggressions such as harassment, gender bias, discrimination, stereotyping (Fouad et al., 2016; Ismail et al., 2017; Reilly et al., 2016), and stigmatization (Reilly et al., 2019). What was unknown was how to differentiate between the influence of these microaggression barriers specific to the engineering career field versus those from society in general (Hunt, 2016; Leaper & Starr, 2018). Despite some gaps in knowledge, these works found that women engineers had not experienced workplace norms and support structures that enabled them to excel and stay in the workplace.

Lacking the ability to master one's occupation and continue to advance was found to lessen a woman's commitment to the engineering profession (Fouad et al., 2016) and was negatively associated with turnover intentions (Singh et al., 2018). Hunt (2016) argued that maybe there were other reasons for the continued drain of female talent, like the lack of mentoring that could better explain the female talent drain. Complimenting Hunt's assertion was a finding that higher levels of STEM interest were the best predictor of career persistence for women engineers and that higher levels of interest corresponded to having meaningful peer and mentor support, which differed from men's interests, which were self-generated (Maltese & Cooper, 2017). When investigated in terms of

professional satisfaction, mentoring support benefitted both males and females, although it was undetermined whether female-female mentoring relationships might be more effective than other pairings (Griffith & Dasgupta, 2018). The only other research uncovered in the literature regarding the effects of mentoring in an engineering setting focused on faculty women of color's storied experiences. Findings were mixed, ranging from positive implications for career aspirations to some negative reinforcing narratives reminiscent of their differential treatment experienced externally in society (Buzzanell et al., 2015). While it was evident that mentoring, or one of the many other support mechanisms, could influence a woman's career decisions, the overall effect of incongruent engineering work cultures was more challenging to understand because they differed broadly based on a woman's attitudes, beliefs, and life experiences, and even varying work contexts. What was clearer from a review of the literature was that women engineers credit their persistence to four general support mechanisms; care and peer support, performance feedback, growth and advancement opportunities, and access to role models as reasons to stay (Fernando et al., 2018).

Male-Dominated Career Contexts

Although there were some gains in closing the gender gap in the engineering subfield, from women making up 9% of the workforce in 1993 to 16% of the workforce in 2017 (National Science Foundation, National Center for Science and Engineering Statistics, 2017), the rate of increase for women entering the engineering workplace changed little since 2000 (Bossart & Bharti, 2017; Corbett & Hill, 2015; Fouad et al., 2017; Singh et al., 2013). Most notably, computer science and engineering subfields still

ranked as the STEM professions with the lowest female participation (Michelmore & Sassler, 2016). These subfields accounted for most of the gender disparity in STEM overall (Sassler et al., 2017). To make matters worse, once working in the engineering profession, many women were choosing to leave their careers (Fouad et al., 2017), at rates approaching 50% of their ranks (Fouad et al., 2016). This research puzzle continued to draw interest from scholars seeking to understand this phenomenon further to identify and promote positive interventions to address the constant drain of valuable female talent from engineering. The business risk from the loss of human capital and diminished gender diversity was considerable. It meant that firms could not sustain the intellectual capacity needed to achieve competitive advantages like increased productivity and firm reputation (Fouad et al., 2016; Smith-Doerr et al., 2017). The need to retain more women engineers had compelled scholars to build on the key findings from many of the earlier works discussed above to extend and focus the conversation in more meaningful ways.

In 2018, scholars began exploring how gender composition, specifically higher percentages of women in the engineering workplace, may reduce female career exits' incidence. This research paradigm has its intellectual roots in tokenism theory, which states that organizational climates and employee performance improve as the organization reaches gender parity (Kanter, 1977). A search of the literature revealed just one study that specifically explored women engineers' career aspirations through the lens of gender composition in the workplace. Griffith and Dasgupta (2018) found that when women engineers in academia make up less than 25% of their workgroup, they are less satisfied with work and have more thoughts of leaving, shaped by their perception of a

less collegial and transparent culture. Further, as the percentage of women in the workplace increased, negative perceptions declined linearly until the ratio of women and men approached parity, at which time, women's job satisfaction increased and thoughts of leaving diminished (Griffith & Dasgupta, 2018). While not specific to engineering, a complementary study by van Veelen et al. (2019) investigated the broader STEM workforce, finding that the more outnumbered STEM women were in the workplace, the higher the levels of gender identity threat they experienced, even at higher rates than their counterparts in non-STEM roles. Although not empirically supported, findings presented by Griffith and Dasgupta and van Veelen et al. align with Kanter's (1977) theory that the presence of more women in work settings can have a positive effect on their engagement and the workplace climate. Although, Begeny et al. (2020) cautioned that even if gender parity can be achieved, mechanisms like gender bias may not be resolved. What was and remained less known was how different gender compositions might unfold in other engineering contexts and whether there was a correlation with a woman engineer's thoughts of abandoning their career.

Another recent research paradigm used for exploring women engineers' career persistence in male-dominated workplaces is through a resilience and coping lens. Psychologists have researched resilience and coping for more than 5 decades but are a new arrival for understanding the underrepresentation of women in engineering. Wilkins-Yel et al. (2019) sought to explore which resilient coping strategies were employed by graduate and early entrant career women engineers in "chilly" work settings. They used semistructured phone interviews to collect data from 12 current women engineers located

across the United States. Following a thematic analysis of coded narrative data, they found that women engineers exhibited five coping strategies to deal with an often-unwelcoming engineering work culture. Women engineers: (a) displayed a strong determination to bounce back from career setbacks, (b) stood up to those who imparted gendered or biased attitudes or behaviors, (c) built strong networks of support, (d) used positive affirmation of their professional abilities, and (e) maintained a strong connection with their vision of pursuing meaningful work as an engineer (Wilkins-Yel et al., 2019).

Wilkins-Yel et al.'s (2019) findings complemented other research findings presented in this section in two ways. First, their study provided further evidence that the "chilly" engineering work culture persists. Second, women engineers who are outnumbered in the workplace must find ways to cope with the many obstacles they will encounter if they aspire to remain in the profession. Lastly, Wilkins-Yel et al.'s findings suggested that women engineers who do not possess resilient coping strategies are likely to abandon their careers.

A final aspect of women engineers' constant attrition may be attributed to organizational mechanisms that resist efforts to change workplace norms that disadvantage women in hegemonic male contexts. Research on the phenomenon of *genderwashing* has gained interest by exposing the ills of policies and practices that espouse equality but, instead, reproduce inequalities in organizations (Fox-Kirk et al., 2020). While not specific to engineering, Fox-Kirk et al. (2020) found that genderwashing practices, like non-disclosure agreements to preserve company reputations, and issuing diversity management, talent management, and leadership

competency policy documents, are institutionalizing and not eliminating discriminatory practices against women in the workplace. Because Fox-Kirk et al.'s work is exploratory, there is more to be investigated and understood. Still, advancing genderwashing and resilience-based research for engineering contexts could help address embedded obstacles in organizational cultures that are often unrecognizable in a woman engineer's workplace milieu.

In large part, the literature reviewed and discussed in this section highlighted the incredible complexities of finding universal meaning about why women continue to exit the engineering profession at higher rates than their male counterparts. Much of the relevant literature showed how difficult it was to control quantitatively for each context because of a plethora of possible variables acting in seemingly endless combinations. Further, authors performing statistical analysis on sizeable survey-generated data sets limited their ability to distinguish between statistical significance and practical significance or meaningfulness and find the richer meaning behind respondent responses. While scholars have suggested many factors and mechanisms that may influence a decision to abandon a career, they showed no clear reasons or combinations of reasons that can fully explain women engineers' enduring career attrition phenomenon.

This section's fundamental concepts are crucial elements for this study as they represent established mechanisms that persist in the engineering workplace. Researchers have shown that certain workplace features like the absence of support mechanisms may provide incremental insights into the research puzzle of why women engineers might leave their chosen profession but not a complete understanding. What remained less clear

was how these concepts might collectively influence a woman engineer's career choices. This study's methodology facilitated advancing the knowledge of the attrition phenomenon by serving as an appropriate basis for answering the research questions and uncovering a more profound meaning about the effect that certain engineering workplace features had on a woman engineer's career exit decision.

Methodology Literature

Qualitative research is an organized inquiry process that allows researchers to observe social life to understand the experiences of people's lives and how social and cultural interactions shape relationships and behavior in a natural setting (Babbie, 2016). Narrative inquiry as a research design fits the qualitative paradigm because it enables the researcher to serve as the instrument of data collection through collaboration with the storyteller to understand lived human experiences with a focus on temporality, sociality, and place (Clandinin, 2016). While relatively new to the study of women in engineering, the narrative inquiry way has established itself as a valuable tool for generating a deep and more meaningful understanding of social phenomena.

Origins of Narrative Inquiry Research

As a recognized term and research methodology, narrative inquiry was conceived by Jean Clandinin and Michael Connelly in 1990, but the intellectual heritage goes back much further (Clandinin et al., 2007). The narrative form can be traced back to Aristotle, who interpreted the Greek tragedy as a narrative representation and not a replication of the world (Riessman, 2008). Narrative traditions then evolved with French Structuralism, Russian formalism, post-structuralism, cultural analysis, and postmodernism (Bruner,

2002), establishing different research practices that emerged in many human science disciplines (Riessman, 2008). Clandinin (2016) stated that the foundations of narrative inquiry as a research paradigm were primarily born out of John Dewey's theory of experience (Dewey, 1938) but also included influences from the works of Bruner (1986), Carr (1986), Bateson (1989), and Coles (1989), regarding the narrative composition of experiences. While the study of narratives and the narrative way of understanding phenomena permeate the social sciences, narrative inquiry as a research design has evolved into a distinct methodology with key terms and well-established practices (Clandinin, 2016).

Narrative inquiry goes beyond just understanding the meaning of language objectively by introducing positionality and subjectivity into the telling about an experience (Riessman, 2003). A narrative inquiry becomes the preferred research design when the objective of a study aligns with acquiring rich and thick meanings from the storied phenomenon of an individual's experiences, and the researcher seeks to make sense of complete life-stories that span time and varying contexts (Clandinin, 2016; Taylor et al., 2016). Clandinin and Connelly (2000) added that narrative inquiry is an appropriate choice when other research methodologies cannot provide the level of understanding about a phenomenon needed to illuminate new knowledge that could drive meaningful practical and social actions. Because narrative inquiry focuses on understanding an individual's layered lived experiences over time through storytelling (Clandinin & Connelly, 2000), its selection for the current study was ideal for addressing

the research gaps that have surfaced recently in the literature related to the persistent departure of women engineers.

Methodological Relevance

Empirical research on topics related to the career attrition phenomenon for women engineers has relied predominantly on quantitative methods using large longitudinal survey data sets (see Cech, 2014, 2015; Fouad et al., 2017; Glass et al., 2013; Hunt, 2016; Kahn & Ginther, 2015; Navarro et al., 2014; Sassler et al., 2017; Singh et al., 2013; Singh et al., 2018; van Veelen et al., 2019). As presented earlier, these quantitative study designs have contributed substantively to the body of knowledge by offering insights about potential variables and their relationships to a woman engineer's turnover intentions but are limited in the ability to expose deeper and more nuanced meaning. Complimenting the quantitative scholarship is a few qualitative studies that also advanced the scholarly conversation about the career departure phenomenon for women engineers. These relevant qualitative works used a variety of designs, such as grounded theory (Buse et al., 2013), case study (Mallette, 2017), and phenomenology (Fernando et al., 2018). While narrative inquiry designs were absent for the specific phenomenon of interest, there were examples located in some other engineering and STEM-related literature.

Kachchaf et al. (2015) explored three women of color's career-life balance stories in STEM academic career fields to understand any differential impacts on their career persistence than other normative research findings. The authors chose a narrative inquiry design to collect data from purposefully selected participants. These participants had

previously participated in a study concerning women of color in STEM and indicated a high level of concern regarding work-life balance challenges. Kachchaf et al. found that participants experienced a kind of cumulative disadvantage due to being a minority and a woman that differed from the *norm* of STEM educators, including factors like work being a priority over life pursuits, scarce mentoring resources, questioning their STEM competence based on gender or race, and discouraging use of family leave policies. This research demonstrated the value of using a narrative design to understand better the social phenomena not possible from quantitative research schemas alone.

Buzzanell et al. (2015) explored the stories and narratives from three women of color engineering faculty to understand how their mentoring experiences may affect their careers and sense of professional belonging. Buzzanell et al. found that in general, the participants' experiences were similar to other study findings where women expressed positive feelings about mentoring and themes related to a lack of belongingness, mistrust, and inequality common among women of color in academia. The authors also asserted that the narrative way of finding meaning was well suited to exploring contexts and problems about diversity and inclusion in a safe environment and how the pursuit of policies and interventions might enable improved recruitment, retention, and promotion of women faculty in engineering.

In other research, Craig et al. (2018) used a narrative inquiry design to explore the storied experiences of one undergraduate and two graduate students with parental influence and its impact on their STEM career intentions. The authors found that parental influences played a large part in establishing and sustaining a student's persistence in

STEM careers, noting that it was the narrative inquiry design that led to acquiring the richness of data necessary to discover this relationship to STEM persistence that prior quantitative methods had missed.

Lastly, Wickersham and Wang (2016) sought to explore two women community college students' storied narratives as they transferred to a STEM degree program to understand if this education pathway can help improve women's underrepresentation in STEM careers. The authors found that a women's intention to transfer from community college into a STEM career field was a complex decision process influenced by a combination of school and outside factors. Wickersham and Wang added that further qualitative research was needed to unlock more meaning to identify interventions that could support a woman's intention to transfer from community college into a STEM career program.

The contributions from the various methods employed by the above researchers have added considerably to understanding a woman engineer's experiences in engineering and a decision to leave their profession, but there was still a need for research designs that might offer a more nuanced understanding of a woman engineer's turnover intentions (Fouad et al., 2017; Meiksins et al., 2018), including the effect from cultural mechanisms embedded in the male-dominated profession (Cech, 2015; Fouad et al., 2016; Hunt, 2016; Leaper & Starr, 2018; Singh et al., 2018). While the literature review did not reveal any narrative inquiry-based studies regarding women engineers' career departures, other STEM-based examples demonstrated the value of narrative inquiries to unlock deeper insights about women's experiences, when different research paradigms

may generate less meaningful results (Buzzanell et al., 2015; Craig et al., 2018; Kachchaf et al., 2015; Wickersham & Wang, 2016). Sources from this literature review supported choosing a narrative inquiry design as it was an established and effective means to generate a deeper understanding of the experiences of women in STEM contexts and, by extension, is an appropriate way to explore the stories of former women engineers regarding their experiences with deciding to abandon their profession.

Summary of Gaps in the Literature

A review of the literature revealed several key points. First, the engineering profession had the highest turnover rate of women engineers compared to their male peers of all the STEM career fields (Hunt, 2016; Kahn & Ginther, 2015), yet there was notably less research focused on career attrition than on academic or education departures (Cech & Blair-Loy, 2019). Still, the relevant scholarship on career exits for women engineers comprised a meaningful body of research that represented many methodological approaches and great novelty in contributing to a growing body of knowledge. While there have been considerable advances in attaching meaning to a woman's decision to abandon their chosen profession, there was still much to learn.

Two dominant meta-themes emerged from the relevant literature that represented the current state of understanding about what was behind women engineers' turnover intentions. First, that a woman engineer's career exists can be explained by their socially and culturally influenced way of being (see Buse et al., 2013; Cech, 2015; Fouad et al., 2016; Maltese & Cooper, 2017; Singh et al., 2013; Singh et al., 2018), or that they leave because of unsupportive and noninclusive, male-dominated engineering cultures (see

Beddoes, 2018; Fouad et al., 2017; Singh et al., 2013; Singh et al., 2018; van Veelen et al., 2019). While the works underpinning these meta-themes have contributed substantively to the body of knowledge and continue to be fruitful areas for further discovery, there are some critical gaps.

When considering the meaningfulness of study results, there were calls for future research designs that could better manage and reduce the effects of common method biases from single-source data and self-report measures (Cardador & Hill, 2018; Singh et al., 2018; van Veelen et al., 2019). While some steps to manage bias existed in the studies reviewed, residual common method variances could compromise the validity of findings regarding the relationships between measures (Podsakoff et al., 2003) like the factors and mechanisms argued to influence a woman engineer's turnover intentions. Further, a review of the literature exposed the need for research that could establish causal links that might better explain how complex relationships between factors can result in career exits (Cardador & Hill, 2018; Maltese & Cooper, 2017; van Veelen et al., 2019), and similar to reducing method bias, could help to rule out the possibility of alternative explanations (Fouad et al., 2016). Gaps in methodological approaches are also essential considerations as they enable researchers to position their work to advance the current conversation and body of knowledge about a phenomenon. Gaps in knowledge and understanding can play an equally important role.

A review of the literature provided many plausible explanations for the gender differential that persisted in the engineering profession but finding a more holistic understanding had been elusive. Despite advances in knowledge, the career attrition

phenomenon for women engineers has shown to be a vexing problem to solve (Cardador & Hill, 2018), is more complicated than initially believed (Reilly et al., 2019; Reilly et al., 2016) and will require multi-layered study designs (Maltese & Cooper, 2017) that can better address the socially-situated nature of the phenomenon (Reilly et al., 2019). Future inquiries need to uncover more fine-grained and deeper meanings that may remain hidden in the work experiences of former women engineers (Cech, 2015; Fouad et al., 2017), including organizational factors that contribute to the differential attrition (Cech & Blair-Loy, 2019; Hunt, 2016); Singh et al., 2018) and how a woman's work-experiences evolve and change over time (Kahn & Ginther, 2015; Maltese & Cooper, 2017). These gaps in knowledge demonstrated a growing awareness by researchers that the current knowledge level was insufficient to adequately address the phenomenon of interest and realize meaningful social change.

Conclusions

The literature review presented in this chapter showed that, while there has been noteworthy progress made in understanding why women engineers abandon their careers, there still exists a need for deeper and more complete meanings about their exit experiences, influenced by time and varying contexts. The identified research gaps included the need for better research designs to overcome some limitations specified in prior studies and new inquiries that can produce a more nuanced understanding of the complex nature of the career attrition phenomenon. This literature review established that when viewed through a diversity of frameworks and methodologies, career exits for women engineers relate to how they perceive themselves as professional engineers and

whether they feel connected, supported, and welcomed in the engineering profession and culture. Scholars have also shown that despite the novelty in research approaches and contributions made to date, career attritions for women engineers persist, demonstrating that there remain opportunities to generate new knowledge. The current study addressed gaps in the literature by employing a research approach designed to uncover the more complex and nuanced meanings from former women engineers' career departure stories. Advancing the scholarship could generate the kind of knowledge that engineering stakeholders require to promote meaningful changes for the profession that could establish a workplace culture where women feel welcomed, valued, and want to stay.

Chapter 3 includes the research methods employed for this study. The use of a qualitative method employing a narrative inquiry design is discussed and justified. The chapter also addresses the role of the researcher, participant selection, instrumentation, issues of trustworthiness, and data collection and analysis.

Chapter 3: Research Method

The specific management problem is that more women exit the engineering profession than are entering (Fouad et al., 2017), resulting in a net drain on female talent that incurs lost business value from talent discontinuity and unrealized business revenues (SWE Blog, 2016). The purpose of this qualitative narrative inquiry study was to explore the experiences of six former women engineers in the Northern Tier States region of the United States through their narrative stories of consideration for leaving the profession and their final decision to leave. The following central research question (RQ) and supporting research question (SQ) guided this narrative inquiry:

RQ: What are the recounted experiences of former women engineers as told through their narrative stories of consideration for leaving the profession?

SQ: What are the recounted experiences of former women engineers as told through their narrative stories of final decisions to leave the profession?

The nature of these research questions supported taking a qualitative approach in the study. Qualitative studies are most appropriate when a researcher wants to understand how people ascribe meaning to the experiences of life and make sense of their world (Patton, 2015; Taylor et al., 2016). The research questions focused on exploring the potential hidden meanings underpinning women engineers' departure phenomenon, which aligned with employing a narrative inquiry design. In narrative inquiry, the researcher cocreates meaning with a participant, attentive to time, place or places, and the socially constructed nature of the storied phenomenon of interest (Clandinin & Connelly, 2000). The narrative inquiry design best aligned with this study's objectives to explore

the rich, thick meaning found in the stories of women engineers who left the engineering profession.

Chapter 3 includes a discussion of the research method and rationale, the role of the researcher, and the criteria used for establishing the sample. This chapter also contains a detailed description of participant recruitment and selection, the strategies and procedures used for collecting and analyzing data, provisions for evaluating and enhancing trustworthiness, and how relevant ethical considerations were addressed.

Research Design and Rationale

The phenomenon of interest for this study was the career attrition of former women engineers. While prior research regarding the departure of women engineers generated valuable findings regarding workplace contexts that may precipitate a decision to exit (Cardador & Hill, 2018), in a review of the literature, I found a need for further inquiries. Specifically, there was a need for research designs that can produce a deeper and more holistic understanding of a woman engineer's career exit experiences (Fouad et al., 2017) and studies that explore the engineering workplace culture and its effect on a woman's decision to abandon their profession (Meiksins et al., 2018).

This study's design addressed these gaps in the literature by focusing on the narrative stories of women engineers who left their profession to gain a richer meaning about how they perceive their experiences in the broader engineering culture. This new knowledge could offer insights about the persistent phenomenon of female engineers abandoning their careers that might help engineering stakeholders develop strategies that

simultaneously address the gender imbalance in the workplace and improve organizational outcomes.

The Qualitative Method

I chose a qualitative method for this study to derive greater meaning about the career attrition phenomenon for women engineers. The qualitative tradition is an established and appropriate paradigm for researchers seeking to acquire rich insights through a rigorous interpretation of personal experiences and those of others regarding a phenomenon (Patton, 2015; Shah & Corley, 2006). Qualitative research paradigms also seek to explore and generate meaning through direct engagement (Crawford, 2016). The frameworks of qualitative studies are administered by social researchers to explore and describe phenomena to understand and explain the complex nature of things by collecting descriptive data (Taylor et al., 2016). I did not pursue quantitative or mixed-methods approaches because the problem statement, purpose, and research questions of this study did not align with the need to scientifically test theories or conduct empirical investigations of variables (see Babbie, 2016). The qualitative approach best aligned with this study's objectives because it could uncover the rich, thick meaning of why women continue to leave engineering.

The Rationale for a Narrative Inquiry Design

Narrative inquiry was the most appropriate design choice for this inquiry. The narrative way of understanding phenomena continues to permeate the social sciences, and narrative inquiry as a research paradigm has evolved into a distinct methodology with descriptive terms and well-established practices (Clandinin, 2016). The use of narrative

inquiry to explore the experiences of women in the STEM career pipeline remains an established methodology and has contributed valuable knowledge about the gendered nature of engineering and its potential impacts on a woman's career aspirations (Craig et al., 2018; Kachchaf et al., 2015; Wickersham & Wang, 2016). While a narrative inquiry design has not been employed previously to explore the career attrition phenomenon for women engineers, it holds that it would be a credible choice over other viable methods, such as case study, grounded theory, and phenomenology.

I considered a case study approach but did not select it. Case studies are most appropriate when the research question(s) ask how or why an emerging social phenomenon occurs, often involving exploratory investigations of on-going organizational processes (Yin, 2018), and there is a single bounded unit of analysis limited to a finite set of participants, situations or occurrences, and time for observations (Babbie, 2016; Merriam, 2009; Yin, 2018). Because the nature of the central and supporting questions for this research was related to past experiences that are "what-based" and the number of possible participants or the timing of when they experienced the phenomenon of interest was not theoretically bounded, the case study design did not align with the purpose of this study.

Grounded theory was also evaluated as a viable methodology but not selected. The focus of this study was to uncover the rich, thick meanings from individual departure experiences of former women engineers. Grounded theory is best suited for research that addresses creating a theory or a model (Denzin & Lincoln, 2017; Moustakas, 1994) by performing a systematic comparison of the data across different groups of participants

(Glaser & Strauss, 1999). The use of grounded theory would have been a better choice if an explicit goal of this study was to compare former women engineers' experiences grouped by different organizational or career contexts.

I also considered a phenomenological design for this study because it had merit for exploring how individuals make sense of the world by capturing the beliefs, feelings, or opinions that make up their individual lived experience about an event or timeframe (Percy et al., 2015). Phenomenologists focus on exploring the lived and prereflective meaning of an individual's experience with a phenomenon and suspending judgment when uncovering meaning (van Manen, 2017). Phenomenology and narrative inquiry are related methodologies for understanding human experience (Kim, 2016) but differ fundamentally. Researchers use phenomenology to find shared meaning across participants' experiences, while researchers using narrative inquiry derive meaning about a phenomenon of interest by interpreting individual experiences (Crawford, 2016). Furthermore, phenomenologists approach data differently than narrative inquirers by fracturing interview narratives to find emergent themes (Smith et al., 2009) versus treating narratives as intact storied segments as a way to retain the richness of detail from longer sequences (Riessman, 2008). I did not select a phenomenological design because its focus is on acquiring and elucidating a specific experience's meaning and structure across all participants' perceptions (see Patton, 2015). Instead, in the design of this study, I extended the phenomenological paradigm of understanding experiences by analyzing narrative fragments or terms (see Patton, 2015) by cocreating meaning through more nuanced interpretations of complete stories or passages about individual experiences told

over time and in varying contexts (see Riessman, 2003; Taylor et al., 2016). While a phenomenological approach could have been used to uncover new insights about how women engineers experienced their career exits, the narrative inquiry design offered the advantage of acquiring deeper and richer interpretations of their storied experiences and offering the best opportunity to address the research gap.

Despite the empirical evidence to date, the constant attrition of women from high-paying engineering careers that required completion of a rigorous and academically demanding journey to earn the title of a professional engineer suggests the existence of remaining hidden meanings undiscovered by prior research paradigms. Just as Isaac Newton had to look deeper to discover the invisible forces of gravity, narrative inquirers must look to people's ordinary stories to uncover the hidden meanings from their life experiences (Kim, 2016). In this way, women engineers' career exits may be understood to advance the body of knowledge and enable positive social change.

Role of the Researcher

The role of a narrative inquirer can differ from that of other qualitative researchers using more traditional designs. Narrative researchers go beyond serving primarily as interviewer and analyst by co-collaborating the generation of narrative data and its meaning (Clandinin & Connelly, 2000). This highly relational engagement and the blurring of roles necessitates that researchers reflect more deeply about positionality and their subjectivity regarding any inherent biases that could affect their research (Bourke, 2014). Introducing and focusing on positionality forms a cornerstone of understanding the storied experiences represented in narrative data (Riessman, 2003).

The narrative inquirer must also be explicit about how they situate themselves in a study as a way to increase trustworthiness, being careful to avoid the superficiality of only disclosing characteristics or providing an accounting that detracts from the inquiry (Riessman, 2015). Establishing a thorough but balanced researcher role through reflection serves as an essential step for narrative inquirers to become mindful of how they view the world and engage with all aspects of the data collection and analysis processes (Clandinin, 2016). To help manage the potential impacts of having gendered identities, such as being a male professional engineer, husband, father, or scholar-practitioner, a reflexive account of my relevant life experiences follows.

When reflecting on my background, experiences, and subjectivities, it was essential to pay particular attention to certain aspects of my social identity that might influence the study by introducing additional ethical considerations. For instance, being a White male, having experienced a traditional heterosexual marriage where the male spouse served as the primary breadwinner and being the father of a daughter who struggled academically with STEM-related subjects like mathematics. I acquired most of my engineering career experiences from my service in the U.S. Navy, and all of my engineering experiences were in male-dominated work settings. These experiential factors differed considerably from the life experiences of the women engineer participants who contributed data for this study and also introduced the risk of gender, race, societal, and work-cultural biases that required careful management. Narrative methods involve a close relational element with participants, where researcher bias or subjectivities often arise during data collection, requiring the interviewer, through open-

ended probes or field notes, to reconcile their effects in real-time, to help preserve participant meanings (Riessman, 2008). During interviews, when asking about gendered experiences, I remained attentive to the participant's possible reluctance to respond freely due to concerns that I am a man and might be offended by some replies. Due to sharing the same profession, my perceptions of the phenomenon of interest were shaped by over 36 years of experience as a professional male engineer and engineer leader. Specifically, I experienced leadership and other relational shortcomings from many engineers, mostly men. I noticed that while small in numbers, a higher percentage of women engineers performed better at leading others and working in teams than their male counterparts. I additionally witnessed gender-based biases in the hiring process for engineers that disadvantaged women.

For this study, personal biases, differentials in sex, past work cultures, and power relationships with participants were considered and managed. I remained reflexive about potential bias or ethical impacts as a way to mitigate possible effects and ensure a responsive and data-rich interview experience (see Rubin & Rubin, 2012). The combination of using a semistructured interview format and reflecting on researcher biases helped to manage these kinds of undue influences and increase the level of the participants' comfort with the interviewing and data collection process.

During fieldwork, I remained alert to the possible and ongoing implications of my actions within the context of this research (see Patton, 2015) by acknowledging my background as a man, husband, father, and an engineer, including experiences with supervising, being supervised by and working alongside female engineers. Being

reflexive or “in the midst” remains a foundation of narrative inquiry designs as it enables the researcher to be immersed in the storytelling process during the generation of field texts (data) while retaining a degree of objectivity during the analysis phase and before writing the final research texts (Clandinin & Connelly, 2000). During data collection, I remained attentive to participants’ needs and mindful of how I asked interview questions and interpreted what I heard. This research stance enabled me to mitigate the effects of my biases and perceived gender-based power differentials both during data collection phases and analysis.

Method

Participant Selection Logic

The general population for this study (target group) was professional women engineers from the Northern Tier States region of the United States, who abandoned their careers and were willing to recount their departure stories. This study’s timeframe profile was career departures within the last 4 years, which helped preserve participant stories’ currency and portrayed more timely meanings about the engineering workplace. A nonprobability purposive sampling strategy was used. The choice of a purposive sampling strategy was the most appropriate way to find individuals who might possess and disclose the requisite information-rich narrative data sought for this study (Leedy et al., 2016; Patton, 2015; Taylor et al., 2016). Participant selection began by reaching out to personal and professional network contacts to locate initial participants who met the inclusion criteria. These network seed contacts included employed engineers, managers of engineering groups, and recently retired engineers who knew and could access women

who left their engineering careers. Informal a priori discussions with network seed-contacts yielded three potential participants. Then, through a snowball or chain-sampling strategy, each prospective participant was asked to suggest others who may meet the sampling criteria (see du Preez, 2019; Patton, 2015).

The planned snowball participant selection strategy appeared sufficient to achieve this study's desired sampling size of six to eight referrals. The University of Walden Participant Pool was added as a recruiting source to increase the probability of meeting sampling outcomes. Following Institutional Review Board (IRB) approval, email communications commenced with seed contacts, including a copy of the study announcement and a request to forward the announcement to those former women engineers interested in participating. To establish compliance with study criteria contained in the announcement, potential participants self-selected by responding via email that they were a former woman engineer who:

- had worked as an engineer in the Northern Tier States region of the United States, which includes Washington, Oregon, Idaho, Montana, North Dakota, Minnesota, Michigan, Wisconsin, Illinois, Indiana, and Ohio;
- had left their engineering career within the past 4 years;
- had been registered as an engineer-in-training or professional engineer ;
- and were willing to tell their stories about their consideration for, and a decision about, departing their engineering careers.

A contingency recruitment strategy was also employed to increase the likelihood of reaching the desired number of participants to achieve saturation. This added

recruitment protocol involved contacting designated group owners for professional and social networking sites representing relevant groups, societies, and chapters, asking them to share the study announcement with their members.

Determining a sample size that can best achieve this narrative inquiry's objectives and reach saturation was important. The process and practice of determining saturation is an established concept for determining the trustworthiness and quality of qualitative research. Saturation occurs when no further observations are needed to satisfy the research questions (Lowe et al., 2018), and there are no unaddressed phenomena (Marshall & Rossman, 2016). While the process and practice of reaching saturation are essential aspects of any qualitative study, determining the number to achieve that objective in advance for this study was not knowable, necessitating estimating a sample size to achieve research goals.

Kim (2016) found that across a broad spectrum of narrative inquiry research, sample sizes could range from five to 25 participants to achieve saturation. Marshall et al. (2013) suggested that conducting 12 interviews was usually adequate to achieve study goals for narrative inquiries. In general, due to the richness of narrative data, saturation often occurs with relatively few participant accounts (Suárez-Ortega, 2013). While rule-of-thumb sample sizes can be instructive, there were other benchmarks considered. Specifically, saturation values from different narrative inquiry-based studies in the literature were located and evaluated to refine further the expected number of needed participants.

A review of the literature revealed recent and relevant studies that supported using smaller population samples to achieve research goals. The articles included: an exploration of the stories of three women of color engineers in academia (see Buzzanell et al., 2015); the narratives of three underrepresented women of color in STEM careers regarding issues of career-life balance (see Kachchaf et al., 2015); the stories of STEM career aspirations from two female student's life-experiences (see Wickersham & Wang, 2016); and, the narratives from two graduate and one undergraduate student about parental influences regarding STEM career aspirations (see Craig et al., 2018). While the selection of two to four participants might seem justified based on these works, an incrementally higher a priori sample size range of six to eight was chosen to increase the likelihood of reaching saturation for this study.

Instrumentation

Qualitative research often relies on interviewing as the preferred data collection instrument. Semistructured and unstructured interview formats are most commonly selected by qualitative researchers (Clandinin & Connelly, 2000; Kallio et al., 2016). The semistructured approach is best suited for retaining more focus regarding known concepts and identified research questions (Rubin & Rubin, 2012). The semistructured interview protocol is also a well-accepted practice for collecting data for narrative inquiries (Clandinin & Connelly, 2000; Kim, 2016; Riessman, 2008), and the format should use a limited structure as a way to minimize the influence of the interviewer (Jovchelovitch & Bauer, 2000). Riessman (2008) asserted that some structure is preferred in the interview process to facilitate the discovery of meaning from stories about a particular phenomenon

of interest. Narrative inquiries necessitate that the researcher becomes the instrument of data collection, entering into close collaboration with the participant, being attentive to temporality, sociality, and place as the narrative unfolds through the interview process (Clandinin, 2016). Riessman added that the longer segments of data that define the narrative way could be generated by carefully selecting open-ended questions and probes.

Data collection in the current study occurred through semistructured interviews that included a limited number of open-ended questions and potential probes posed to a purposeful sampling of qualified participants. To enable the process of cocreating narratives and meaning, narrative inquirers need to replace the mainstream paradigm of a researcher facilitating a structured question and answer exchange and instead relinquish some control of the process to generate meaningful data collaboratively (Riessman, 2008). The semistructured interview paradigm best facilitated a balance between wanting to maintain a narrowed research focus and needing to minimize researcher influences by remaining engaged and emotionally attentive to the storytelling process (Clandinin, 2016). Previous narrative inquiries that explored women engineer experiences have argued similarly that the semistructured interview choice was the most appropriate way to acquire meaningful narrative data from storied experiences (Buzzanell et al., 2015; Craig et al., 2018; Kachchaf et al., 2015; Wickersham & Wang, 2016). The unstructured interview paradigm was considered but not chosen because it assumed that the researcher comes to the interview without in-depth knowledge about a topic and no predefined research framework or questions (Patton, 2015; Zhang & Wildemuth, 2017), which was not the case for this inquiry. The semistructured interview approach was the best choice

for collecting narrative data from former women engineers' storied responses recounting their career exit experiences to contribute new meaning to an established body of scholarship.

An interview guide was developed and used to maintain study congruence throughout the data collection process and establish content validity. Specifically, the interview guide served to maintain alignment between the key concepts revealed in the literature review, the research questions, conceptual framework, critical aspects of the narrative inquiry study design, and the generation of interview questions. For this study, there were four crucial concepts identified from the literature review that is pertinent to the phenomenon of interest. They were career progression, familial influences, unsupportive work cultures, and male-dominated career contexts. When combined with the study's research questions, conceptual framework, and methodological choices, the associated keywords from these concepts formed an integrated construct for guiding the interview process that generated the narrative data. Further, to establish content validity, research participants were asked to review and affirm the accuracy of interview transcripts and participant narratives to assure the representativeness of their storied responses and the meaning ascribed to their experiences about leaving the engineering profession.

This study's conceptual framework was based on Bourdieu's concepts of habitus, capital, and field, which offered a construct for understanding how individuals internalize meaning when conditioned by past experiences shaped by the everyday practice of re-enacting them in varying contexts (see Bourdieu, 1972/1977). Complementing

Bourdieu's framework was the narrative inquiry design for this study, which through storytelling, facilitated the discovery of similar patterns and themes from former women engineers about their professional experiences, emphasizing *temporality*, *sociality*, and *place* to ascribe meaning (Clandinin, 2016; O'Toole, 2018). Table 2 shows how Bourdieu's framework, the narrative inquiry design, and salient concepts from the literature supported data collection and analysis to form an aligned construct to facilitate the discovery of new meaning. Table 2 demonstrates how key concepts from the literature review, conceptual framework, and methodology align with interview phases to form an integrated construct for understanding the career attrition phenomenon.

Table 2

Study Alignment Matrix

Interview Phase	General and Key Lit Review Topics	Framework Concepts	Methodological Points
Beginning	Demographics, background story, and career progression.	Habitus and capital (perceptions of self and individual strengths)	Temporality, sociality, and place.
Middle	Familial influences, unsupportive work cultures, male-dominated career contexts	Habitus, capital, and field (personal and professional incongruence)	Temporality, sociality, and place.
End	Retelling stories about the final decision to leave.	Habitus, capital, and field (incompatible culture)	Temporality, sociality, and place

A final alignment consideration carried through the entire data collection and analysis process was how the various study design elements framed the development of interview questions and probes to best answer the research questions. A more detailed

treatise about the alignment between the interview and research questions comes later in the chapter.

Before entering the field to collect data for this narrative inquiry study, a field test was conducted to enhance rigor and trustworthiness (Denzin & Lincoln, 2017; Stake, 2010). The field test's purpose was to evaluate the interview questions' efficacy and probes delineated in the interview guide. A Walden faculty member with expertise in narrative inquiry design and two nonparticipating former women engineers served as expert reviewers of this study's interview questions to provide feedback regarding each question's clarity and concision to generate meaningful narratives about the engineering career attrition phenomenon. The reviewers received the draft interview questions and probes via email and were asked to return comments and suggested revisions within two weeks. All three reviewers responded with feedback and comments on making changes to improve the interview questions and probes. Field test results, Committee Chair input, and lessons learned from conducting practice interviews were incorporated in the final version of interview questions and probes used during each virtual interview session. A detailed treatise of protocols used for data collection and analysis follows in the next section.

Procedures for Recruitment, Participation, and Data Collection

For this study, adhering to the criterion stated above, recruitment, participation, and data collection procedures followed a prescribed process. No contact with potential participants occurred until after receiving approval from the Walden University IRB. The

IRB approval number for this study is 03-09-20-0586392. Below is a detailed summary of the steps followed.

1. Network seed contacts were contacted by email and requested that they forward the study announcement to potential individuals in their networks that may meet the study's participant selection criteria to volunteer for the research and advise them to follow the study's contact instructions for further details or to confirm their interest and qualifications to participate.
2. Once contacted by interested individuals, confirmation was sought that they have read, understood, and can certify that they meet the inclusion criteria and are willing to be part of the study. Meeting the selection criteria was crucial to achieving a sample of participants who were best suited to provide meaningful responses to the interview questions. They were also told that the next step involved giving consent to participate in the research and providing demographic information. Only those who did not meet the participant selection criteria were excluded from the study.
3. For each qualified and willing individual, an informed consent form was emailed to confirm their understanding of the study's purpose and study processes and willingness to consent to serve as a participant. Each individual was then asked to review the consent document, ask any questions or clarifications, and respond within 2 weeks. Once a participant was satisfied with their understanding, they were asked to sign electronically, date, and

return the form. Each participant received a copy of the fully executed consent form for their records.

4. All participants were asked if they knew of others who might meet the study criteria and, if so, to consider sharing the study announcement to determine whether other former women engineers were interested in participating.
5. Each consenting participant was then emailed a demographic questionnaire (Appendix B) to complete, and again, were reminded of efforts to protect their privacy and confidentiality and that they did not have to supply any of the requested information, which included participant age, race/ethnicity, marital status, and current occupation and work status. They were asked to respond with their input within a week.
6. On receipt of consent and demographic information, the initial 60 to 90-minute interview sessions were scheduled by working with each participant to find a convenient date and time. Details about the Zoom virtual meeting format were also provided, so the participant knew what to expect.
7. Once the interview session began, the interview guide script was followed, reiterating the research's voluntary nature and having the right to withdraw from the study at any time for any reason. Protections for their privacy and confidentiality were reinforced, as well as affirming that all study-related personal information, including names, signatures on consent forms, email addresses, and phone numbers, were stored separately from the transcripts and kept confidential and secure, and seen only by me.

8. After addressing any questions and before asking the first interview question, the study's purpose, and the importance of the information being provided by the participant were reviewed. They were also reminded that: (a) the interview should last 60-90 minutes, (b) they would be responding to about four main questions with the potential for follow-up questions to clarify or elaborate on their initial responses, and (c) the question phase of the interview would be recorded and transcribed. Each participant was then asked if they had any final questions before beginning the interview question phase.
9. After addressing any remaining questions, the formal interview phase commenced using the interview questions and probes detailed in the interview guide. Recording of the interview began here to reduce the possibility of capturing unwanted, personally identifiable information, shared earlier, in the final transcription process.
10. After the interview concluded, including the recording's termination, and while still in the virtual interview setting, each participant received a debrief of the next steps. The first post-interview step involved converting the MP4 digital recording file to a Microsoft Word document using Rev transcription service (https://www.rev.com) that offered comprehensive confidentiality protections, including the encryption of all customer files throughout the transcribing process and maintaining confidentiality and non-disclosure agreements with their transcriptionists. Once the Word document was received back from transcription, an initial quality check was performed,

looking for errors and making revisions as required. The reviewed Word version of the transcript was then forwarded via email to each participant to complete a member check to ensure the transcript accurately portrayed their storied responses to questions and probes. Based on feedback received, the document was revised, and if needed, a follow-up exchange occurred to address anything needing further clarification. After addressing any remaining feedback issues, each participant was thanked for their time and contributions and informed that the next step was to seek their validation regarding interpretations made in creating a participant narrative. As discussed later, a pseudonym was substituted to identify each participant interviewee in all research texts to protect their privacy and identity.

11. Due to the nature of this narrative inquiry design, an additional member check was conducted to ensure the co-constructed interpretations from participant conversations were valid and accurately represented their career exit stories. Following the conclusion of member checking, the co-created participant narrative summaries were included in Chapter 4.
12. All data collected from the participants through the interviews and any other communication artifacts between the researcher and participants were kept confidential and secure. Confidentiality continued to be attended to, as the narrative inquiry design did not necessitate sharing information among the interviewees. For all research texts, a pseudonym was substituted for each participant’s name to protect their privacy and confidentiality.

13. Snowball sampling efforts continued throughout the data collection phase, and when recruiting efforts slowed or failed to produce enough participants, contingency recruiting strategies were invoked. Recruitment and data collection continued until the data was sufficient to meet the criteria for saturation.
14. Participants exited the study following the data collection phase's successful conclusion, including all member checking sessions needed to clarify the data's interpretation. To memorialize the moment, each participant received an email thanking them for their contributions to the research, stating that there is nothing more required from them, and asking if they were interested in receiving a one-page summary of the final results of the study once approved and released by Walden University. If the response was yes, a commitment was made to email a copy of the summary document when releasable.

Data Analysis Plan

The purpose of this research was to explore the experiences of former women engineers in the Northern Tier States region of the United States through their narrative stories of consideration for leaving the profession and their final decision to leave. The central research question was: what are the recounted experiences of former women engineers as told through their narrative stories of consideration for leaving the profession; and the supporting research question was what are the recounted experiences of former women engineers as told through their narrative stories of final decisions to

leave the profession? Interview protocols and questions were aligned to key concepts from the literature review and the research questions, as shown in Appendix C.

Collecting and analyzing data for this narrative inquiry was a crucial part of exploring and understanding the lived experiences told by the participant, as the storyteller. Building a relationship with the participant was central to creating and shaping field texts in a narrative inquiry study (Clandinin & Connelly, 2000). Field texts from the co-authored interview transcripts formed the foundation for understanding the participants' storied experiences (see Clandinin, 2016; Clandinin & Connelly, 2000).

In contrast to some forms of data analysis that are reductionistic, narrative analysis involves an immersive process that allows for the systematic study of personal experience and meaning-making (Riessman, 2003). Analyzing data narratively deviates from standard data-reduction analytics, which relies primarily on coding and categorizing words and phrases from transcripts to enable generalizations across participant inputs. Instead, it emphasizes a holistic meaning-making process extracted from entire passages in a story underpinning narrative inquiry research (Riessman, 2008). While narrative analysis serves as a single overarching approach for analyzing and interpreting data generated through narrative inquiry, there are some variations in the process.

For narrative inquiry, the transition from field texts to research texts involves a complex process of reading and re-reading field texts to construct a summary accounting of their contents before coding the texts with assistance from software programs to help manage their volume and complexity (Clandinin & Connelly, 2000). Clandinin (2016)

asserted that the analysis of field texts involved an iterative process of unfolding the many dimensions of what was captured in transcripts, sometimes requiring additional conversations with participants, but ultimately resulting in a final research format suitable for completing a study. In this way, the analysis process could also involve the writing of many interim texts that can take many forms and serve as instruments to share and negotiate interpretations with participants before establishing a final research text (Clandinin & Connelly, 2000). Narrative analysis usually involves thematic, structural, a combination of thematic and structural, or dialogic approaches to interpreting data or field texts (Riessman, 2008). The thematic analysis approach was chosen because it offered a better result than having to master a more challenging dialogic or structural approach used by more advanced narrative researchers while still enabling a consistent and rigorous way to unlock meaning from the storied narratives. Data analysis commenced by compiling each participant's completed story that became the basis for identifying related themes on the attrition phenomenon for women engineers.

The thematic analytic paradigm used to interpret the interview data for this study used the Braun and Clarke (2006) six-phase process, discussed in more detail in Chapter 4. Using established methods such as a trusted data analysis paradigm helped establish dependability by introducing rigor and structure, which enhanced the research's trustworthiness (see Nowell et al., 2017). Central to this thematic approach was the choice of an appropriate coding schema for a narrative inquiry design. While Saldaña (2016) suggested narrative coding as an appropriate way to understand storied-phenomenon (p. 155), it was not considered to be suitable for me as a novice researcher

due to the complexity of meaning-making inherent in the schema. Instead, initial coding was chosen to derive meaning from the career exit stories of former women engineers. Initial coding assigns words or short phrases to a passage of descriptive data, including coding for multiple forms of data, similar to this study, involving interview transcripts, field notes, and journal entries (Saldaña, 2016, p. 115). Saldaña added that Initial Coding could often include elements from other coding schemas, including those suited for less experienced researchers like in vivo and descriptive coding, to enable a deeper reflection on the content and nuances inherent in descriptive data.

Based on the large volume of first-cycle codes and consistent with other narrative inquiry research, second cycle pattern coding was used to identify categories or subthemes comprised of primary codes that could share common meanings that address the research questions. Saldaña (2016) asserted that second cycle pattern coding is ideal for finding commonality across similarly coded data segments to identify more meaningful representations of the data that can reveal emergent themes. The use of pattern coding also aligned with Braun and Clarke's (2006) third phase, searching for themes. The authors described the process of analyzing all initial codes and sorting them into categories or what they referred to as *candidate themes* (p. 20). For data management, hand-coding was selected over a computer-assisted qualitative data analysis system (CAQDAS). The NVivo data and analysis software tool was considered based on its competitive cost, superior user ratings, and features (Predictive Analysis Today, 2018). Some narrative inquiry research designs have benefited from using a CAQDAS product like NVivo (Herman, 2015). Still, its use was argued to buffer the analytic

process by distorting the meaning-making process. A researcher can become reflectively disconnected with the inherent complexity in narrative data by accepting the outputs of a software's many reporting features without considering meaning-making implications (Woods et al., 2016). Narrative inquiries require that the researcher maintain a constant reflexive posture by staying close to the data and its meaning (Clandinin, 2016; Riessman, 2008). Hand coding was the most appropriate choice for this study design based on offering critical advantages over CAQDAS by removing limitations to reflexivity and the meaning-making process described above. A codebook was created to facilitate the discovery of themes using the hand-coding method (see Appendix D). A codebook facilitated the analysis of this study's large sets of narrative data. The codebook consisted of each code's name, a short description of the code, and examples of textual data segments that illustrated the code (see Roberts et al., 2019).

During the analytic process, discrepant data may emerge from participant cases. Discrepant data does not conform to patterns or current understandings of a phenomenon of interest (Ravitch & Carl, 2016). Because discrepant cases could offer opportunities for generating new knowledge like alternative meanings (Patton, 2015), if encountered, they would be handled equally with other data as a way to introduce potential new meaning about what may precipitate women engineers' occupational exits.

Issues of Trustworthiness

Qualitative or naturalistic researchers must attend to the concept of trustworthiness to establish the quality and rigor of their work when judged by others. Ravitch and Carl (2016) noted that the term trustworthiness parallels the positivist-based

term *validity* used by quantitative method-scholars. To ensure research trustworthiness, qualitative researchers can employ various strategies (Mauthner & Doucet, 2003). Lincoln and Guba (1985) proposed *credibility*, *transferability*, *dependability*, and *confirmability* as the most relevant criterion for trustworthiness for qualitative research. While Lincoln and Guba acknowledged that their trustworthiness framework for qualitative research was imperfect, Loh (2013) concluded that their construct was a recognized and established method for judging quality and rigor in qualitative research in general, and narrative designs, in particular. Connelly and Clandinin (1990) argued that *transparency*, *verisimilitude*, and *transferability* reflect the trustworthiness criteria aligned with the narrative way. Therefore, Lincoln and Guba's standard was adapted for this narrative inquiry design and formed the basis for the strategies employed to establish trustworthiness in this study. Ethical concerns and mitigation strategies are also discussed.

Credibility

Credibility refers to the accurate portrayal of the phenomenon under study (Shenton, 2004) and equates to internal validity used in quantitative approaches (Lincoln & Guba, 1985). The credibility for this narrative inquiry study relied on an ability to capture and interpret the storied experiences of former women engineers to the degree that instills confidence in the audience of the study's rigor (Loh, 2013) and plausibility (Connelly & Clandinin, 1990). Strategies to achieve these outcomes included; member checks, rich and thick descriptions of the phenomenon under study, establishing saturation, and reflective journaling of the interview process that provided further

evidence of credibility by generating a reflexive accounting of the process (Burkholder et al., 2016). For instance, member checks, or correspondence validation in narrative inquiry, solicited participant feedback on interpretations to ensure an accurate representation of participants' storied responses (Kornbluh, 2015; Riessman, 1993). As part of data analysis, established data coding mechanisms of descriptive and pattern coding were used to analyze verbatim passages from transcripts (see Saldaña, 2016). To enhance these strategies for establishing credibility, the most knowledgeable participants were recruited. The rigor in the research process was demonstrated by using an interview guide (see appendix A) and detailing the methods and research processes employed in the study. A formal dissertation committee review process was included as part of the manuscript review to improve the overall quality and establish a stronger case for the credibility of findings (see Spall, 1998).

Transferability

Transferability is analogous to external validity used in the quantitative paradigm and refers to how well the researcher demonstrates the contextual similarity represented by a study's findings and results to other settings and cases envisioned by the reader (Patton, 2015). Although qualitative research does not seek generalizability, it does pursue the establishment of transferability through findings that generate meaning externally (Crawford, 2016), through the use of reflexivity (Schwandt, 2015) and thick descriptions (Merriam, 2009). Narrative inquiry designs also emphasize transferability by instilling a sense of verisimilitude, over creating a false appearance of causality from narrative data's temporal aspects (Connelly & Clandinin, 1990). Transferability for this

study came from detailed accounts of the research and reflexivity, including; disclosing researcher positionality, using journaling and thick descriptions, and providing detailed accounts about the study process, setting, and results.

Dependability

Dependability refers to the degree to which a study establishes and adheres to a methodological process (Patton, 2015), which can be replicated and generates similar results (Yin, 2018). Demonstrating this study's dependability included a detailed description of the methods and inquiry processes (Lincoln & Guba, 1985). Triangulation, a common dependability enhancement mechanism for narrative inquiries (Kim, 2016), occurred by comparing and interpreting interview transcripts, field notes, and journaling entries during data analysis. Further, serving as the sole researcher and mitigating personal biases throughout the inquiry process also helped establish dependability.

Confirmability

Confirmability is analogous to objectivity and refers to data and interpretations aligned to a participant's meaning-making and not to the researcher's biases, world views, and positionality (Patton, 2015). Similar to substantiating dependability, Lincoln and Guba (1985) asserted that the primary means of supporting a claim of confirmability is using an audit process that documents and details the processes and procedures for recruitment, data collection, and analysis. For this study, an audit trail was documented to establish a clear link between the data collected and the analytic results.

Ethical Procedures

The potential for ethical issues in qualitative research is ever-present, and there must be protections added to protect against any adverse effects in the study design. Ethical concerns are prevalent in qualitative field research. Due to the nature of the close interactions with participants, intentional research planning is an essential strategy to build-in measures to avoid ethical dilemmas (Babbie, 2017). I attended to ethical considerations throughout the study process by treating participants according to the ethical principles of respect, beneficence, and justice outlined in the *Belmont Report* (National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research, 1979). Further, particular attention was placed on ethical obligations related to the choice of a narrative inquiry design, which involved special considerations. Clandinin (2016) and Riessman (2008) emphasized that because of the close relationship with participants as cocreators of meaning, there is a higher standard of care beyond mere compliance with rules to embrace the embedded essence of the narrative way of collecting data from people.

For this study, ethical considerations were addressed by ensuring reasonable protections for the participants throughout the engagement for this project and communicating such through the informed consent process. For privacy, pseudonyms were used in place of participant names for transcripts and any other references in this study. All study-related documents and files were secured and password-protected to ensure confidentiality. Participants were also asked to read and fully understand the consent process and its content. When interviewing participants, being considerate of

their needs, showing respect, and honoring all promises made remained a priority. Member checking was used to ensure an accurate portrayal of participant meanings in both the data (transcripts) and any interpretations requiring clarification. Rubin and Rubin (2012) emphasized the importance of researchers behaving ethically to ensure no deception, undue pressure, or other violations of trust that could compromise the entire research process and bring discredit on yourself or the institution you represent.

Ethical considerations were present while member checking to improve credibility and provide transparency about how identities were protected, by reaffirming their informed consent, and obtaining any permissions for including verbatim excerpts from their transcribed stories (Riessman, 2003, p. 198). Ethical responsibilities remained at the forefront when asking questions about gendered aspects of the engineering workplace and culture that could have potentially made the participants feel uncomfortable and be reticent to be forthcoming in their responses to a male interviewer. A priority was to disclose information about the study and its possible benefits and highlight the potential value of a male researcher and female participant cocreating meaning about the career departure phenomenon for the engineering profession to mitigate risks and attempt to create a more trusting relationship with participants during recruitment. In this way, the participant experience was monitored to gauge their comfort level and make adjustments as needed during the interview phase of data collection.

Summary

The purpose of this qualitative narrative inquiry study was to explore the experiences of six to eight former women engineers in the Northern Tier States region of

the United States through their narrative stories of consideration for leaving the profession and their final decision to leave. A narrative inquiry design was the preferred method because the literature reviewed and synthesized in Chapter 2 showed that despite considerable progress in understanding why women engineers might abandon their careers, there was still a need for deeper and more complete meaning about their exit experiences, influenced by time and varying contexts. Results from this study could address this gap in the literature by revealing the more profound and subtle meanings found in former women engineers' stories that could offer new insights about the persistent career attrition phenomenon. This narrative inquiry study design demanded a high level of ethical care due to close interactions with participants, which included remaining attentive to the many ethical considerations inherent in this study by maintaining a heightened awareness level. Ethical obligations extended beyond mere compliance with rules and policies by embracing the embedded essence of the narrative way of collecting data from people. All aspects of this study's protocols and procedures were followed closely to ensure participants' privacy, avoid ethical dilemmas, and enhance the study's trustworthiness. Chapter 4 provides the study results, the research settings, and details about recruiting participants, data collection, data analysis, and evidence of trustworthiness.

Chapter 4: Results

The purpose of this qualitative narrative inquiry study was to explore the experiences of former women engineers in the Northern Tier States region of the United States through their narrative stories of consideration for leaving the profession and their final decision to leave. The following central RQ and one SQ guided this narrative inquiry:

RQ: What are the recounted experiences of former women engineers as told through their narrative stories of consideration for leaving the profession?

SQ: What are the recounted experiences of former women engineers as told through their narrative stories of final decisions to leave the profession?

The career attrition phenomenon for women engineers has persisted for over a decade (Noonan, 2017), and more women are exiting the engineering profession than are entering (Fouad et al., 2017). While prior research has generated some valuable findings (Cardador & Hill, 2018), there is still a need for studies with varied methods to develop a more nuanced understanding (Fouad et al., 2017; Meiksins et al., 2018). The results from this study could address this gap in the literature by revealing the more profound and subtle meanings found in the stories of former women engineers. Chapter 4 includes a discussion of the field test, research setting, demographics, data collection and analyses, evidence of trustworthiness, and study results before concluding with a summary and transition to Chapter 5.

Field Test

I completed a field test before entering the field to enhance the study's rigor and trustworthiness (see Denzin & Lincoln, 2017; Stake, 2010). A Walden University faculty member with expertise in narrative inquiry design and two nonparticipating former women engineers served as expert reviewers. Reviewers received an email with a copy of the interview questions and probes and a summary of the study. They were asked for feedback regarding whether the interview questions/probes: (a) were appropriate for the targeted participant population; (b) would not unnecessarily cause distress or discomfort; (c) were clear, appropriately worded, and open ended (i.e., were not yes/no type questions); and (d) were likely to elicit prolonged storytelling responses over just short answers.

I received feedback from all three reviewers. While many of the comments supported the formulation of interview questions, three feedback themes emerged and identified specific questions and probes that would benefit from revisions. The first recommended revision involved changing all questions and probes' phrasing to avoid yes/no questions. For example, instead of asking, "could you tell me ..." begin with "tell me ..." The second recommendation was to remove any words that could introduce unintended bias in a participant's response. For instance, changing the phrase "wanting to leave your engineering career" to read instead "about leaving engineering." Finally, they recommended being more specific about what is being asked by probing questions. A good example was the recommendation that when seeking background information, ask each participant specifically why they went into engineering. Based on all the feedback

received, I made revisions to the relevant interview questions and probes and submitted a change request to the IRB (which was approved) for including the revised interview questions in this study.

Research Setting

This study initially included face-to-face interviews with plans to meet in a quiet, publicly accessible meeting room, such as those found at libraries or other community facilities. Following receipt of IRB approval, but before data collection activities began, the novel coronavirus (COVID-19) pandemic, also referred to as "The Great Pause" (Timoney, 2020), emerged in the United States, placing unprecedented restrictions on human contact. In response, Walden University IRB issued directions to all student researchers to adopt virtual interviewing protocols to avoid any added health risks to participants and researchers from face-to-face interviews.

Following a review of various video-teleconferencing options, I selected Zoom as the preferred data collection platform to conduct and record all interview sessions virtually. The informed consent process and the collection of demographic information were also done virtually using email, and the Adobe Acrobat Reader DC Fill and Sign feature. While direct participant observation was not possible, the added burden of worry and stress associated with the prospect of meeting in-person during a pandemic would have been incongruent with established ethical standards for human subjects. When reflecting on the entire data collection process using virtual means, there was an unexpected benefit. While there were concerns about the diminished potential for gathering data from visual cues by not being physically present for the interviews

(Novick, 2008), the virtual environment still provided some essential visual cues and, more importantly, enhanced the participants' psychological safety. Psychological safety is the nexus between an individual's way of being and a given context where individuals feel secure in taking interpersonal risks without fear of negative repercussions (Rimm-Kaufman, 2016). Social distancing and the natural settings experienced in the virtual environment for this study helped to mitigate the accumulation of stressors beyond COVID-19 concerns, which for in-person contexts, could have diminished a participant's feelings of psychological safety. These stressors included traveling to and meeting in a strange place and being physically present in a research setting where they may experience a heightened awareness of being observed and documented. Instead, the participant experience occurred from the relative comfort and safety of a home setting. A psychologically safe research environment's positive effect was demonstrated through the depth and richness of the stories participants told, sometimes recounting experiences involving sensitive subjects like workplace harassment, sexism, and discrimination.

In summary, the COVID-19 pandemic changed some of the planned research methodologies in this study by introducing unexpected contextual conditions that may have influenced interpretations of the study results. While I made attempts to capture and document some of these impacts and considerations related to the research setting, there was the possibility that others were unknowable.

Demographics

I collected data from six former women engineers to gain a deeper understanding of their considerations for leaving and a final decision to leave their careers. Table 3

shows the demographic profile for the sample. The mean age of the sample was 39 years. For participants still working full- or part-time following their departure from engineering, two were project managers, one was in timber sales, one was a health coach, and one was an adjunct professor.

Table 3

Demographic Profile of Sample

Demographic category		No. of participants	%
Age range	20-30	2	33
	31-40	2	33
	41-50	0	0
	51-60	2	33
Ethnicity	White	5	83
	Black	1	17
Marital status	Married	4	67
	Single	2	33
Work status	Full-time	4	66
	Part-time	1	17
	Not working	1	17

Note. The demographic information contained in this table was generated from self-reported participant responses to an email questionnaire sent out before conducting individual interviews.

Data Collection

I recruited six former women engineers who left engineering within the last 4 years and were willing to recount their career departure stories. The geographic focus area for recruitment was initially restricted to the Pacific Northwest region, including

Oregon, Washington, Idaho, Montana, and Wyoming. When the primary and contingency recruitment strategies stalled, a change in procedures request was submitted to and approved by the Walden University IRB to extend the geographic area of consideration and add the Walden University Participant Pool as a recruiting tool. This change was sufficient to obtain a sample size large enough to achieve data saturation. No discrepant data emerged in this study.

I used semistructured virtual interviews to collect data from six former women engineers. Zoom served as the platform for conducting and recording the participant interviews. The average length of the interviews was 62 minutes. The recorded audio from each interview was transcribed into a Microsoft Word document using the Rev transcription service. The six virtual interviews generated a total of 93 pages of single-spaced transcriptions. Participants were provided a copy of their transcribed interview for member checking. While the use of Zoom or telephone calls were offered to facilitate these reviews, all participants chose to use email to return their transcript revisions. Due to intermittent bandwidth interference during the virtual interviews, some participants needed to fill in lost passages from the recordings due to muffled or missing audio segments. Most of the other revisions were minor and included grammatical and spelling changes. No other changes were requested.

Following each interview, I captured and transcribed my reflective thoughts in an audio journal before being used in concert with member-checked transcriptions to inform and guide the data's interpretations during the thematic analysis process. Twenty-eight pages of reflective journaling were generated from the virtual interviews. Following a

review of these sources, I created initial codes that assigned meaning to storied segments of member-checked transcriptions to help become familiar with the data.

Table 4 contains details about the interviews, data collected, and the number of first-cycle codes assigned. As indicated by the range values, there was some variation in the lengths of interviews and transcripts, although the difference could be explained by the different durations a participant spent in their engineering career. Former women engineers with longer careers had lengthier interviews and corresponding transcripts. I assigned 138 codes in the first cycle of coding before collapsing and categorizing codes into broader patterns and themes.

Table 4

Descriptive Statistics for Data Collected

Description	Total	*M*	*Mdn*	Range
Length of interview (minutes)	474	79	72	76
Transcript pages (single-spaced)	93	16	11	30
Typed journal pages (single-spaced)	28	5	5	1
Number of codes assigned	138	23	22	23

Data Analysis

This section details how the data were analyzed for this study, including a review of the analytic paradigm chosen to generate meaning from the data collected from six former women engineers. Next, the coding process is described, including how codes

were developed, categorized as subthemes, and finally formed themes. Examples of the coding process demonstrate how the analytic paradigm aligned with the conceptual framework to yield relevant and meaningful themes. The section ends with a discussion of discrepant case impacts for the study.

Analytic Paradigm

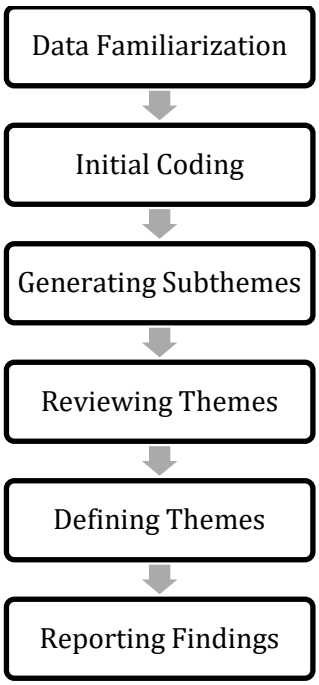
Analyzing the data for this narrative inquiry was crucial in exploring and understanding the lived experiences told by former women engineers as the storytellers. In contrast to some data analysis forms, narrative inquiries involve an immersive process that allows for the systematic study of personal experience and meaning-making (Riessman, 2003). Instead of a reductionistic analytic paradigm that seeks to code and categorize words and short phrases from narrative data, narrative inquiries seek to understand the data by analyzing entire passages in a story to help preserve the storyteller's intended meanings (Riessman, 2008). The analytic approach that best aligned with the narrative inquiry design was Braun and Clarke's (2006) six-phase thematic analysis protocol. The Braun and Clarke protocol has delivered meaningful results for research designs that focused on semantic content and were particularly useful for more latent analytic stances like this study, which inductively generated meaning from the underlying conceptualizations that shaped the narrative content of the data. In this way, the Braun and Clark paradigm complemented this study's goal to generate a more nuanced understanding from the stories of women engineers who abandoned their profession.

Analytic Process

The Braun and Clarke (2006) approach was carried out through the phases shown in Figure 2. The first phase involved reading and re-reading the member checked transcriptions, field notes, and journal entries to annotate initial thoughts and ideas for each narrative passage. In preparation for coding, annotations were bracketed around complete storied segments rather than single words or short phrases to retain intact narratives and align with narrative inquiry (Riessman, 2008). During this initial phase, storied narratives were viewed carefully through the lens of Bourdieu's (1972/1977) concepts of habitus, capital, and field, which enabled an effective way to understand how individuals internalized meaning while being conditioned by past experiences and shaped by the everyday practice of reenacting them in varying contexts. The use of habitus, capital, and field allowed the viewing of former women engineers' experiences through the lens of their socially constructed engineer identity and how certain workplace factors might precipitate a decision to leave their careers. During data familiarization, the male-dominated engineering workplace was conceptualized as a "field" where a woman's engineering "habitus" (engineering identity) and "capital" (professional strengths) combined to create a storied experience of professional life leading up to a choice to leave.

Figure 2

Braun and Clarke's (2006) Six Phases of Thematic Analysis



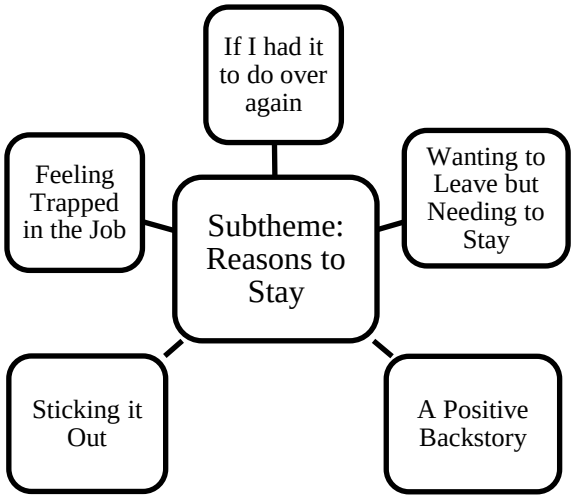
The second phase of this framework and analytic stance involved hand-coding of the participant-generated data segments to reflect interpretations of the data's intended meaning. Hand coding was selected to retain alignment with the narrative inquiry way, which requires the researcher to maintain a constant reflexive posture by staying close to the data and its meaning (Clandinin, 2016; Riessman, 2008). An *initial* coding schema was employed that assigned words or short phrases to complete data passages (see Saldaña, 2016) to ascribe meaning to former women engineers' career exit stories. A codebook, maintained in an Excel document, informed the rest of the analytic process and facilitated analyzing the large quantity of narrative data. The codebook consisted of

the code's name, a short description of the code, and an example(s) of textual data segments that illustrated the code (Roberts et al., 2019).

Employing Braun and Clarke's (2006) third phase involved analyzing all initial codes to determine how they combined to form subthemes or themes. Relationships between codes were explored by reviewing and comparing interpretations of participant motivations, feelings, thoughts, behaviors, and interactions when telling, re-telling, and reliving their storied experiences (Clandinin, 2016). To facilitate searching for subthemes, a second *pattern* coding schema was used to identify categories of primary codes that shared a collective meaning (Saldaña, 2016) about a woman engineer's consideration for, and a final decision to, leave the profession. Pattern coding aligned well with Braun and Clarke's third phase, which described the process of analyzing all initial codes and sorting them into categories, or what they referred to as "candidate themes" (p. 20). Figure 3 is a thematic map created to show how codes aligned with a subtheme.

Figure 3

Thematic Map Example of how Codes Cohere Together to Form a Distinct Subtheme



Once all patterns were identified and codes grouped in subthemes, the fourth phase began and involved reviewing and refining the candidate or subthemes to produce themes aligned with the full dataset and were internally congruent while externally distinct (Patton, 2015). Figure 4 displays a thematic map example of how subthemes joined to become themes. When satisfied that theme constructs met these criteria, the process of naming and defining the final set of themes commenced, as prescribed in phase 5, in preparation to complete the final analytic step.

Figure 4

Thematic Map Example of how Subthemes Cohere Together to Form a Distinct Theme

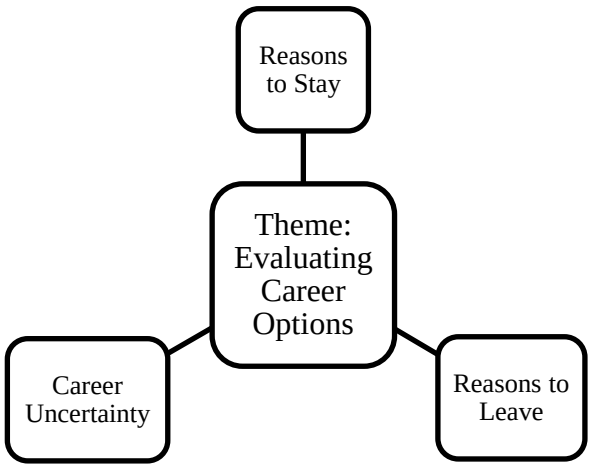


Table 5 demonstrates how example codes from the codebook, when viewed through the conceptual framework lens, formed subthemes, which were then grouped in themes. Organizing the results through inductive content analysis was an essential step to produce the final research text that served as the summary accounting of the storied narratives from former women engineers. During this phase of analysis, an evaluation was made of the data's sufficiency to make a final assessment regarding the attainment of data saturation, one of the criteria used to establish trustworthiness. A detailed description of how saturation was determined for this study follows in the Evidence of Trustworthiness section.

Table 5

Example of how Codes Roll-Up to Subthemes and Then to Themes

Codes	Subthemes	Themes
Career burnout		
Career choices influenced by impactful life events		
Career disillusionment		
Career doubts		
Early warning signs	Career uncertainty	
This is not working for me		
Thoughts about another career		
What do I want to be when I grow up?		
Why do I feel this way?		
A good move		
Checking out and moving on		Evaluating career options
Disillusioned by a female boss		
Latent feedback and support		
Maybe things will be better at another firm	Reasons to leave	
The beginning of the end		
The need for a change		
The straw that broke the camel's back.		
Why do I feel this way?		
A positive backstory		
If I had it to do over again		
Sticking it out	Reasons to stay	
Wanting to leave but needing to stay		
Feeling trapped in the job		

Following Braun and Clarke's (2006) phase6, the evidential account of how extracts from the narrative data supported the final themes and addressed the research questions was produced. This account is found in the Study Results section and includes an illustration of how themes were aligned to each research question to tell a coherent story of how former women engineers experienced the career attrition phenomenon.

A final consideration during the process of data analysis was the identification of any discrepant data. Discrepant data is any data that does not conform to patterns or current understandings of a phenomenon of interest (Ravitch & Carl, 2016). Discrepant cases can form essential research findings because they offer opportunities for generating new knowledge like alternative meanings (Patton, 2015). If encountered, it would be handled equally with other data to introduce potential new meaning about what may precipitate women engineers' occupational exits. After the analytic process concluded, a determination was made that no discrepant data had emerged, in part because all data elements had converged to form a finite set of subthemes and themes. The implementation of and adjustments made to the planned strategy for ensuring this study's trustworthiness are presented next.

Evidence of Trustworthiness

Lincoln and Guba (1985) proposed *credibility*, *transferability*, *dependability*, and *confirmability* as the most relevant criterion for trustworthiness for qualitative research. Connelly and Clandinin (1990) argued that transparency, verisimilitude, and transferability reflect the trustworthiness criteria aligned with the narrative way. Therefore, Lincoln and Guba's standards were adapted for this narrative inquiry study

and formed the basis for the strategies employed to establish trustworthiness in this study. Ethical concerns and mitigation strategies are also discussed.

Credibility

The credibility of this narrative inquiry study relied on an ability to capture and interpret the storied experiences of former women engineers to the degree that would instill confidence in the reader of the study's rigor (Loh, 2013) and plausibility (Connelly & Clandinin, 1990). Six strategies formed the basis for generating a meaningful representation and reflexive accounting of the process (Burkholder et al., 2016). Before entering the field, expert validation occurred through a field test to ensure the interview questions' and probes' sufficiency and effectiveness in the interview guide to elicit representative responses about the phenomenon under study (Denzin & Lincoln, 2017; Stake, 2010). Second, only expert participants were recruited, which facilitated a rich and meaningful engagement that produced the conceptual depth needed to achieve saturation (Nelson, 2017). Third, the determination of saturation was made after establishing that: (a) there was little or no change in the coding process, as evidenced by the data converging and not diverging to form cohered subthemes and themes (Guest et al., 2006); and (b) the data collected had achieved the desired richness and conceptual depth necessary to show there was ample evidence in the data that enriched the meaning of emergent themes and resonated (Kim, 2016; Nelson, 2017; Suárez-Ortega, 2013). Fourth, member checks, or correspondence validations, were used to ensure an accurate representation of participants' responses and interpretations of meanings from co-created narratives (Kornbluh, 2015; Riessman, 1993. Fifth, the established data coding

mechanisms of initial and pattern coding were employed for analyzing verbatim passages from transcripts (Saldaña, 2016). Sixth, a formal dissertation committee review process was completed to improve the research's overall quality (see Spall, 1998).

Transferability

A goal of this study was to establish the transferability of findings externally by generating meaning (Crawford, 2016) through the use of reflexivity (Schwandt, 2015) and thick descriptions (Merriam, 2009). This study's narrative inquiry design emphasized transferability by instilling a sense of verisimilitude over creating a false appearance of causality from the temporal aspects of narrative data (Connelly & Clandinin, 1990). Transferability for this study was established by creating detailed accounts of the research and using reflexivity, including attentiveness to and disclosure of positionality, journaling and thick descriptions, and detailed accounts about the study process, setting, and results.

Dependability

Demonstrating dependability for this study included the execution of four strategies. First, detailed descriptions of the methods and processes were included for this inquiry (Lincoln & Guba, 1985). Second, triangulation was employed by comparing and interpreting transcribed interview data, field notes, and journaling entries during data analysis. Third, an audit trail was produced by maintaining detailed documentation of the data collection and analysis process, including audio recordings, field notes, journaling entries, verbatim member-checked transcripts, and the development of codes and themes (Kim, 2016; Lincoln & Guba, 1985). Finally, serving as the sole researcher enabled the mitigation of personal biases throughout the inquiry process by remaining reflexive and

adhering to established research protocols. For instance, the rigorous use of an expertly validated interview guide during each semistructured interview maintained a balance between achieving a narrowed research focus and needing to minimize personal influences by remaining engaged and emotionally attentive to the storytelling process (Clandinin, 2016).

Confirmability

Similar to substantiating dependability, Lincoln and Guba (1985) asserted that the primary means of supporting a claim of confirmability is using an audit process that documents and details the processes and procedures for recruitment, data collection, and analysis. For this study, an audit trail was produced that documented the research process and established a clear link between the data collected and the analytic results. To further establish confirmability, inherent researcher biases common with the interpretative nature of narrative inquiry were managed using reflexivity, member checking, and peer review protocols (Lincoln & Guba, 1985).

Reflexive interpretations of the data helped to mitigate researcher bias and enhance adherence to ethical practices. In the current study, these reflexive interpretations were evidenced in two ways. First, they were employed to mitigate the introduction of errors and assumptions when cocreating the participant narrative summaries presented in the next section. Second, the results section in this chapter includes reflexive interpretations of the data's thematic representations, which enhanced the meaning-making process's quality.

Participant Narrative Summaries

Narrative summaries were generated from information acquired from demographic questionnaires, transcripts from semistructured interviews, and detailed narratives that were co-created, and member checked with each participant to ensure an accurate representation of their stories. The use of member checks to validate researcher interpretations of a participant's storied responses enhanced the inquiry's credibility (Kornbluh, 2015; Riessman, 1993). The resulting narrative summaries offered a contextual foundation to help understand the stories shared by each participant, which is an essential component of narrative inquiry (Chase, 2005; Riessman, 2008). Narrative summaries for the six participants are provided below using pseudonyms.

Participant 1

Ashley is a 33-year-old married White woman currently employed full time in the timber industry. She grew up in a large city in the Pacific Northwest and enjoyed playing soccer and being involved in athletic and fitness pursuits. After high school, Ashley had earned her Bachelor of Arts in Psychology, intending to work in human resources. Following some reflection, she decided to return to college and earn an engineering degree to pursue more meaningful work opportunities like helping underserved populations by designing and building safer structures to inhabit. Having earned a degree in civil engineering with an emphasis in structural design, Ashley began her career with an engineering consulting firm. In the beginning, she was excited about her career prospects, but at the 2-year mark, she began to feel unsupported and isolated. She experienced conflicts between her engineering work-values and the firm's need to

balance quality with business efficiency. She recalled being told to “take more shortcuts” with her work assignments but even more troubling were her experiences with differential treatment or sexism, like when one of her male peers told her that she looked like a sexy librarian. Despite her attempts to stop these behaviors from others, the unwanted comments continued. Additionally, unrealistic workload demands had placed job priorities above her life goals, which made her more miserable and upset over time, feeling stressed and burnt out when combined with everything else. In her fourth year as an engineer with no relief in sight, Ashley opted out of her engineering career.

Participant 2

Amy is a 26-year-old single White woman currently employed full time in the construction industry. She grew up in a small town in the Pacific Northwest and was the daughter of parents who had lived in this same town their entire lives. In school, she enjoyed many subjects but had a particular affinity for math and science, taking and excelling in advanced offerings of these courses. At college, Amy opted to earn a degree in civil engineering, in part because of the positive experience she had with an entry-level course taught by an engineering professor she enjoyed. Following graduation, she interviewed and accepted a position with a large and local firm that offered a wide range of design-based engineering opportunities. The first 6 months of her career was devoted to learning the ropes at work and getting used to living away from home. Soon after, Amy experienced feelings of uncertainty about whether she had made the right career choice. Over the next year, she tried to refocus her energies and commit herself to experience as much variety of work to see if there was something that she enjoyed. She

learned that instead of putting her head down, drawing out details, and running calculations, it was the personal interactions in teams involved with real problem solving that she looked forward to every week. Amy was also becoming aware of incongruencies in the work culture. She experienced differential treatment, attributing her experiences to being both a single young person and a woman, with an inherently different personal and professional support paradigm than her married male peers. She also felt increasingly unsupported and unbalanced in her life pursuits. The accumulation of differential treatment and the lack of support had reached a point where Amy left engineering.

Participant 3

Julie is a 29-year-old married White woman currently employed full time as a health coach. She grew up in Western Washington with her parents and one older sister. While growing up, Julie liked math and anything that allowed her to be creative, which she credited in part to her parents, who instilled an interest in engineering at an early age, including thoughts of building healthy communities. She had settled on pursuing an environmental engineering degree for college because she thought it reflected her social and community building passions and responsibilities. Julie had her first glimpse of the challenges awaiting her in the workplace, when during her senior capstone project presentation, a male engineer advised her to go to graduate school sooner than later, so she did not have to raise babies while pursuing a graduate degree. Still, she entered the workforce, accepting a position with a local engineering firm. It was only after about a month in her new job that Julie knew that she did not want to work there. The firm lacked any kind of mentorship, and the work environment promoted competition over teamwork.

Her feelings of disconnectedness grew, and Julie began experiencing anxiety about a work environment that kept her at a desk in a cubicle all day, working on incremental engineering solutions that lacked visibility of how her work connected and contributed to the overall design. She left this firm in hopes that her new engineering role at a smaller company would improve. The longer she worked at this new company, the more she became frustrated with the industry as a whole. The incongruent work environment, gender discrimination, feelings of being undervalued, and being stifled in her career, precipitated her decision to leave the company and change careers.

Participant 4

Kristi is a 34-year-old married White woman currently employed full time in the construction industry. She grew up on the East Coast in a more rural setting and grew up with three siblings. Kristi remembers being influenced by her mom's work that focused on the built world and how cities were laid out, constructed, and functioned. She credited her dad for her keen interest in science, recalling the many issues of *Scientific American* deposited around the house. Still, she headed off to college to pursue a degree in international relations, as she loved the idea of traveling and learning new languages. While taking a course about the evolution of structures, she fell in love with the idea of being a structural engineer, which led to her switching majors and earning both a bachelor's and a master's degree in civil engineering. She entered the workforce and held positions with four different firms, one on the east coast, two on the west coast, and one nonprofit where she worked abroad. Except for the nonprofit, where women held all key leadership roles, and there was an empowering and supportive climate, Kristi found the

other engineering work environments and cultures incongruent with her needs and where she saw herself in the future. She was not interested in climbing the management ladder as she was put off by the idea of having to work past what she saw as a real boy's club. She recalled her experiences at prior engineering firms and highlighted the kind of sexism and discrimination that permeated the engineering work culture. Kristi described her final decision to leave as less about a discreet moment than an accumulation of interrelated factors over her 10 years as an engineer that caused her to exit the profession.

Participant 5

Marta is a 57-year-old single White woman currently not working. She was born in a large city, but she moved to one of its affluent suburbs during her formative years, where she stayed until going off to college. She was one of 14 children, and both parents were educated. Her dad was an engineer, and while her mom primarily stayed at home to raise the children, she found time to write a book and articles for newspapers and magazines. Marta's dad was a key influencer for her choice to be an engineer and served as a trusted mentor. While in college, she had worked as a co-op student with various auto companies, which led to her decision to take a permanent position with one of those firms following graduation with a degree in electrical engineering. Later in her career, she returned to school to earn a master's degree in engineering. Marta was able to persist longer in the engineering field, crediting her early success to being good with people, having a knack for team problem solving, and excelling at writing technical papers and effectively communicating with management. As her career progression stalled, she became more aware that the espoused norms for advancement were not the same as those

in practice. Marta saw that some managers were advancing despite their low-performance metrics. Marta was disappointed by this aspect of the culture, as she had aspired to be a vice president someday. Marta's decision to finally leave engineering was based on being unappreciated for all her work successes and many life sacrifices, disadvantaged as a woman, exposed to discrimination and harassment, unsupported as a woman, and provided evidential certainty that the culture was unlikely to change in a meaningful way.

Participant 6

Cynthia is a 57-year-old married Black woman currently employed part-time as an adjunct professor. She was born and raised in a large city and was educated through the public school system before going to college. Her parents both grew up in the Jim Crow South, characterized by a period when southern state laws enforced racial segregation and moved north to seek better opportunities. Cynthia was the middle of three children and was a very bright student, although she had a form of dyslexia that affected her interpretation of letters but not numbers. While this condition impacted some aspects of her life, she did not find the public-school curriculum very challenging, in part due to a high aptitude for math and an exceptional curiosity for science studies. Cynthia earned a degree in mechanical engineering and took a job with a large automotive firm. She stayed with this firm for over 30 years before abandoning her career, choosing to earn a master's degree and Ph.D. along the way. Cynthia recalled being keenly aware that while there were still very few women in engineering, there were even fewer women of color. Her career experiences exposed the paradox of being valued by managers for improving department diversity metrics while being disadvantaged for advancement by

those same metrics. She believed that this paradox explained why she remained at the same management level for most of her time at this company. While discrimination was a dominant reason for her early departure from engineering, she had also credited her exposure to misogynistic and racist behaviors from White, male managers as a contributing reason. She recalled her final "check out" as an engineer as the moment when she knew that even if she could have walked on water, it would not have mattered given the work culture.

Study Results

This section contains the results of thematically analyzing the data from six former women engineers about their considerations for leaving and a final decision to leave the engineering profession. Results are organized by research questions and include verbatim illustrative quotes from participants' storied narratives to support each finding. The section concludes with a summary of the results and a transition to Chapter 5.

Research Question Themes

The research question (RQ) focused on the recounted experiences of former women engineers, as told through their narrative stories of consideration for leaving the profession. Six former women engineers recounted their storied experiences working in the engineering field and how some aspects encountered in the workplace precipitated thoughts of abandoning their chosen profession. The analytic process was guided by reflecting on the different data (Kim, 2016) and generating interpretations through an immersive and rigorous process of ascribing meaning to participant accounts through

codes and themes that underpin each research question. Example codes and their corresponding verbatim excerpts assigned for RQ are shown in Table 6.

Table 6

Example Codes with Excerpts for RQ

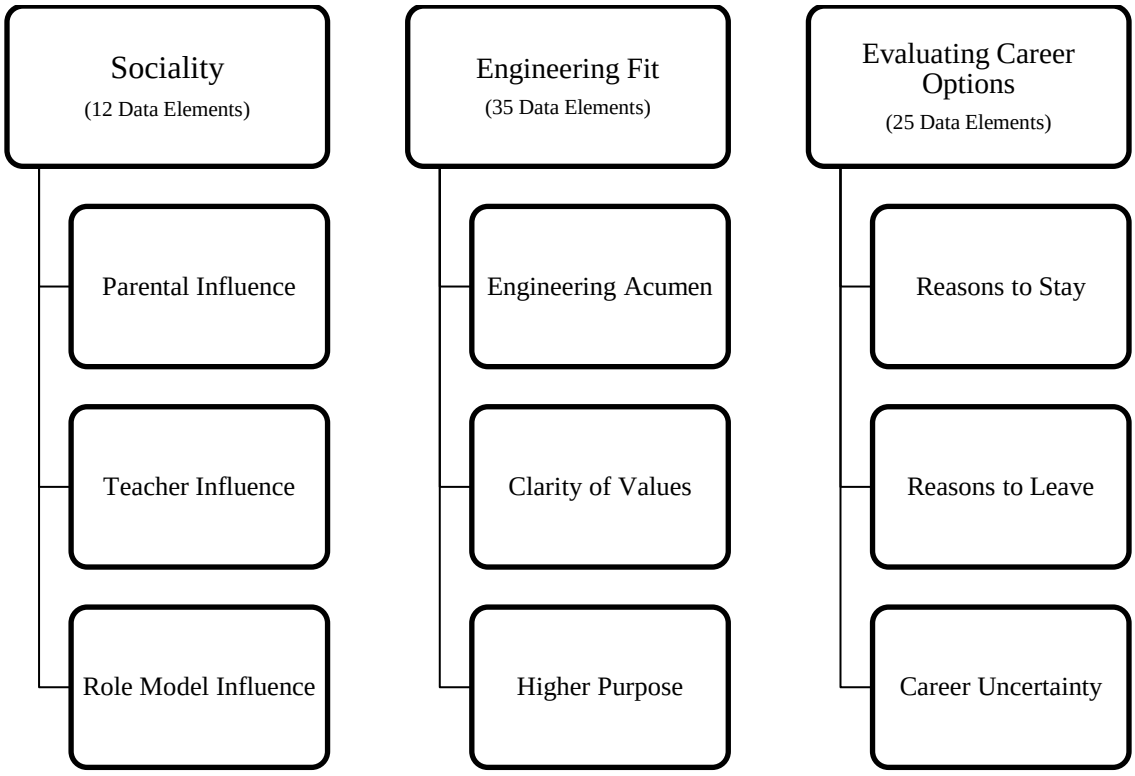
Initial Codes	Example
A good move	So, I decided to get into construction, which seems kind of backwards, but I found it to be much more, much easier to navigate as a woman than engineering, to be honest. So, it's been a good move.
Career burnout	So, I think my earliest memory where I started, not thinking of leaving, but starting to be like, "Is this still for me?" was about 2 years in. Then about year three, I was miserable. I was upset all the time. I wasn't enjoying the work that I was doing. I was stressed out and stretched thin, feeling very, very burnt out.
Meaningful engineering work	It was nice, no matter I feel like, you feel better going to bed at night when you know that you've kind of helped 300 families build safe homes than you do when you know that you've built a nicer gym for a university kind of thing.
More women as role models	The top four, the director of engineering, the director of education, then the director of outreach, are all women. I think it was much easier to see if this was something I wanted to do, there are many role models, and there are many people that I can see being me. I could do that, and I could be that next person.
Supportive parents	So, growing up, I always had that; on the one hand, coming from my mom, I had a lot of interest in the built world and how cities work and that sort of thing. She majored in architecture, so she always talked about buildings a lot. From my dad's side, I had a lot of just interest in science in general. He was always kind of leaving Scientific Americans around or asking questions and stuff.
School came easy	And so that being said, I would say I was a pretty academically driven kid. Not to sound conceited, but I didn't have to put a lot of effort into it. It came naturally, and I think that's part of the reason why I enjoyed it because it did come relatively naturally.

The resulting analytic code comparisons netted nine subthemes. Figure 5 depicts a thematic map of how these subthemes, comprised of cohered data elements, converged to form cohesive themes that addressed RQ meaningfully. Three themes emerged: (a) sociality, (b) engineering fit; and (c) evaluating career options. In the following section,

each theme for RQ is supported by presenting rich and thick examples from the storied-responses of former women engineers for each subtheme.

Figure 5

Convergence of Data Elements in Subthemes That Form Themes for RQ



Theme 1—Sociality

The sociality theme was a direct reflection of how former women engineers' habitus emerged from the data as their socially and culturally constructed way of making sense of their congruency with an engineering career path through the lens of varied influences experienced over time. Former women engineer identities were shaped by: (a) parental influence, (b) teacher influence, and (c) role model influence. When retold through a story, each form of influence imparted a positive effect on their decisions to

pursue engineering and for how long they persisted in the workplace before abandoning their career and profession.

Parental Influence. Parents played an essential role in supporting and encouraging the academic and career aspirations of former women engineers. Former women engineers re-told stories about their parents' constant encouragement to achieve more in life and experience a fulfilling and successful career as an engineer. Ashley's dad would tell her, "well, you're really good at math and science... you're really good at physics... maybe engineering would be good for you." Parents had also built on their daughter's natural way of being, through a nurtured upbringing and exposure to socially and culturally constructed contexts, that instilled a drive to excel at learning and life pursuits. Cynthia's parents wanted her to gain "exposure to how other people lived," adding that "everything was focused on following their work ethic and their desire to be continual learners... that was just part of our DNA" Former women engineers brought to their careers an engineering habitus and identity that was positively influenced and shaped by the actions and words of supportive parents who wanted their daughters to have better opportunities and to be successful in life. The parental component of their habitus carried forward to work and life and helped frame how former women engineers responded to the challenges of navigating an incongruent engineering workplace and culture.

Teacher Influence. Former women engineers shared stories about teachers who played an important role in influencing their choice to pursue an engineering career path. They told of teachers who exhibited behaviors that translated to feelings of

encouragement and support to pursue engineering by creating an environment where they felt welcome and wanted to excel at learning. Some of the most meaningful experiences were at college when career aspirations are just forming. Amy told of how her positive experiences with a college civil engineering instructor "solidified me choosing to get a degree in civil engineering." For some, the engineering program structure was more conducive and supportive of academic success. Kristi was drawn to the engineering degree program because it offered "a smaller program with interested professors who were willing to pay attention to her and provide more learning support." The exposure to dedicated and caring teachers situated in a pedagogical environment that was more nurturing and supportive made a positive impact on former women engineers, which contributed to their choice to become an engineer.

Role Model Influence. Former women engineers also shared stories about their experiences with engineers and others in the workforce that positively affected their career aspirations before entering the workforce and working as an engineer. These impacts often originate from family or close acquaintances, leaving a strong and lasting impact on an eventual career choice. Cynthia recounted that her cousin's reasoning for becoming an engineer was "because you're making things, you're fixing things, you're problem-solving," which inspired her because "I always had that, I wonder why and how do you make this different or better, was always in my psyche." The positive effect of role models could also emanate from positive career influences, where others looked similar and provided an achievable vision of what was possible. Kristi told of a work setting where "the director of engineering, the director of education, then the director of

outreach, were all women. I think it was much easier to see; this was something I wanted to do." Former women engineers told stories of being exposed to positive role models who inspired their engineering career aspirations. They also benefitted from exposure to other women in the workplace, especially in leadership positions, to see themselves in a more positive light as a competent and successful engineer who belongs in the profession.

Theme 2—Engineering Fit

Former women engineers recounted that work settings and cultures contained embedded mechanisms and norms that precipitated feelings and beliefs that they did not belong as engineers. Their perceptions of engineering fit or alignment with the professional culture were framed in three subthemes: (a) engineering acumen, (b) clarity of values, and (c) higher purpose.

Engineering Acumen. Former women engineers' professional skills and abilities varied and were accumulated, changed, or refined over time in response to different life and work contexts. Their professional strengths represented the types of "capital" that differentiate engineering from other career paths, and the stories told demonstrated their congruency with the group's identity. Former women engineers shared that school was easy for them because they were exceptionally skilled at math and science-related subjects synonymous with engineering degrees. Amy recounted, "I continued with advanced classes, and mostly science and math related electives." In the workplace, former women engineers' engineering development was fueled by a desire to be good at what they do, whether striving for technical excellence or business efficacy. Marta shared, "I was always learning. Keep trying to continuously learn." While possessing

demonstrated engineering capital helped to feel valued and fit in, former women engineers also experienced how that same capital did not matter when trying to realize their career aspirations. Cynthia reflected, “I felt that the people that were engineers were collaborative and accepting until I got promoted to the first level of leadership.” Through their stories, former women engineers demonstrated that they possessed a strong engineering acumen that included the kind of valuable engineering capital needed to realize career and engineering business outcomes. While their engineering acumen offered career benefits early on, it could not protect against the presence of gendered mechanisms that disadvantaged them as they aspired to grow and develop in their careers.

Clarity of Values. Former women engineers’ stories about considering to leave engineering included accounts of how their perception of the value proposition for an engineering career influenced their entry and persistence in the field. They shared experiences with how they tried to maintain alignment between their value system and the work culture. Former women engineers told of the need to balance their need for meaningful work and professional development with familial priorities. For Kristi, family values mattered, reflecting that, “I really started thinking realistically about having a family. Engineering firms don't give any sort of benefits to women that make it easy to be a mother.” Former women engineers also reflected on the importance of exploring their values alignment with a company before accepting a position. Ashley shared that her best advice “is to take time to truly develop a strong understanding of what you stand for as a person and making sure that that’s in alignment with whatever company you end up going to work for.” Former women engineers’ career fit depended on how well their

value-systems and beliefs brought to the engineering workplace aligned with the professional engineering culture's norms and values. When aligned with the cultural norms, women engineers excelled, but their career aspirations and feelings of fitting in diminished when they perceived an incongruency.

Higher Purpose. Former women engineers' stories about their considerations for leaving the engineering profession included passages that illuminated how they were affected by whether they perceived their contributions at work as altruistic or serving a higher purpose. They told of how their engineering identity included the expectation that their career improved their prospects of bettering humanity by contributing to something more substantial than themselves to improve others' lives. While doing seismic retrofits in small island nations, Kristi reflected how "you feel better going to bed at night when you know that you've kind of helped 300 families build safe homes." Former women engineers recounted that their pursuit of a higher purpose was not limited to engineering endeavors, especially when their daily job tasks did not connect with that need. At work, Marta had raised funds to buy Christmas presents for a local charity that served foster kids, recalling how "we'd have a wrapping party. It was this very joyful time." Former women engineers' engineering habitus and identities were founded in part on the prospect of pursuing a career that would contribute to a better society. They also recounted that when pursuing a higher purpose became elusive in their engineering career settings, disillusionment and thoughts of leaving emerged and increased over time.

Theme 3— Evaluating Career Options

Former woman engineers' thoughts of leaving are manifested in how they perceive themselves persisting in their careers. Their stories about their considerations for leaving the engineering profession included passages that illuminated the recursive progression of thought that fuels feelings of disillusionment about their future as an engineer. Former women engineers' thoughts of leaving were influenced by three factors: (a) reasons to stay, (b) reasons to leave, and (c) career uncertainty.

Reasons to Stay. Former women engineers' stories about leaving engineering included persisting even while disillusioned about their prospects for a fulfilling engineering career. They told of times in their careers when circumstances dictated that they remain in engineering longer. Former women engineers chose to persist in the profession to achieve personal or professional outcomes that maintained economic security. Cynthia told of when her career had stalled, and she was ready to leave, but her husband had quit his job, so she decided to stay "because it was stability for our family." While career longevities varied, women engineers also told how they experienced negative consequences resulting from their decisions to stay longer. Ashley recounted, "I was physically ill from the stress... my mental health was not in a good place, all due to the strains of this job." Despite their intentions to leave, former women engineers sometimes chose to persist in their engineering careers longer due to personal or other considerations such as family needs. Their choices to stay in engineering often brought added hardship from physical and emotional stresses from extended exposure to incongruent work climates.

Reasons to Leave. Former women engineers shared their stories about when their engineering careers became unsustainable, and thoughts of leaving had transitioned to plans to depart. They experienced moments when they believed that staying in their careers was no longer their best option. They told of how the unwavering expectation for putting in long hours at work had taken a toll on their personal life, and when they elevated their concerns or asked for help, their requests were often dismissed. Amy reflected on that time in her career, when she recognized that "I'm just here as a means of production for them and pretty much in that moment, I decided I was done with this job, and also engineering as a career." Former women engineers also shared their frustration with being unsupported in their career growth and development needs, especially the lack of mentoring and coaching, which played a substantive role in their choice to move on from engineering. Kristi recounted, "I was stifled in my career. I have asked for help, support, mentorship as a professional and as a female employee and never received it." Former women engineers had encountered workplace norms that created barriers to realizing success at work and in life and feel valued as a person and engineer. They also told of a work culture that did not support their career needs and aspirations, which precipitated thoughts of leaving.

Career Uncertainty. Former women engineers told of how their engineering career path experiences had diminished their sense of self-efficacy and belongingness in the profession, which increased the uncertainty of whether they could sustain their career. Once in the workforce, career life precipitated thoughts about whether engineering was the right professional choice. For some, feelings of uncertainty grew as they began to

question their abilities as engineers when confronted with feedback about their work performance that was not aligned with their perceived standard for engineering excellence. Ashley recounted how her boss told her to “take more shortcuts; you should know how to do that by now,” which elicited in her thoughts that “this isn’t working for me anymore; I'm obviously not in alignment with this company and its values.” For others, their uncertainty was derived from feelings of isolation from being deprived of the kind of group problem-solving that allowed them to contribute more meaningfully as an engineer. Amy reflected on why the lack of collaborative opportunities had tempered her passion for engineering, recounting, “I started to realize that it was the personal interactions, and what I felt was like true problem solving, that I enjoyed the most.” Former women engineers told stories about how their work experiences precipitated feelings of incongruency with engineering. They also revealed that their uncertainty about the profession and thoughts of leaving accumulated over time to levels that dictated a career change.

Supporting Research Question Themes

The Supporting Research Question focused on the recounted experiences of former women engineers, as told through their narrative stories of final decisions to leave the profession. Six former women engineers recounted their experiences about how certain workplace features contributed to a decision to abandon their chosen career. Examples of the descriptive codes assigned for SQ are shown in Table 7.

Table 7

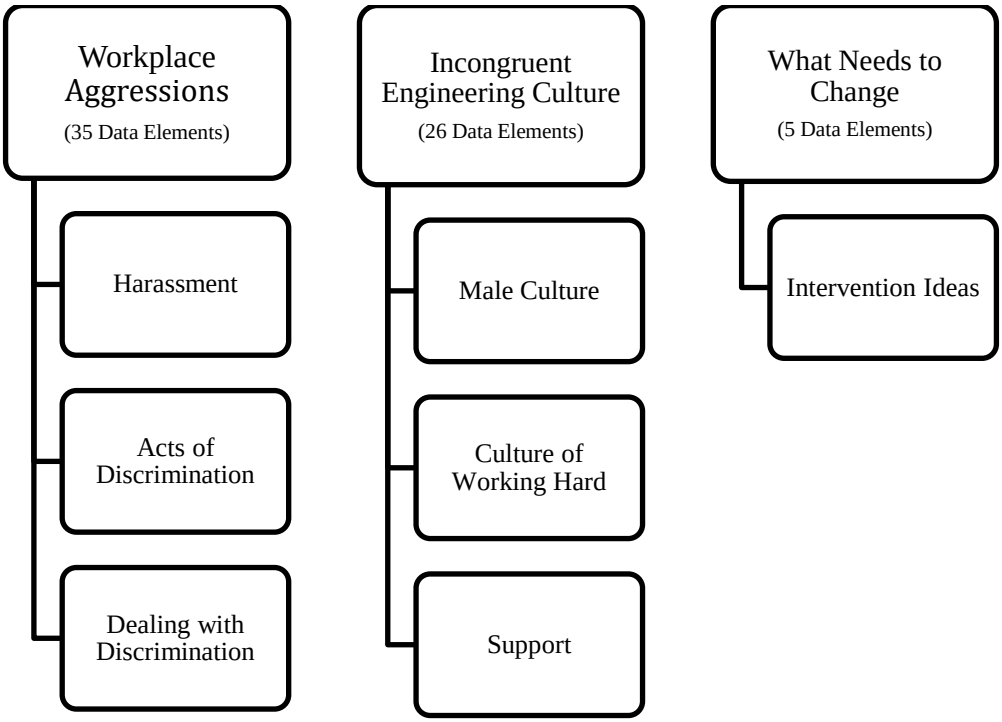
Example Codes with Excerpts for SQ

Initial Codes	Example
All-consuming work	I had given up all of the other things that filled me up in life just to do engineering. I wasn't involved in my community. I wasn't working out. I wasn't coaching or playing soccer. I wasn't doing anything else. I was just doing engineering because that's all I had time for.
Battling bias, sexism, discrimination	The plant manager asked, "Did you bring the engineer with you?" And the whole place is silent because I am the engineer. Like, "Oh, I thought you were from Purchasing." I'm like, "Well, you've just insulted me. And did you want me to continue?"
Combatting a harsh climate	We had these little cubicles, and I was the only woman besides the administrative assistants. As I walk through this department, there were naked women and pornographic pictures under the glass all over these desks, every desk. I was horrified. I've never seen that.
Dashed expectations	I pulled all the metrics to that, and I got the Top Achiever Award, and I got a big raise. But I didn't get a promotion out of it.
Combatting a harsh climate for a woman engineer	So, one day, as he's barraging me with these, F this F that. I said, "You've used that word enough. You used that word as an adjective and an adverb and a descriptive additive and a noun and a past participle; here's a thesaurus. There are so many more colorful words to use. You should try changing it up a little bit."
Instances of harassment	Then once, when I got new glasses, a coworker told me that I looked like a sexy librarian. I was like, "You can't say that. That's not okay. That's harassment." Things like that would happen time after time, disrespectful innuendo.

Through second cycle pattern coding, seven subthemes emerged that underpinned the resulting three themes for SQ. Figure 6 shows how the seven subthemes, comprised of cohered data elements, converged to form cohesive themes that meaningfully addressed SQ, which was: (a) workplace aggressions, (b) incongruent engineering culture, and (c) what needs to change. In the following sections, each theme is supported by presenting rich and thick examples from former women engineers' storied responses for each subtheme.

Figure 6

Convergence of Data Elements in Subthemes That Form Themes for SQ



Theme 1—Workplace Aggressions

Former women engineers experienced aggressions in the workplace that contributed to a decision to leave the profession. They shared meaningful examples about their experiences in an engineering work setting with: (a) harassment, (b) acts of discrimination, and (c) dealing with discrimination.

Harassment. Former women engineers shared stories about how their workplace harassment experiences contributed to leaving their careers. They told of unwanted and inappropriate comments in the workplace directed at them by men. The comments directed at them were often subtle, but their persistence over time hurt their sense of belonging and value as an engineer and person. Former women engineers shared

instances when male peers and superiors' behaviors made them feel demeaned and elicited a response. Ashley told of when "I got new glasses, and a coworker told me that I looked like a sexy librarian. I was like, you can't say that. That's not okay. That's harassment." These behaviors and disrespectful innuendo were common in the workplace and contributed to women engineers' choices to leave. Some could endure the prevalence of harassment in the workplace better than others by building resistance to their effects. Marta reflected, "I was tough... I tried to make my skin thicker, so it didn't bother me, and then if someone crossed the line to me, I was pretty vocal, like, you don't get to treat me that way." Former women engineers recounted various instances of harassment while working in an engineering work culture. While they employed strategies to combat these forms of persistent workplace aggression, former women engineers continued to endure their effects, feeling diminished as an engineer, until ultimately choosing to leave.

Acts of Discrimination. Former women engineers shared stories about being discriminated against at work that played an important role in influencing their choice to leave engineering. They told of being disadvantaged in a work setting because their support needs were incongruent with a set of rigid cultural norms that favored the dominant male workgroup's needs. They also characterized discrimination as a systemic issue for engineering that disadvantaged women by making them feel unheard, unsupported, and unwelcome. Former women engineers shared how subtle types of discrimination often occurred, almost daily, and not just directed at them but to every other female in the workplace. Julie portrayed that "these types of experiences are wearing, and they are harmful." Former women engineers endured a discriminatory

climate where male engineering leaders exhibited the behaviors and norms that amounted to institutional blindness that systematically disadvantaged them. Kristi reflected that for male engineer leaders, discrimination "just seemed to be going over their heads, and they were completely missing the mark on what was missing culturally." In addition to the misogynistic attitudes displayed by male engineers, former women engineers had experienced pay discrimination. Marta told of her disbelief when viewing payroll data and thinking, "wait a second, this is a problem, and now I have this data, and I'm the lowest-paid manager... I was just pissed." Former women engineers recounted stories of experiencing acts of discrimination in the engineering workplace. While the examples of discriminatory practices could be subtle, their enduring nature suggests that discrimination remains a defining feature of engineering cultures. It becomes incompatible with their career aspirations for some women engineers and culminates in deciding to opt-out of the profession.

Dealing With Discrimination. Beyond witnessing and experiencing acts of discrimination, former women engineers also shared stories about how the enduring presence of discrimination in the workplace affected them over time and, for some, precipitated psychological effects that persisted beyond their departure from the engineering career field. They shared work experiences that highlighted the effect discrimination had on their career aspirations and a decision to leave. Pervasive practices of some male engineer leaders formed much of the discriminatory culture of engineering. Cynthia told of "one guy that was one of the worse leaders in history for me, and he was the misogynistic, racist, who reprimanded me at every turn for nothing." Former women

engineers also shared post career reflections that provided meaningful insights about how they responded to the residual effects of their exposure to discrimination in the engineering workplace. For some, the harmful effects were deep-rooted and required professional help to resolve. Ashley recounted how she "felt insignificant; my confidence had withered away... it took a lot of time and self-work, time with therapists and time talking through things with friends, to rebuild myself, to get to a place where I felt like myself again." Former women engineers had to deal with many forms of discrimination in the engineering workplace that ultimately contributed to leaving. Some discriminatory behaviors were perceived as invisible to their male peers, making change more challenging to implement. While career longevities, work contexts, and coping strategies differed, former women engineers were disadvantaged and sometimes harmed by discriminatory practices entrenched in engineering. For some, the experiences were so intense that they endured adverse psychological effects following their career exits.

Theme 2—Incongruent Engineering Culture

Former women engineers told stories about workplace contexts, climates, and cultural norms that did not align with their career expectations and world views. When combined with impacts from other workplace features, these embedded barriers precipitated a choice to exit the profession. Former women engineers reflected on their career experiences with specific examples about how their final decision to leave could be attributed to the presence of incongruent workplace characteristics like: (a) male culture, (b) culture of working hard, and (c) support.

Male Culture. Former women engineers told of their token status's impact on their reasons for leaving their careers. They shared their stories about navigating a hegemonic male culture at work that did not align with their support needs. Often the male-centered work culture made them feel like outsiders, mostly when their life aspirations and values were not aligned with those of the men engineers at work. Amy shared that "the men that I worked with all had very similar, conservative lifestyles, believing "that they never could grasp both a single young person's lifestyle or also just from a female's perspective." Former women engineers also told of how their token status contributed to growing concerns and doubts about whether a long and rewarding engineering career was a viable option. Kristi had decided that she was not willing to "work past what I saw as a real boy's club. I just decided that it wasn't worth it to me to be the person breaking that barrier." While there were many aspects of the male engineering culture that challenged former women engineers' resilience, they sometimes found ways to persist and adapt. Some recounted breaking through cultural barriers to see that they were again subjected to deep-seated male biases toward women engineers. Marta told of when she moved into management, and her male subordinates would openly share their belief that "she's not qualified... it should have been one of us," adding how she "had to earn my stripes again with this group." Former women engineers demonstrated varying degrees of resilience with the hegemonic male engineering culture before leaving their careers. They shared experiences of having to adapt or change as a way to cope with a culture that advantaged men more than women. They also told how

the constant exposure to established male norms at work meant they were unlikely to sustain career aspirations and life goals.

Culture of Working Hard. Former women engineers' stories about deciding to leave engineering included accounts of how the engineering culture demanded a substantial investment of time at work without consideration for accommodating their different personal and professional needs and life goals. They recounted experiences about the high toll they paid for trying to meet the demands of an engineering culture that included a business model that valued time spent at work more than individuals' well-being. Some tried to live up to demanding work environment norms but resisted becoming unbalanced with their life pursuits. When balancing work-life demands became unsustainable, thoughts of leaving transitioned to a decision to leave. Ashley told of how she "had given up all of the other things that filled me up in life, just to do engineering," reflecting that she "was way too mentally and emotionally exhausted to fit anything else in my life." Former women engineers encountered a work culture that often demanded a disproportionate commitment to working long hours over life pursuits as a criterion for success, which can have differentially greater negative consequences on their personal lives than their male peers. Some told how their investment in long work hours benefitted their advancement success but contributed to unwanted life events like divorce. Marta shared, "I worked a lot... probably worked 80 hours a week, every week, every weekend, every holiday, every vacation, I worked." Former women engineers suggested that the engineering culture is perceived to be harsher on women when it comes to career

alignment and persistence because they can place a higher value on maintaining work-life balance than many of their male peers.

Support. Former women engineers described through their stories about career exits that having access to support in the workplace was a crucial factor when choosing to leave engineering. They told stories about leaving, where being supported or not played a role in whether they felt their growth and development needs were congruent with the norms found in an engineering work culture. They often asked for assistance and support, only to be dismissed. Ashley told of how the constant denials for support from her boss meant that "the leaders did not care who you are as a person, care that you have personal commitments... a husband... a family that you want to spend time with." Former women engineers also told how the absence of mentoring support stifled their growth and development and precipitated thoughts of leaving the profession. Julie reflected that "I needed direction and mentorship, and there just wasn't any." In contrast, some former women engineers credited mentoring support as an enabler for their success and ability to stay longer in the profession. Marta had been mentored on how to improve her presentation skills, recalling how others' perceptions of her competence went from none to "yeah, she's really organized...she's got it all going on." Former women engineers shared stories about navigating engineering work settings and how their perceived access to support contributed to leaving engineering. They suggested that having little or no perceived support contributed greatly to abandoning their career while having access to more support mechanisms like mentoring and coaching mitigated some of their turnover intentions by enabling them to stay longer in the profession.

Theme 3— What Needs to Change

Another outcome from the current study was the generation of insights from participants that might inform stakeholders about meaningful strategies and interventions that could help address the loss of valuable women engineers from the workforce. Former women engineers shared ideas about ways to address some features experienced in the engineering workplace that, if changed, could promote better work environments that might retain more women engineers.

Intervention Ideas. Captured in the stories from former women engineers were ideas for making the engineering work culture more congruent with women engineers' needs to create a workplace where they feel welcomed, valued, and want to stay. They shared their perspectives about addressing features in the engineering workplace culture that could promote meaningful change. Some had encountered a work culture that valued more traditional family values, which did not align with their world views and made them feel like they did not belong. Amy wanted those in charge "to just grasp and accept different backgrounds and upbringings and current values." Some had seen the need for engineering stakeholders to create a more inclusive work environment where being viewed through gendered, racial, social, or cultural lenses becomes secondary to being seen and valued as a professional engineer. Cynthia longed to experience a norm where others would view an engineer like herself as; "she's an engineer with credentials; she's smart, she delivers." Former women engineers also told of the need for engineering stakeholders to reimagine the current support paradigm that may be biased towards men's needs to realize a more equitable way of growing and developing all who aspire to be an

engineer. Some told of the need to start with establishing and institutionalizing mentoring and coaching competencies for the profession. Julie reflected that “if I had a mentor in either of those companies, I would have succeeded, or wouldn't have maybe felt so isolated.” Some advocated for engineering stakeholders to adopt a communication support strategy that can address and respond more meaningfully to the various barriers that women engineers face in the workplace. Kristi offered that a good starting point for leaders would be to “start having a weekly thing where we have lunch together and talk.”

Former women engineers shared stories that reflected optimistic messages about how addressing and changing some engineering work culture features could promote better work environments for women engineers. Their retold stories included transformative insights about: (a) changing attitudes about gender and race that persist in the workplace, (b) adding more robust support mechanisms to help women and men to co-exist in a more meaningful way, and (c) messages to those in engineering leadership to reflect more deeply about their role in enabling a more positive and inclusive engineering culture.

Summary

The purpose of this qualitative narrative inquiry study was to explore the experiences of former women engineers in the Northern Tier States region of the United States through their narrative stories of consideration for leaving the profession and their final decision to leave. The phenomenon of interest for this study was the persistent career attritions for women engineers. Three themes emerged for each research question.

Six former women engineers described how their socially constructed way of being and perceived engineering fit had become increasingly incongruent with the structures and mechanisms experienced in the engineering workplace. Three themes emerged for the RQ: (a) sociality, (b) engineering fit, and (c) evaluating career options.

Former women engineers brought to their careers an engineering habitus and identity that was positively influenced by the actions and words of supportive parents, trusted teachers, and inspiring role models who promoted taking an engineering career path. Once in the workplace, former women engineers demonstrated that they also possessed a strong engineering acumen, including some undervalued but crucial non-technical competencies needed to realize desired engineering business outcomes. Opposing their career strengths were challenges with their perceived engineering fit and how incongruent their values and world views had become with the persistent norms and values they experienced in engineering work settings. As careers progressed, they became disillusioned, and thoughts of leaving increased as their resilience diminished and was replaced by the growing uncertainty about whether their chosen field was sustainable for their professional and life goals and aspirations.

Former women engineers described how their experiences with an incongruent engineering work culture precipitated a choice to abandon their profession. Three themes emerged for the SQ: (a) workplace aggressions, (b) incongruent engineering culture, and (c) what needs to change.

Former women engineers experienced, directly and indirectly, instances of microaggressions in the workplace, including harassment and discrimination, which left

them feeling diminished and disadvantaged as an engineer, and unwelcome in the workplace. These career stressors affected former women engineers' resilience differently as they navigated various work settings and contexts, but their final decisions to abandon their careers shared some common messages regarding the engineering culture. They struggled with a hegemonic male work culture that favored men more than women, demanding and inflexible work environments that often lacked the kind of support mechanisms they needed to excel, and work demands that precipitated an imbalance in their work-life priorities. Former women engineers also suggested ways to improve the engineering work culture. They offered strategies that included changing attitudes about gender and race, adding more meaningful support mechanisms, and facilitating a dialogue with engineering leadership to enable a more positive and inclusive engineering culture.

Chapter 4 covered the study results, the research settings, and details about recruiting participants, data collection, data analysis, and evidence of trustworthiness. Chapter 5 focuses on an interpretation of the findings and where they converge with, diverge from, or extend the knowledge within the body of the literature. The remainder of Chapter 5 includes a discussion of the study's limitations, recommendations for further research, implications of the current study, and conclusions.

Chapter 5: Discussion, Conclusions, and Recommendations

The purpose of this qualitative narrative inquiry study was to explore the experiences of former women engineers in the Northern Tier States region of the United States through their narrative stories of consideration for leaving the profession and their final decision to leave. I chose the qualitative narrative inquiry approach because it was best suited to cocreate meaning from more nuanced interpretations of complete stories or passages about former women engineers' career exit experiences told over time and in varying contexts (see Riessman, 2003; Taylor et al., 2016). The current study focused on uncovering new meanings from former women engineers' departure stories that could generate new knowledge that engineering stakeholders require to promote and establish a workplace culture where women feel welcomed, valued, and want to stay.

There were two overarching findings from this study, each addressing one of the research questions. For the RQ, former women engineers attributed their thoughts about leaving their careers to an increasing awareness that their socially constructed engineering habitus and identity and perceived engineering fit had become misaligned with organizational structures and mechanisms that disadvantaged them in the engineering workplace. For the SQ, former women engineers attributed their reasoning for a final decision to abandon their profession to a realization that without the prospect of more support and changes in the workplace, they no longer possessed the resilience necessary to persist in an incongruent engineering culture. This chapter includes the interpretation of findings, limitations of the study, recommendations for further research, implications of the study, and conclusions.

Interpretation of Findings

A review of the literature revealed two key points regarding the attrition phenomenon for women in engineering: First, the engineering profession had the highest turnover rate of women when compared to all STEM career fields (Hunt, 2016; Kahn & Ginther, 2015), and second, that most research had focused on investigating academic or education attrition and not career departures (Cech & Blair-Loy, 2019). Still, the relevant scholarship on career exits for women engineers comprised a meaningful body of research that represented many methodological approaches and great novelty in contributing to a growing body of knowledge. While there have been major advances in attaching meaning to a woman's decision to abandon their chosen profession, there was still much to learn.

This study's results were generated by thematically analyzing 93 pages of narrative transcript data collected from semistructured interviews with six former women engineers. This section focuses on interpreting the final results, including six themes that emerged to answer the research questions. Three themes were identified for both the RQ and SQ.

RQ

The RQ focused on exploring the recounted experiences of former women engineers as told through their narrative stories of consideration for leaving the profession. Six former women engineers described how their socially constructed habitus and engineering identity and perceived engineering fit had become increasingly incongruent with the structures and mechanisms experienced in the engineering

workplace. Three supporting themes emerged from the data: (a) sociality, (b) engineering fit, and (c) evaluating career options.

Sociality

Former women engineers brought to their careers an engineering habitus and identity that was positively influenced in three ways: (a) by the actions and words of supportive parents, who wanted their daughters to have better opportunities and to be successful in life; (b) by teachers, who promoted taking a STEM career path; and (c) role models, who inspired career choices. These findings corroborated other research findings in the literature. Leedy et al. (2003) determined that increased levels of girls' STEM self-concepts were directly related to parents' belief regarding their daughters' perceived abilities in math and science curriculums. Similar to parental influences, a child's level of STEM self-concept can be positively affected by teachers' pedagogical efficacy in math and science courses (Leedy et al., 2003). Findings from this study also extended the understanding of these parental and teacher influences on career choices by suggesting that their presence in a woman engineer's habitus and engineering identity continued to influence their feelings of belongingness and resilience at work. Researchers found that women engineers with access to role models were more likely to persist in their careers than those who did not have someone supporting their professional aspirations (Fernando et al., 2018; Walsh et al., 2016). The presence of socialization mechanisms that affect career decisions supported other research findings. A woman engineer's turnover intentions were determined to be influenced by their socially and culturally influenced way of being, such that gendered self-conceptions about career choices could be

incongruent with being an engineer (Buse et al., 2013; Cech, 2015; Fouad et al., 2016; Maltese & Cooper, 2017; Singh et al., 2013; Singh et al., 2018). Former women engineers' sociality was not just a factor in choosing their career path, it also extended to the workplace and continued to have an impact on their considerations for staying or leaving.

Engineering Fit

Once in the workplace, former women engineers demonstrated that they possessed a strong engineering acumen or professional capital that included valuable nontechnical competencies needed to realize desired engineering business outcomes in addition to their technical proficiency. The presence of these valuable career assets that former women engineers had brought to the workplace formed a nexus between the literature and the conceptual framework of this study. For management studies, Bourdieu's (1972/1977) concepts were characterized such that habitus referred to an individual's ability to fit into conventions, capital represented the often intangible benefits of belonging to a particular group, and field was associated with a person learning the "rules of the game" for their profession (Sieweke, 2014). Former women engineers possessed the ability to adhere to established protocols or conventions for the engineering profession, including applying knowledge in mathematics, science, and technology often carried out within a business and management context (Prusty & Dwivedy, 2016).

Former women engineers' fit also depended on the degree of alignment of their values and beliefs brought to the engineering workplace with the professional

engineering culture's norms and values. This values-based aspect of fit with engineering was related to a woman's persistence in the field. Career exits have been linked to: (a) an incongruence between their needs and organizational values (Cech, 2015; Fouad et al., 2017), (b) a misalignment between a woman's perception of success and that which others, guided by cultural norms, value (Maltese & Cooper, 2017), and (c) the differentially higher stresses on women from conflicting life demands (Singh et al., 2018).

Findings from the current study suggest that this cultural dissonance could result from hidden conventions and unwritten rules of the game that advantage their male peers and create an incongruency between career fit and belongingness that can precipitate a decision to leave. For instance, former women engineers recounted how they became disillusioned over time, and thoughts of leaving increased, as their engineering fit was affected by workplace norms that often conflicted with their need to connect their careers with a higher purpose. This finding supports prior studies that found that women engineers' turnover intentions had been linked in part to whether they had perceived their work as meaningful (Cardador & Hill, 2018; Fouad et al., 2017) or contributed to making the world a better place (Bossart & Bharti, 2017; Cech, 2015).

Evaluating Career Options

Former women engineers' levels of career resilience varied and were influenced by: (a) familial considerations, (b) the need for advancing their professional growth and development, (c) having access to career support, and (d) feeling incongruent with the engineering profession that over time increased their levels of uncertainty about persisting in their careers. These results support prior findings that women engineers who perceive diminished self-efficacy and expectations for positive career outcomes are more likely to abandon their careers (Fouad et al., 2016; Maltese & Cooper, 2017; Singh et al., 2013). Fouad et al. (2017) added that when women engineers' career needs are not met at work, they are more likely to exit their profession.

Former women engineers also told stories about how their work experiences precipitated feelings of incongruency with the engineering career field. Over time, they accumulated to a high enough level of uncertainty that they contemplated a career change. A woman engineer's turnover intentions and career exits have been linked to unsupportive, noninclusive male-dominated engineering cultures (Beddoes, 2018; Fouad et al., 2017; Singh et al., 2013; Singh et al., 2018; van Veelen et al., 2019). Although former women engineers sometimes felt incongruent with the engineering culture related to familial considerations, the magnitude of its effect on turnover intentions varied. These findings are consistent with Glass et al. (2013) and Hunt (2016), who determined that family-related constraints were not a statistically significant factor for why women engineers exited the profession. Singh et al. (2018) added that while there was no significant relationship between interferences from work on a woman engineer's family-

based career choices and her work commitment or intentions of leaving, family interferences with work were correlated with lower commitment and increased thoughts of leaving. Combined with the results from the current study, the evidence suggests that there remain features in the engineering workplace culture that do not support some women engineers' familial needs and aspirations.

SQ

The SQ focused on former women engineers' consideration for a final decision to leave their engineering careers. Six former women engineers described how their experiences with an incongruent engineering work culture precipitated a choice to abandon their profession. Three themes emerged from a thematic analysis of the data: (a) workplace aggressions, (b) incongruent engineering culture, and (c) what needs to change.

Workplace Aggressions

Former women engineers experienced, both directly and indirectly, instances of harassment while working in an engineering culture, which left them feeling diminished as an engineer and unwelcome in the workplace. The prevalence of harassment toward women in male-dominated workplaces like engineering is well documented in the research and can take many forms. Workplace harassment can include doubting a woman's legitimacy and competence, diminished access to promotion opportunities, hostilities directed at their demonstrated proficiency at performing in traditionally male careers, and other gender-induced obstacles meant to denigrate women (Dresden et al., 2018; Taylor, 2016). Harassment in the workplace can also precipitate deciding to leave

engineering (Fouad et al., 2016). Women in the engineering workplace have often reported negative experiences with microaggressions, such as harassment, gender bias, discrimination, stereotyping (Fouad et al., 2016; Ismail et al., 2017; Reilly et al., 2016), and stigmatization (Reilly et al., 2019). What was less clear was how to differentiate between microaggressions' influence on women specific to the engineering career field and those from society in general (Hunt, 2016; Leaper & Starr, 2018). The findings in the current study did not offer any new insights in this regard. However, results included specific examples from former women engineers' stories that provide more depth and meaning regarding what underpins microaggressions in an engineering work setting.

Former women engineers also experienced discrimination at work that, while sometimes subtle, disadvantaged them in realizing career aspirations and contributed to their decision to leave. This finding is consistent with other research that determined women engineers who reported workplace discrimination or differential treatment based on being female were more likely to leave the profession (Fouad et al., 2017). As minority or token members of their workgroup, women engineers have more thoughts of leaving (Griffith & Dasgupta, 2018), are more likely to abandon their careers, and exhibit a higher stress response from negative work contexts and exposure to discrimination (Taylor, 2016). Findings from the current study complemented Taylor's (2016) work by extending the understanding of work stressors for women engineers. Former women engineers reported how discrimination served as a workplace stressor that worsened over time and produced adverse psychological effects that remained after leaving. Together,

these results suggest that discriminatory practices in engineering work settings may have a greater and more lasting impact than initially thought.

Incongruent Engineering Culture

Former women engineers demonstrated varying degrees of resilience with the engineering work culture. They recounted challenges with an incongruent work culture, which included demanding and inflexible work environments that often lacked support mechanisms women needed to be successful. Work demands also introduced an imbalance in work-life priorities, which agreed with prior research. Former women engineers have reported that underlying their decision to leave their jobs and the engineering career field were: (a) inflexible and demanding work environments (Fouad et al., 2017) and (b) the lack of specific support mechanisms, like care and peer support, performance feedback, growth and advancement opportunities, access to role models (Fernando et al., 2018), and mentoring (Hunt, 2016). Findings from the current study further support prior research that turnover intentions for women engineers have been linked to their self-efficacy beliefs and outcome expectations (Singh et al., 2013) and their perceived lack of organizational fit regarding working conditions, safety, fairness, and having meaningful work (Fouad et al., 2017). Former women engineers also reported how their resilience and fit diminished as they tried to deal with gendered norms embedded in the professional culture.

Former women engineers in the current study shared how they had struggled to adapt or change to a work culture that favored men more than women, which was a well-established concept in the literature. Women in male-dominated occupations like

engineering had reported experiencing stressors that contributed to workplace sex segregation (Kanter, 1977), that when perceived as commonplace, reduced their satisfaction at work (Griffith & Dasgupta, 2018), and increased their thoughts of leaving their careers (Taylor, 2016). The effects of the hegemonic male culture of engineering surfaced in many workplace stories retold by former women engineers and contributed to their considerations for abandoning engineering as a career. Former women engineers in the current study recounted how their socially constructed way of being or engineer identity often collided with academic and work climates that disadvantaged them more than their male peers. The current study's findings complemented and extended those of other scholars who argued career socialization for women engineers introduced thoughts of leaving, which could begin early through the reproduction of sex segregation embedded in engineering academic settings, often mimicking the professional engineering culture (see Seron et al., 2016; Seron et al., 2018).

What Needs to Change

A secondary outcome of the current study was to determine the narrative inquiry research paradigm's efficacy to generate new knowledge about the career attrition phenomenon. Former women engineers offered constructive thoughts for promoting better work environments for both women and men in engineering. Their ideas included: (a) changing attitudes about gender and race that persist in the workplace; (b) adding more robust support mechanisms to help women and men coexist in a more meaningful way; and (c) starting a dialogue with engineering leadership to consider more deeply, their roles in enabling a more positive and inclusive engineering culture. These results

serve as a summary of expert feedback regarding meaningful strategies and interventions that might address the continued loss of valuable women engineers from the workforce. Buzzanell et al. (2015) argued that the narrative way of finding meaning was well suited to uncover the kind of insights about work contexts that could inform the development of policies and interventions that might reduce women engineers' attrition rates. Without this type of new knowledge, the engineering profession will be ill-equipped to intervene in ways that will attract and retain the female talent necessary for firms to sustain competitiveness in a global marketplace.

Limitations of the Study

The current study had several limitations. While reasonable precautions were taken to minimize its effects during data collection and analysis, researching during a global pandemic could have introduced temporal and contextual factors that could limit the extent to which study results can be compared to other research findings produced during non-pandemic settings. Certain psychological elements might have been introduced through the study's nature that influenced the meaning-making process inherent in narrative inquiries.

An additional weakness emanated from the study's methodological tradition. The qualitative narrative inquiry design introduced limitations regarding researcher and participant biases due to the close relational aspects of collecting data and cocreating meaning. Participant biases may have been captured in the data through the telling, retelling, and re-living mechanisms inherent in the storytelling process for how individuals make sense of their lived experiences. Participants could have also provided

responses that were not entirely transparent, accurate, or complete to advance an agenda or obscure information that was too difficult to reveal. To this last point, while there is more risk when interpreting survey questionnaires and large archival data, there remains some potential for common method bias to affect this study's results from self-reported data. In addition to distorting and withholding details in their responses, participants may also introduce social desirability bias that could exaggerate their recounted adversity with the engineering work culture.

The study was also limited in its transferability, as only women engineers who have departed the engineering profession within the last 4 years were sought. Participant recruiting efforts were also confined to one region of the United States, with unknown applicability to other states or regions. Additionally, the small sample size for this study and the participant sample's final demographic profile limited the broader range of relevance of study findings to other populations of women in other engineering careers or work settings.

Recommendations

The current study focused on former women engineers' storied experiences to uncover more nuanced meanings about their considerations for leaving and a final decision to leave the profession. In addition to its identified limitations, this research's findings contributed new insights and knowledge about the career attrition phenomenon for women engineers that suggest the need for further inquiry and action.

Future Research

In response to this qualitative narrative inquiry design's limited focus, future studies should replicate this research tradition or introduce new paradigms for exploring and investigating other geographies, workplace contexts, engineering subdisciplines, and underrepresented groups in engineering. Additional research efforts could further extend the understanding of engineering work cultures' impacts on the profession's future viability.

The current study results support prior research findings that women engineers who experience workplace features and mechanisms that disadvantage them are more likely to abandon their careers. This finding suggests that it may be prudent to transition future research focus to those concentrating on meaningful interventions and change. Because the career attrition phenomenon is, in part, a social problem, as evidenced by identified inequities in the engineering culture that disadvantage women, some relevant, actionable research typologies may warrant consideration.

A qualitative Delphi approach could recruit a group of experts to evaluate the desirability and feasibility of solutions to a forward-looking grand strategy to retain more women in the engineering career field. An ethnographic futures research paradigm could explore a diverse mix of engineering leaders' perceptions to examine different scenarios' efficacy, potentially facing the professional engineering culture to realize meaningful change. Other action research approaches could be employed to offer engineering practitioners and academe a playbook to implement promising interventions and solutions expediently. While there may be sacrifices in methodological rigor, participatory action

research could bring together women engineers experiencing adversities with those leaders accountable for reducing or eliminating them to establish a roadmap for solving specific problems in organizational and professional work contexts.

The current study's research findings also suggested the need to employ other theoretical and conceptual frameworks to examine and explore women engineers' experiences with engineering workplace cultures. There is a need for more research that explores women engineers' work experiences through the lens of a resilience and coping conceptual framework. Study results also supported the need to move away from conceptual frameworks that focus on fixing women engineers and instead adopt those that facilitate understanding through an organizational and cultural lens, such as ethnographic approaches exploring individual experiences to uncover sometimes hidden institutionalized mechanisms.

Future Practice

Findings from the current study revealed three stakeholder groups that could benefit from this study. The following recommendations for future practice can be used by parents, higher education professionals, and engineering leaders in responding to the persistent attrition phenomenon for women engineers.

The Role of Parents

This study's results captured insights about the vital role that parents play in a child's engineering career choice and resilience. Former women engineers reflected on specific memories of how their parents, either through role modeling, direct engagement, or through words or behaviors, had encouraged and reinforced a strong belief in

themselves to succeed in engineering and life. Former women engineers also told how meaningful their parents' influence was when working as engineers to gain insights and advice about career and life aspirations and challenges. Women who pursue STEM and specifically engineering interests and careers need robust support systems, including caring family members who can help mitigate the impacts of barriers faced in a male-dominated career pipeline. Parents are encouraged to continue serving as counselors, coaches, and mentors to support their daughters when navigating and balancing school, work, and life pursuits.

Pedagogical Considerations

In addition to parents playing a pivotal role in influencing former women engineers' career choices, higher education professionals need to create learning environments that prepare student engineers to enter, cocreate, and sustain workplace climates that mitigate gendered norms. Former women engineers told of challenges they faced while attaining their degrees that carried forward to the workplace. Educators should assume a pedagogical stance that supplements technical learning outcomes with those that expose students to: (a) social and cultural sensitivity and awareness; (b) supportive and inclusive workplace norms and behaviors; and (c) applied experiential learning opportunities that better prepare women and men to excel together to cocreate and deliver technical solutions that better the human condition.

Leader-Practitioners

Those responsible for engineering workplaces should view this study's results as confirming evidence that professional engineering workplace cultures still contain

features that advantage men more than women. Research findings from the current study suggest that the accountability for institutionalizing change lies predominately with the engineering profession's dominant male-leadership cohort, who should address any cultural workplace norms that disadvantage any group. Leader-practitioners can also benefit from the study findings by leveraging a deeper understanding of women engineers' career departure experiences as a means of exploring ways to improve organizational efficacy.

The current study results also exposed a nexus between engineering leaders, subordinate women engineers, and their workgroup's performance that can translate into discreet training and development opportunities that can promote the kind of change management planning that can realize positive organizational outcomes. Finally, research results uncovered a crucial shortcoming in how engineering organizations implement and execute mentoring programs. Former women engineers shared mentoring experiences, ranging from being absent in the workplace to being formalized and well documented but ineffective in practice. Engineering leader-practitioners should provide structured mentoring/coaching programs for all employees. Workplace mentors are a necessity for all but especially vital for women engineers who struggle to adapt to engineering work settings, characterized by climates that favor men more than women and have demanding and inflexible work environments that precipitate imbalances in women's work-life priorities.

Implications

The specific management problem addressed by the current study was that more women are exiting the engineering profession than are entering (Fouad et al., 2017), resulting in a net drain on female talent that has sustained lost business value from talent discontinuity and unrealized business revenues (SWE Blog, 2016). With women making up just 18% of the engineering workforce and 15% of the leadership ranks (Predescu & Chen, 2017), their attrition incurs unplanned firm costs from untapped technological advances (Holtzblatt & Marsden, 2018). While there have been meaningful advancements in understanding why women may exit their careers (Cardador & Hill, 2018), there is little published research on the workplace culture of engineering and its effect on a woman's decision to abandon their career (Meiksins et al., 2018). A review of the literature also identified the need for further inquiries that can produce a deeper and more holistic understanding of a woman engineer's career experiences and her decision to exit the profession (Fouad et al., 2017). Findings from this narrative inquiry study helped narrow these gaps by making meaningful contributions to scholars and practitioners in three areas: (a) methodological implications, (b) implications to practice, and (c) social change implications at the individual and organizational levels.

Methodological Implications

The narrative inquiry design applied for this study enabled an exploration of participants' storied lives as a continuum of interrelated experiences, told in a relational context, and as the result of social influences in their environments (Clandinin, 2016). The retold stories of former women engineers exposed the complexities and often hidden

meanings in career exit experiences obscured by other research traditions. While still valuable, an essential part of the body of evidence about the career attrition phenomenon for women engineers was based on quantitative methods that are less suited for generating a deep understanding of a phenomenon (Babbie, 2016). The results of the current qualitative narrative inquiry study added to the body of knowledge about the career attrition phenomenon by providing an in-depth understanding of lived exit experiences and exposing the feelings and perceptions of a specific group about engineering career contexts. The findings from detailed narratives of former women engineers confirmed the existence of a myriad of career barriers that await women engineers entering the workplace and, over time, could precipitate a decision to abandon their profession.

The conceptual framework, comprised of the concepts of habitus, capital, and field from Bourdieu's (1972/1977) *Outline of a Theory of Practice*, complemented the use of a narrative inquiry design. Habitus, capital, and field formed an integrated way to extend the ability to generate meaning from the storied lives of former women engineers, viewed as a continuum of interrelated experiences, told in a relational context, and as the result of social influences in their life and work environments (Clandinin, 2016). Former women engineers recounted their experiences with an incongruent engineering work culture that aligned with the concept of a field where a woman's habitus and capital combined to generate meaning about their thoughts of leaving and a final decision to exit the profession.

Their engineering habitus, or how they internalized everyday work life complexities through time and in different settings (Bourdieu & Wacquant, 1992), provided valuable insights about how their interactions with specific features of the professional culture manifested itself in their actions. Former women engineers described having to deal with workplace aggressions that conflicted with their sociality. Over time, they diminished their perception of their engineering identity and fit, to a point where persisting longer in their careers became unsustainable.

The concept of capital complemented habitus to understand women engineers' practices in response to a male-dominated profession where they may experience differential access to, or accumulation of, certain forms of capital. Former women engineers felt devalued by an incongruent engineering culture that contained attitudes, norms, and support structures that favored men more than women. Former women engineers also recounted that while they possessed and demonstrated non-technical strengths that benefitted the business, that skillset was not valued or rewarded as highly as technical competencies. Viewing former women engineers' career exit experiences through an integrated lens of habitus, capital, and field enabled a deeper and more complete understanding of the temporal complexities of navigating a culture that disadvantages them, makes them feel unwanted, and drives them away.

Implications for Practice

The findings from this narrative inquiry study highlighted some practical implications for researchers, educators, and practitioner-leaders. For researchers, while there are still benefits for understanding further the career attrition phenomenon for

women engineers, the results from this study suggest that refocusing an inquiry's purpose may be in order. Future research should transition away from objectives aligned with understanding women engineers' experiences with engineering's hegemonic male work culture. Instead, they should focus on exploring gender equity through the lens of male engineers' plurality in the workplace.

Former women engineers' retold stories of how they perceived that many workplace aggressions and other incongruent features of the work culture seemed unrecognized as harmful by their male peers. This lack of conciseness by the dominant male group about their collective effect on women engineers may explain why meaningful change has been elusive, despite a substantial body of knowledge that explains why women leave and how retaining them would benefit the profession. Exploring the over-advantaging of men in engineering might be what the profession needs to enlighten those in positions of power and influence to take accountability for institutionalizing change that cocreates a more equitable career path and work environment (Anicha et al., 2020).

Academic organizations can also benefit from the results of this study. Former women engineers' retold stories of how there were no single reasons for why they left their careers, but rather an accumulation over time of persistent microaggressions and an incongruent work culture that eventually overtook their resilience. Armed with this knowledge, college administrators, career counselors, and faculty could promote, design, and offer programs that raise awareness and help to build coping strategies for students, especially women, who may encounter incongruent work contexts and climates (Wilkins-

Yel et al., 2020). Educators can further promote engineering career resilience by ensuring program curriculums do not contain gendered learning outcomes that disadvantage women.

Practitioner-leaders in the engineering profession can also benefit from this study's results. Engineers responsible for others should leverage these research findings to develop or acquire through benchmarking, new policies, procedures, and best practices that can reduce or eliminate workplace barriers that disadvantage women engineers and contribute to their continued career attrition. Former women engineers shared ideas about ways to address some features they experienced in the engineering workplace that, if changed, could promote better work environments for both women and men in engineering. Their retold stories included transformative messages about (a) changing attitudes about gender and race that persist in the workplace, (b) adding more robust support mechanisms to help women and men to coexist in a more meaningful way, and (c) messages to those in engineering leadership to reflect more deeply about their role in enabling a more positive and inclusive engineering culture. Practitioner-leaders should adopt a stance that acknowledges the likely presence of gendered norms and behaviors in the workplace as a way to begin a dialogue about how men might unknowingly benefit from sexism, including engagement sessions that include specific data and examples (Anicha et al., 2020). The next step should consist of a rigorous review of all organizational norms, artifacts, policies, and procedures to help uncover and eliminate any institutional mechanisms that might disadvantage any one group over another. Pursuing these change strategies that increase gender equity, foster supportive and

inclusive work environments, and unlock employees' full potential could create a more egalitarian culture where both women and men are supported, can excel, and want to stay.

Social Change Implications

At the organizational level, former women engineers' retold stories of engineering workplace cultures that contained norms, mechanisms, and features that disadvantaged them, made them feel unwanted. In some cases, it caused long-term emotional stress. Because study results were supported by rich, thick descriptions of specific engineering workplace experiences, practitioners, especially those in leadership roles, can pursue interventions that target known barriers for women. Through meaningful changes in policies, procedures, and embedded behaviors that intentionally or unintentionally produce thoughts of leaving and a final choice to leave for women engineers, engineering leaders can begin to realize a work climate where all employees can collaborate, excel, and be valued. In doing so, more women will want to stay, which could help improve business performance outcomes by increasing productivity and innovation (Roh & Kim, 2016). Also, having more women in the engineering workplace could increase the potential for developing more innovative and creative ways to address some of the most vexing problems facing society and the planet (Duran & Lopez, 2015).

On an individual level, contributions from this study about how women perceive their experiences in the broader engineering culture could increase women's awareness about entering a gendered engineering career field and improve the professional lives of women already in the engineering workforce. As more women persist in the engineering

career field, the higher the economic benefit they might realize from a high-paying profession, which could also contribute to more sustainable and healthier communities.

Conclusions

The unabated attrition of women from high-paying engineering careers, which included a rigorous and academically demanding journey, hinders the profession and its stakeholders from realizing their full potential to solve the most vexing problems facing humanity. In addition to unsustainable attrition rates for women engineers, the loss of diversity in the workplace further challenges the male-dominated engineering profession to deliver solutions that effectively serve the needs of women who constitute half of the world's population.

The purpose of this qualitative narrative inquiry study was to explore the experiences of six former women engineers in the Northern Tier States region of the United States through their narrative stories of consideration for leaving the profession and their final decision to leave. This study addressed gaps in the literature by revealing the more profound and subtle meanings found in former women engineers' stories that offered new insights about the persistent career attrition phenomenon. Consistent with prior research, this inquiry revealed that former women engineers attributed their thoughts of leaving to increasing awareness and perception that their engineering fit was misaligned with the embedded structures and mechanisms of an engineering workplace that favored men more than women. Former women engineers also recounted how their final decisions to abandon their profession resulted from realizing that they no longer possessed the resilience necessary to persist in an unchanging and incongruent

engineering work culture. While resilience levels varied, former women engineers shared common themes about increasing a women's career persistence. They advocated for improving attitudes about gender and race, adding more support to meeting a woman's needs, and instilling in engineering leaders a sense of urgency to create a more positive and inclusive professional culture. The results from the current study, combined with the body of published knowledge about the career attrition phenomenon for women engineers, make a compelling case for shifting the focus away from problem identification to the type of inspired, problem-solving acumen that has been a hallmark of the engineering profession.

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Appendix A: Interview Guide

Participant: _____ Date: _____

Interviewer: _____ Start time: _____

End time: _____

Special Notes: _____

_____

Interview Process:

Introduction:

1. Greet each participant in the virtual interview setting –

   Hi _____*,*

   It's a pleasure to meet with you today, albeit virtually.... How are you doing today?... Let me express my sincere gratitude for you agreeing to be interviewed as part of my research.... How is the connection at your end, can you hear and see me ok?

2. Establish a relaxed environment and conversational style leading up to the formal interview phase –

   I know your time is valuable, so to get us started, there are a few items I wanted to cover with you about my study. First, I would like to review again with you the key points of the consent form you previously received, to be sure there are no questions or concerns. As you may recall, I will be recording and transcribing our interview today. Also, any reports from this study will not include any way of

identifying you; for instance, I will be using a fictious name, or pseudonym for yourself. Details that might identify participants, such as your, will also be omitted. I will not use your personal information for any purpose outside of this research project and all demographic information you provided will only be reported as part of the research group and will not be attributable back to you or your interview responses. All of this data collected today will be kept secure by password protection for all storage locations that include a laptop, flash drive, and OneDrive. Only myself and two members of the study's supervising committee will have access to the data. Data will be kept for at least five (5) years, as required by Walden University.

So before moving on, do you have any questions about the consent form?... Great, before getting to the questions, I wanted to recap the purpose of my research that you may recall from the study announcement and consent form. My interest is in exploring the stories from former women engineers about their considerations to leave the engineering profession and their final choice to leave. Results from this study could help address gaps in our understanding of women's career aspirations by revealing the more profound and subtle meanings that could lead to positive changes in the engineering workplace. Another expected benefit is to gain new knowledge about the effectiveness of this research methodology, called narrative inquiry, as a way to explore other aspects of the engineering workplace and profession.

3. Begin the formal interview phase:

So, if you are ready, I will start the recording and begin:

IQ1 – Tell me a little something about yourself and your background?

P1 – Why did you choose to be an engineer?

P2 – Tell me more about how your family influenced your career choice?

P2 - How did your career progress over time?

IQ2 – Tell me about the earliest memory you have about leaving engineering? (*considering leaving*)

P1 – How did your thoughts about leaving engineering change over time?

P2 – Give me an example?

P3 - Tell me more about...?

P4 - Describe any specific aspects of the work setting or climate that influenced your decision to leave engineering? (*perceived fairness, fit, and support at work, and working in a male-dominated workplace*)

P5 - Tell me about your experiences with juggling your personal life with your work life?

P6 – Tell me how you were supported or mentored in your career?

IQ3 – Tell me about when you chose to leave the engineering field, what were your thoughts and feelings? (*decision to leave*).

P1 – What could you or others have done differently that may have enabled you to stay?

P2 – Reflecting on your decision, what advice would you offer other women thinking of entering the field?

IQ4 - What else would you like to share with me about your experience of leaving engineering, that I may not have asked?

P1 – Tell me more about...?

4. Concluding the Interview:

Well, _____, that was the last formal question. Do you have any questions or comments about the interview before I go over the next steps?... Ok then, the plan going forward is for me to have the interview recording transcribed and placed in a Microsoft Word document so that I can conduct an initial review to ensure its readability and accuracy. Next, I will email a copy to you, asking that you review its content over the following week, noting anything you would like to change or edit to be able to state that the transcript, as written, is an accurate portrayal of your responses. If needed, we can also have a follow-up phone call or Zoom meeting to capture your comments and revisions, as well as asking about any new insights you may have regarding your interview experience and the stories you shared with me. Once you are satisfied with the quality of the transcript, I will proceed with analyzing and interpreting what I heard, compiling any findings and conclusions in a draft research text. At that point I would like to share what I have learned with you and get your feedback. Again, this can be done over the

phone or through another Zoom meeting. At that point, your work is done and it is up to me to finish the research report or dissertation.

If interested, I can provide you a one-page summary of the final results of the study once approved and released by Walden University.

Are there any last questions before we end today? Again, please accept my sincere thanks for being part of my research and sharing your stories and experiences. I hope your contributions to my research will help to bring about the kind of new knowledge that can enable meaningful changes in the future. Again, thank you and I will be in touch. Bye.

Appendix B: Demographic Information Questionnaire

DEMOGRAPHIC INFORMATION	
Age	Age in Years: _____ ☐I choose not to identify
Race/Ethnicity (list all that apply)	☐ Race/Ethnicity: **Hispanic or Latino** A person of Cuban, Mexican, Puerto Rican, South or Central American, or other Spanish culture or origin, regardless of race. ☐ **American Indian or Alaska Native** A person having origins in any of the original peoples of North and South America (including Central America) who maintains cultural identification through tribal affiliation or community attachment. ☐ **Asian** A person having origins in any of the original peoples of the Far East, Southeast Asia, or the Indian Subcontinent, including, for example, Cambodia, China, India, Japan, Korea, Malaysia, Pakistan, the Philippine Islands, Thailand, and Vietnam. ☐ **Black or African American** A person having origins in any of the Black racial groups of Africa. ☐ **Native Hawaiian or Other Pacific Islander** A person having origins in any of the original peoples of Hawaii, Guam, Samoa, or other Pacific Islands. ☐ **White** A person having origins in any of the original peoples of Europe, the Middle East, or North Africa. ☐I choose not to identify
Marital Status	☐Married ☐Single ☐I choose not to identify
Current Occupation(s)/Work Status	Occupation(s): _____ Work Status: ☐Employed Full Time ☐Employed Part-Time ☐Not Employed ☐I choose not to identify

Appendix C: Interview Question Alignement Matrix

Research Questions	Interview Questions	Alignment with Framework and Concepts in the Literature	Probing Questions
N/A	IQ1 - Tell me a little something about yourself and your background?	Building trust, establishing a conversational tone, gaining background information, insights about habitus.	P1 -Why did you choose to be an engineer? P2 - Tell me more about how your family influenced your career choice? P3 - How did your career progress over time?
RQ - What are the recounted experiences of former women engineers as told through their narrative stories of consideration for leaving the profession?	IQ2 - Tell me about the earliest memory you have about leaving engineering?	Turnover intentions, incongruent workplace culture, and accumulated effects from microaggressions, habitus, capital, and field,	P1 – How did your thoughts about leaving engineering change over time? P2 – Give me an example? P3 - Tell me more about...? P4 - Describe any specific aspects of the work setting or climate that influenced your decision to leave engineering? P5 - Tell me about your experiences with juggling your personal life with your work life? P6 – Tell me how you were supported or mentored in your career?

Research Questions	Interview Questions	Alignment with Framework and Concepts in the Literature	Probing Questions
SQ - What are the recounted experiences of former women engineers as told through their narrative stories of final decisions to leave the profession?	IQ3 – Tell me about when you chose to leave the engineering field, what were your thoughts and feelings?	Unsupportive work culture, habitus, capital, and field.	P1 – What could you or others have done differently that may have enabled you to stay? P2 – Reflecting on your decision, what advice would you offer other women thinking of entering the field?
N/A	IQ4 - What else would you like to share with me about your experience of leaving engineering, that I may not have asked?	Concluding the interview, seeking unshared insights, feedback.	P1 – Tell me more about...?

Appendix D: Codebook with Examples of Initial Codes

Initial Codes	Description	Example
A good move	Based on life-goals, a person will be drawn to a job that offers a better career fit.	Then so I decided to get into construction, which seems kind of backwards, but I found it to be much more, much easier to navigate as a woman than engineering, to be honest. So, it's been a good move.
All-consuming work	The accumulation of work demands that outpace one's ability to juggle work and life and, if left unmitigated, can have considerable and negative career implications.	I wasn't involved in my community. I wasn't working out. I wasn't coaching or playing soccer. I wasn't doing anything else. I ended up leaving, but I had conversations with other people, like my manager, prior to that. I didn't just show up to work one day and tell them, "I'm out of here."
Career burnout	Thoughts of leaving, fueled by feelings of being overwhelmed, upset, and uncertain about whether being an engineer is sustainable or aligned with life-goals.	I was stressed out and stretched thin, feeling very, very burnt out. I would say things started to change at year two. But by year three, that's when I started thinking, "What am I doing?" Is this what I'm called to do?
Career choices influenced by impactful life events	The combined effects of temporality, sociality, and place on a person's cognitive processes of determining a desired career path.	Yeah, well, I went to a large state college. I graduated and then I did one summer internship. I had several summer internships with companies in the auto industry. I just decided, well, I'm here, I'll go work in the auto industry or something that's a good job.
Career doubts	After completing an undergraduate degree and entering the workforce, uncertainty mounts regarding whether you are in the right career field.	I worked there for a little bit. I was like, "Oh yeah, I don't know if this is the type of company culture, I want to work in. I don't know if this is the type of people I want to work with."
Career strategies	Planning ideas for how best to enter the engineering workforce.	I'm going to go into the work force for a couple years, and if there's a specific topic that lights a fire in me, I'll go back to grad school for that at that point.
Choosing the first job	Remembering all factors that went into the decision to accept or decline the first engineering job	They were a big firm that did everything from high end residential to schools and hospitals and kind of everything in between, so I felt like they would offer a good variety of projects so that I wouldn't be bored... so I just kind of jumped in the deep end both feet and went for it.

Initial Codes	Description	Example
College degree program fit	The engineering program structure was more conducive and supportive of academic success.	A lot of it, to be fair, was probably just that it was a small program with interested professors who were willing to kind of pay attention to me and support me.
Diversity disillusionment	A recognition that despite some progress to institutionalize diversity in the workplace, some company cultures struggle to sustain progress.	They've shown that diversity works and my company was on this path. They were doing so good. And then they sort of disbanded those diversity teams. And I don't know if they got too much backlash from the majority group.
Diversity paradox	Organizational policies and reward systems that reinforce passive leader behaviors that can unintentionally disadvantage underrepresented employees.	And I know for sure, being the only person in leadership and power train, I fit a really specific diversity goal for my director. And she didn't want me to move or quit. Therefore, I don't think I got good, constructive coaching at the appropriate times.
Drawn to engineering as a career	Related more easily and succeeded at engineering pursuits compared to liberal arts or expressive interests.	When they have a little group where they allow girls in and it was to explore engineering and I found I was really interested in it.
Drawn to STEM-like interests	Related more easily and succeeded at math and science compared to artistic or expressive subjects.	For example, I was a year ahead in a lot of my math classes. When I had a chance to take electives, I took mostly science or math related elective classes. I kind of came to realize that where my brain excelled was in the numerical, logical side of things compared to the artistic or written side.
Emergence of an engineer identity	The realization that your intellectual and academic strengths are aligned better with engineering.	I think I was missing from my other courses the engineering mathematic side of things. I just enjoyed doing that, and I didn't get that from international relations.
Engineering as way to serve a higher purpose	Connecting with engineering as a way to help others or being part of a socially relevant career.	It was a much less technical program and much more about looking at the social and economic impact of structural engineering and how you could do it in a way that can be both artistic, and doesn't necessarily require that you mold the structure based on architectural needs.

Initial Codes	Description	Example
Gendered familial influence and the work culture	Attitudes and beliefs from men in the workplace that unfairly scrutinize and judge a woman's work-life choices.	Okay, so 2 years in, I became pregnant and the coworker said, "So now you're just going to leave and never come back?"
Gendered mentoring	Mentoring program that matches new entrants with someone of the same gender.	They also tried to match you with a mentor they thought you would work well with, so I actually got assigned one of the few other females as my mentor. Looking back, I don't know if that was necessarily good as it almost felt like it created a men stick together, women stick together, sort of mentality.
Gendered transition from school to work.	Experiencing differential treatment as a woman engineer when seeking employment out of college.	When I transferred, I got smaller classes, more attention. I did better. There's a lot of people from that college that were at my company, so it's a highly recognized school and such. It's typical for college graduates to come in as trainees, men and women. My brother was direct hired. So, over our career, he still actually works and I retired. He got promoted faster than I did. He made more money than I did. It was just really interesting how I had this direct comparison. We hired in at the same day, like within a month. He had gone to a cattle call and I had gotten wooed. Because my GPA was high, I got on campus interviews and such.
School came easy	Achieving academic success without great challenge or effort.	I went through public schools, very low challenge and often was used as a grader in math and not really pushed or challenged.
Job choice in response to seeking a higher purpose	When a job opportunity presents itself that connects with one's sense of community and social responsibility, even if it means pausing on the pursuit of other personal and professional goals.	Then from there, I ended up working in a small island country, because I came across a job with a nonprofit that does retrofits and seismic retrofits and rebuilds in island nations that have been hit by, or are expected to be hit hard by earthquakes, or have been, and typhoons. I worked in low income informal housing to create housing stock that is actually safe, and to teach local engineers and builders how to build safely.
Meaningful engineering work	The positive career influence of being involved in engineering work which is challenging, satisfying, and serves a higher purpose.	It was nice, no matter I feel like, you feel better going to bed at night when you know that you've kind of helped 300 families build safe homes, than you do when you know that you've built a nicer gym for a university kind of thing.

Initial Codes	Description	Example
Mentoring lite	When a mentoring program exists on paper but is deficient in its application, efficacy, and an understanding by the leadership of what mentoring is and its value.	I don't think, and actually no, I don't think I ever had a mentor necessarily. I wouldn't say that any of the firms ever had someone that I was comfortable with going to, to ask any sort of questions. Whether it was a technical question or how to navigate a certain work issue or anything like that. I never found that anywhere.
Mis-aligned work-life needs	When persisting in a work culture with incongruent expectations and norms is not sustainable or aligned with changing life-goals.	One thing for sure is that as I really started thinking realistically about having a family, engineering firms don't give any sort of benefits to women that make it easy to be a mother. With my last engineering firm, the maternity leave was nonexistent if anything.
More women as role models	The positive career influence of having role models who look like you and provide an achievable vision of what you can become.	The top four, the director of engineering, the director of education, then the director of outreach are all women. I think it was much easier to see if this was something I wanted to do, there are many role models and there are many people that I can see being me.
Overcoming obstacles	The ability some individuals possess, that when faced with challenging life-situations, to persevere and overcome those barriers that to others may become a limitation or impediment to realizing their full potential.	That was always challenging for me, however, I had an exceptionally high aptitude in mathematics. And an exceptional curiosity in the sciences, ever since I can remember.
Personal network support	Friends and acquaintances who are personal network contacts that can be accessed if needed for support and guidance.	So, I did have a couple of friends who we would chat, nothing that seemed significant at the time. But looking back on it, I guess that we probably would work through issues together pretty regularly.
Playing to one's strengths.	Pursuing job tasks that someone finds enjoyable and feels confident performing.	After a few meetings, I think my project manager started to realize that I was comfortable, and an effective communicator in these meetings, so he started letting me go to the weekly coordination meetings by myself.

Initial Codes	Description	Example
Power of positivity	The good things that can happen as the result of maintaining a positive attitude at work.	We had the downturn in 2007, '08 and I was the happiest person there because I needed to be, as the leader. And they're like, “Well, how are you today?” I'm like, “I'm fabulous.” “How can you be fabulous? Aren't you worried about losing your job?” I said, “It’s okay. I'm an engineer. I'm a good engineer. I'll get a job somewhere else.”
Seeds of disillusionment	Early in one’s career, when the realities that one’s chosen career may not meet the expectations of pursuing exciting and rewarding work with opportunities for meaningful personal and professional growth.	I think probably I considered leaving engineering, I've considered leaving engineering since my first job. I liked that there was such clear path and tasks ahead of me. At the same time, I'm not entirely sure what it was, I think it was the culture. I think I just found that every time I thought about my future, I never thought to myself, “That’s where I want to end up.”
Serving a higher purpose	Leveraging one’s engineering career to help others or be socially relevant or responsible.	We did a charity that buys Christmas presents for foster kids. We would go and buy all the gifts through the coffee club, buy all the gifts, everything on their list. Then we would wrap them and tag them. All you got was a description of the kid and how old they were. And we'd have a wrapping party. It was this very joyful time.
Sexism in the workplace	Times in a work setting when a woman engineer would experience feelings of being undervalued and dismissed just because she was a female.	I know there was often a feeling for me that if I didn't ... I could either change my personality and act more “like a man” and speak up more, or at least speak louder, and kind of unnecessarily mansplain things and make people hear me. I think the number of times that I was spoken over or someone asked someone else instead of me when I was the clear person with the subject matter knowledge expertise, it just became grating.
Shared personal and career values	When considering career options, there is a desire to find a degree path that will lead to employment opportunities with work that aligns with one’s way of being and world views.	From this research I decided I was way too social of a person to be stuck in a lab running experiments for my whole life. So then, started looking into other possible majors. At this point I decided to switch back to an engineering-based field, but was unsure exactly what subset of engineering I wanted to pursue.
What do I want to be when I grow up?	The process of formulating a career identity as one grows up, based on social and individual queues.	But I never thought I wanted to be in STEM or anything like that, I always thought I wanted to be a lawyer.

Initial Codes	Description	Example
Supportive parents	Parents, through role modeling, encouragement, and support, who promoted academic achievement as a way to create life-opportunities that they did not have growing up.	So, growing up, I always had that, on the one hand coming from my mom, I had a lot of interest in the built world and how cities work and that sort of thing. She also, she majored in architecture, so she always talked about buildings a lot. From my dad's side, I had a lot of just interest in science in general. He was always kind of leaving Scientific Americans around or asking questions and stuff.
The work is great, but ...	Engineering work assignments are satisfying and rewarding but work climate and career progression characteristics at a firm do not always promote a sense of belonging or willingness to stay.	I got to work on a lot of different projects and a lot of my coworkers, we had a good relationship. Also, having to work past what I saw as a real boy's club, and I just decided that it wasn't worth it to me to be the person breaking that barrier. So, I decided to get into construction, which seems kind of backwards, but I found it to be much more, much easier to navigate as a woman than engineering, to be honest.
Unsupportive leaders	When entry-level engineers experience a void of support from their leaders to learn and grow professionally and instead are expected to figure things out on their own.	But I don't feel like those expectations were same for people that were, let's say, more experienced than me or more seasoned, like leadership, right? Leadership was definitely not leading by example. They weren't walking beside me and other people that were at my point in their careers. They were not supporting us through these times. The mentality was "just get it done."
Wanting to leave but needing to stay.	The negative consequences, both physically and emotionally, from a decision to stay in an engineering job to achieve personal or professional goals that could maintain economic security or improve future job opportunities, while continuing to deal with an incongruent and unsupportive work culture.	That was the longest year ever. I was miserable. I was physically ill from the stress. My mental health was not in a good place. All due to the strains of this job. I was staying with the company because I felt like I had no other option.