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CHAPTER II: LITERATURE REVIEW

There is substantial research on STEM and women, in large part due to studies that the U.S. government has funded, and continues to fund, including substantive data collection related to recruiting women into STEM professions and the barriers to progress. The majority of published works include a focus toward the academic years and/or why women leave STEM professions. While these previous studies offer valuable insight in correcting our actions, they provide only partial solutions for the modern STEM professions and women professionals. A limited body of knowledge exists regarding what contributes to women's motivation to stay in STEM professions.

The goal of this literature review is to summarize the history of barriers for women in STEM and provide background as to the importance of STEM professions internationally and in the United States. There is also a focused section on three groups in the literature that are most relevant to this study: women at the university level studying to become STEM professionals, STEM faculty, and women in the STEM workforce. Also included in this discussion are some considerations from the literature for overcoming barriers in the STEM profession. Finally, as this study seeks to develop theory in the framework of motivation, a summary of employee motivation, turnover, and retention is included.

Discuss the organization of the chapter.

Search Strategy

The search strategy for this study started with establishing a literature review components outline, which guided the keywords used in search databases. Keywords included, but were not limited to *science, engineering, technology, math, women, STEM, workforce, employee, turnover, motivation, and satisfaction*. The *ProQuest, ERIC, EBSCOHOST, and SAGE databases* were searched. Google Scholar was also leveraged to

Include the specific search terms you used and put them in italics.

Include the specific databases.

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Tip: Consult with your committee about any limits on the dates of published research.

search for information. Sources of information included peer-reviewed journal articles, books, government statistics, theses, and dissertations. Over 250 sources, dating from the 1950s to the present, were identified with relevant material. The majority were published within the last 5 years.

Older sources were included to provide the reader a perspective of the longevity and history of the topic. RefWorks was leveraged to help identify duplicate material. A subset of the sources retrieved, as listed in the references section of this dissertation, was identified as the most relevant sources for this study and provide the foundation of the literature review.

History on Barriers for Women in STEM

Many examples of barriers for women in STEM in the literature exist, some consistently cited over time. Some barriers cited more recently have emphasized primary contributors to women leaving careers STEM fields permanently. Some barriers apply to STEM fields in general, for both men and women. For example, trying to keep skills sharpened to stay current with the high pace of technology change is a barrier for anyone in STEM professions (Hira, 2010). Another general barrier is the evolution of business models, including downsizing and outsourcing, to stay competitive in a global business environment for women in STEM professions (Hira, 2010; Preston, 2004; Rhea, 1996). These types of barriers are arguably barriers for many professions. Women in STEM professions seemingly face much more over their academic and industry careers.

Provide relevant historical information on your topic to provide context for your study.

The most commonly cited barriers include workplace recognition barriers (Glass & Minnotte, 2010; Lincoln et al., 2012; Thilmany, 2010); workplace culture barriers (Beddoes & Borrego, 2011; Cheryan, 2012; Kerr et al., 2012; Marques, 2011); self-efficacy barriers (Cordero et al., 2010; Deemer et al., 2014; Jones, Paretti, Hein, & Knott, 2010); career fit

Tip: If you're struggling with finding literature, reach out to the wonderful team at the library! You can find their contact information, [here](#).

(Giles et al. 2009; Preston, 2004); and social system bias (Matusovich et al. 2010). Many of these barriers are rooted in early stereotypes (Ambrose, Dunkle, Lazarus, Nair, & Harkus, 1997). While modern legislation has helped facilitate some positive changes, many of these barriers remain rooted in early stereotypes (Ambrose et al., 1997) and still exist in the workplace (Etzkowitz, 2008).

Early Stereotypes

Tip: Use appropriate [level headings](#) so your reader can understand the organization of your document.

In the early 19th century, science fields had a hierarchy: white men were at the top, then white women, followed by other races and ethnicities at the bottom (Ambrose et al., 1997). When the 20th century brought more military-related demands for engineering and technology professionals, white men were still positioned at the top of this hierarchy (Ambrose et al., 1997). Today, some progress was made for equal rights for women and other minorities in the workforce during the civil rights movement. Over 200 years of cultural stigma in scientific professions has not gone away completely; the remnants of this archaic way of looking at the capabilities of men versus women remain woven into the fabric of workplace cultures.

Doors Opened by Equal Rights Legislation

The Civil Rights Act of 1964 and the enactment of Title IX in 1972 fostered notable differences in the workforce (Etzkowitz, 2008). The Civil Rights Act of 1964 prohibits discrimination on the basis of race, color, religion, sex or national origin. Title IX in 1972 protects from discrimination based on sex in education programs and activities that receive federal assistance (U.S. Department of Labor Report, 2011). Women's attendance at the college level increased steadily since the early 1970s, in no small part due to this legislation.

Today, more than half of the students enrolled in U.S. colleges are women (Morganson et al., 2010).

While Title IX certainly helped to break down some barriers, many of the same barriers may still exist. In the 110th Congress in 2007, both the U.S. House of Representatives and Senate signed resolutions to celebrate Title IX, reinforcing the need to uphold it (Congressional Record Daily 110th Congress, 2007). The House resolution stated that a need remains to bring visibility to Title IX, because women continue to earn less for work than men with the same educational background, and girls face substantial barriers in pursuing high-STEM fields.

Workplace Recognition Barriers

The Matilda Effect, The Matthew Effect, and The Athena Factors include the description of overt and covert discrimination towards women in STEM fields. The Matilda Effect is the under-recognition of women in science with the same credentials as their male peers (Lincoln et al., 2012). The Matthew Effect is the male over-recognition in science fields or the act of enhancing an already large reputation for a male in science through repeated reference of their work, for example (Lincoln et al., 2012). The Athena Factor was comprised of five antigens found in private industry following a study called the Athena Project that identified challenges for women in reaching higher levels of management (Thilmany, 2010). Studies found that women remained in STEM fields, but feel like *tokens of diversity* in their positions or are *ghettoized*, meaning they reach leadership levels, but have the least perceived importance or rank on the leadership team (Glass & Minnotte, 2010; Lincoln et al., 2012). While these different recognition barriers impact women in STEM

fields, these experiences may be rooted in how women are viewed within the culture of STEM.

Tip: Use [active voice](#) in academic writing.

Workplace Culture Barriers

Men have dominated the STEM fields, creating a masculine culture where women are viewed differently than men. There has been a heavy emphasis on the challenges for women in the masculine culture of STEM (Espinosa, 2011; Gilbert, 2009; Kerr et al., 2012; Servon & Visser, 2011). One of the challenges that this culture perpetuated for women is the lack of access to information and invitations into informal networks in the workplace (Glass & Minnotte, 2010; Kerr et al., 2012). The implicit biases and the stereotypes projected on women stemming from and fostered by this masculine culture continued to reduce opportunities for women in STEM and created a hostile environment for those motivated to stay long-term (Beddoes & Borrego, 2011; Cheryan, 2012; Deemer et al., 2014; Glass & Minnotte, 2010; Kerr et al., 2012; Lincoln et al., 2012; Marques, 2011). Ultimately, the underlying masculine culture of STEM may push women out of the field, as it creates a culture where it is difficult to build and maintain positive relationships in the work setting.

Self-Efficacy Barriers

One factor related to recruiting women in STEM and their persistence through the university years is low self-efficacy compared to their male peers (Deemer et al., 2014; Leslie et al., 1998). Self-efficacy is specific to a capability, unlike self-esteem, which is more associated with feelings of self-worth. Having math self-efficacy is particularly helpful for women pursuing STEM careers (Cordero et al., 2010), but Jones et al. (2010) found that men had higher competency or self-efficacy beliefs than women. This importance of self-

Tip: The writer has introduced the topic, provided some supporting evidence, and concluded with a sentence, in her own words, that pulls everything together. For help with paragraph development, see this [resource](#).

efficacy, combined with the lower levels of self-efficacy in women, likely contributes to reasons women stay out of, or leave, positions in STEM.

Career Fit

Another barrier cited as contributing to women leaving early in their professional careers is career fit (Preston, 2004). Giles et al. (2009) found that interest in the topic was critical to success for women in science and engineering. It seems imperative that the recruitment of women in STEM, therefore, is not done so blindly, but should consider intrinsic factors that motivate an individual and lead to a good career fit. However, it is important to acknowledge that although the ideal state may be that women and men choose careers based on interest, societal factors remain or exist that strongly influence these interests, starting from childhood (Barber, 1995).

Social System Bias Barriers

Matusovich et al. (2010) emphasized the social system of peers, faculty members, and family support as part of the equation in increasing the potential for persisting and achieving a degree. The U.S. society is image-driven and filled with gender stereotypes (Matusovich et al., 2010). Many existing government-sponsored programs exist that try to expose young girls and women to STEM fields deliberately in order to overcome some of these societal barriers (Matusovich et al., 2010). Unfortunately, these programs may do women a disservice in some ways because they may lure young girls and young women into a fantasy (Matusovich et al., 2010). These programs somewhat deceptively leave out the details of the known challenges women would encounter in the androcentric culture of the STEM workplace, where gender stereotypes are magnified (Matusovich et. al, 2010). In the absence of corrections to the current gender stereotypes and masculine culture, women who enter

STEM professions will likely have to assimilate and, over time, will potentially lose part of their identities (Barber, 1995).

Additional Barriers for Women in Non-linear Careers

STEM work cultures have been particularly inflexible to anything that does not fit into the traditionally long work weeks heralded in these professions (Tomlinson, Olsen, Neff, Purdam, & Mehta, 2005). Women face a particular barrier when they choose to leave their career to become a mother and later return to work. Thirty-seven percent of women and 43% percent of women with children leave their career at some point (Hewlett, 2007). When women do leave, over 93% want to return to their careers, but only 74% ultimately do and only about half of those women returned to the workplace full-time (Hewlett, 2007). Those who returned to work part-time instead of full-time experienced a 16% lower salary for the same type of job for working less hours (Tomlinson et al., 2005). Not surprisingly, the wage gap that starts in the beginning of one's career rises exponentially throughout. As raises and bonuses are based on one's salary, the compounding compensation gap increases. The U.S. Department of Labor (2011) provided some staggering projections on the wage gap effect over time. If, for example a man at age 25 earns \$6,000 more annually than a woman at the same age, the earnings gap grows to \$28,000 by age 35 and \$379,000 by age 65. It is clear that wage inequity can be severe over the span of a career. These differences in pay could keep women from entering STEM fields, or push them to change to a new career when returning to the workforce after becoming a mother.

International Emphasis on STEM Professions

STEM government initiatives absorb a lot of attention, time, and tax-payer-funded resources. Hira (2010) argued that U.S. policy action addressing STEM field concerns have

Tip: In referencing quotes or paraphrasing others, sentences should be written in **past tense**.

been too singularly focused, not allowing for the broader contributing factors and conflicts of interests that often result. Hira (2010) and Preston (2004) called for the U.S. government to mobilize for change. Other advanced western countries such as Australia, England, Sweden, New Zealand, and Canada also have efforts to increase recruitment and retention of women in STEM (Giles et al., 2009; Preston, 2004).

These countries expanded their higher education systems in STEM at a time when the U.S. system struggled to expand (Giles et al., 2009; Varma & Freehill, 2010). Sweden is perhaps the most aggressive in their national policies in general, which require employers to balance the numbers of men and women in the workforce (Preston, 2004). Sweden's government also enforces what seems to be a progressive family-friendly workplace, requiring 12 months of maternity and paternity leave to be offered to employees, more than any other country (Preston, 2004). China and India challenge all countries in another way. Their STEM-related industries evolved as global leaders in high technology, manufacturing, and IT sectors, respectively, claiming sections or whole parts of these industries once strongholds in the United States (Varma & Freehill, 2010). These changes in the field have resulted in a focus on recruiting and retaining women in these important fields.

The notion of a pipeline is referenced often in STEM literature (Espinosa, 2011, Glass & Minnotte, 2010; Lincoln et al., 2012; Servon & Visser, 2011). The phrase STEM pipeline described the journey of recruiting and retaining women in STEM fields starting with grammar school, to include efforts to expose young girls to STEM fields as potential career choices. The pipeline then moves to the university years and finally to the workplace. The leaky pipeline is a well-documented phrase meant to represent the junctures where the highest numbers of candidates moving through the pipeline drop out (Glass & Minnotte,

Tip: Try to end paragraphs with your own ideas and analysis of the research. This keeps the focus on your study and what **you** can add to the [scholarly conversation](#) on the topic.

Tip: For help with when to use **hyphens**, see page 98 in the APA Manual.

2010; Mavriplis et al., 2010; Servon & Visser, 2011). The logic of a pipeline concludes that increasing the amount of women recruited into STEM professions will result in more women receiving STEM field degrees and subsequently pursuing work in these fields (Lincoln et al., 2012). The pipeline notion, however, has not been realized (Glass & Minnotte, 2010; Mavriplis et al., 2010; Servon & Visser, 2011). Therefore, more research is needed to examine why some women remain in STEM fields; this information may help to address reasons for the leaky pipeline.

STEM Workforce

STEM professions constitute a minority of the U.S. workforce with only 5% of U.S. workers participating in STEM professions (Lowell, 2010). The supply and demand of the STEM workforce shifted since the 1960s because of various factors such as globalization, worker attrition, and the rise of technology, but still remains a critical part of the U.S. competitive advantage (Giles et al., 2009; Hira, 2010; Jolly, 2009; Lowell, 2010; Preston, 2004; Varma & Freehill, 2010; Washburn, 2007).

General Population Workforce

The U.S. Bureau of Labor Statistics report, *Labor Force Projections to 2020: A More Slowly Growing Workplace*, indicated that the participation of women in the overall workforce was on a steep climb from the 1960s to the 1990s, increasing from approximately 37% participation to 57% participation, and peaking in 1999 at 60%. The percentage of women in the workforce has been declining since dropping to 58.6% (U.S. Bureau of Labor Statistics, 2008). Women 25-54 years of age saw a peak percentage of 76.7% in 2000, declining to 75.2% today (U.S. Bureau of Labor Statistics, 2008).

Tip: Avoid general statements of time. In this case, it would be better to state the current year.

Male workforce participation has been on a continuously downward trend as well, since the 1960s decreasing from 84% participation in 1960 to 71% in 2008 with projections showing a continuing decrease (U.S. Census Bureau, 2008). Men 25-54 years of age have a workforce participation rate of 89.3% (U.S. Census, 2008). Thus, for the prime-age men and women, women have almost 15% fewer participants in the workforce (U.S. Census Bureau, 2008). The number of women in the workforce is not expected to increase in the near-term projections. Although the gap between the percentage of women and men in the overall workforce decreased, women continue to be underrepresented in the workforce.

STEM Workforce Supply and Demand

The number of STEM degrees and advanced degrees fluctuates. Although the number of STEM degrees awarded in the United States increased across the broad spectrum of STEM professions, there has been a decrease in the physical sciences and engineering and, more recently, in computer science (Varma & Freehill, 2010). The supply and demand for STEM professions changes over time, as new industries emerge and some older technologies and methods become obsolete (Rhea, 1996). The STEM workforce grew more than three times the rate of the overall U.S. workforce from 1950 to 2000 (Lowell, 2010). An alarming drop in the STEM workforce from 2000-2006 caught the attention of the highest office in the United States. The STEM workforce was a topic of interest in the George W. Bush presidency in the early 2000s, during which President Bush launched several campaigns supporting STEM fields (Varma & Freehill, 2006). The interest continues into the Obama presidency. President Obama launched a campaign in 2009, Educate to Innovate, which calls for an expansion of STEM education and career opportunities for women interested in STEM careers.

One reason for this labor shortage in STEM professions is that men, who make up the bulk of staff in these professions historically, indicated a marked decline in pursuing STEM professions since the 1980s (Preston, 2004). Knowledge loss is a growing concern for the future of STEM professions, as the baby boomer generation reaches retirement age (Giles et al., 2009). It is estimated that the STEM workforce will have a 50% attrition rate between 2012 and 2017 (Washburn, 2007).

There were many other environmental factors contributing to drop in demand. One is that the U.S. United States became more service, and less, manufacturing focused. Computers went mainstream, creating other job specializations (Hira, 2010; Lowell, 2010). Globalization is also a key factor in supply and demand for STEM professions, providing a platform for engineering and science industries to move toward service industries (Jolly, 2009; Varma & Freehill, 2010). The United States, overall, did not retain its competitiveness in some of these industries.

Groups Studied in the Literature

Include literature focused on the population and context or setting of your study.

Researchers examining women in STEM professions have largely focused on four population groups: (a) girls and boys of grade school and high school age, (b) students studying STEM fields at the university level, (c) STEM faculty, and (d) STEM professionals in private industry (Ambrose et al., 1997; Cordero et al., 2010; Hewlett, 2007; Lee, 2012; Powell, 1992). For the current study, the literature review largely focuses on students studying STEM fields at the university level, STEM faculty, and STEM professionals in private industry as these groups are most relevant to the STEM workplace experience.

University Students Studying in STEM fields

Studies related to students in STEM professions clarified that, based on math testing scores, women and men have an equal academic chance at succeeding in STEM professions (Cordero et al., 2010). Despite the testing scores, self-efficacy in math and science is higher for men than women (Cordero et al., 2010). Because self-persuasion in belief perseverance affects self-efficacy, women in STEM fields would benefit from external positive influences such as mentors and social networks that help persuade them to believe in their capabilities (Cordero et al., 2010). Lee (2012) explored what factors influence choices in education and career paths using stereotypical images of STEM career settings. Women's motivation in this study was not affected by the stereotypical male images (Lee, 2012). The study participants in Cordero et al. (2010) and Lee (2012) were students.

Faculty Specializing in STEM

Tip: In APA style, you can separate items in a series using lowercase letters within parentheses.

Some studies exist that largely consist of women in academic STEM fields (Ambrose et al., 1992). Common themes for these women contributing to staying in the profession were personal influences in their lives such as family members and a genuine interest in their field of study (Ambrose et al., 1992). Other themes contributing to their success were (a) mentors, (b) professional networks, (c) having a hobby or an outlet outside of work, and, for some, (d) the supportive environment that all-female schools provided. Discrimination was a common obstacle (Ambrose et al., 1992). This study was conducted in 1992. Because it is highly probable that that academic and working environment in 1992 was a different environment than when this dissertation was published, the studies are not duplicative.

Professionals in STEM Industries

Studies on professional women in STEM included executive level women and women working within the engineering profession. Powell (1992) cited two primary

strategies for executive level women: impression management (acting like a man) and finding a pocket of sanity (finding a place they could be themselves while assimilating to the norms of the profession). Marques (2011) cited strategies for high-achieving women such as over-delivering, taking stretch assignments, and establishing a reputation of competence. Marques' study focused on women in engineering only. A high-level of competence in technical acumen is very important to move into higher level positions (Marques, 2011; Powell, 1992). The participants in Powell (1992) and Marques (2011) were all upper level, executive management, whereas the participants for this dissertation research included women in STEM at any level of the organization. It is important to understand what motivates women in STEM at any level in the organization, particularly in lower management levels, as not every person defines career success as achieving a position in the C-suite and, conversely, organizations require engaged employees at every level of the organization in order to be most profitable.

Some studies focused on a specific STEM profession. Themes that were factors in

one study that addressed women in engineering persisting included (a) coping skills for workplace inequities and workplace culture, (b) support from family, (c) having a personal interest in engineering work, and (d) taking advantage of family-friendly workplace policies (Fouad, Fitzpatrick, & Liu, 2011). Those that persisted said that they did make compromises in career advancements, especially management opportunities, to take care of their families.

All of the above studies in this section either focused on women at senior levels or in a single STEM profession. This current dissertation research focused on women in STEM at any level of the organization and across all STEM professions.

Extrinsic Considerations in Removing Barriers for Women in STEM

Don't leave a heading stranded at the bottom of the page without any text. To fix this, simply move the heading down to the next page.

Tip:

Discuss existing research and show how your study will add to the literature. Think about **why** your study is important.

Society

Societal shifts in how STEM professionals are perceived could help minimize bias in the STEM workplace. Beddoes and Borrego (2011) suggested that future research on science and engineering fields should include gender theories which may help to deconstruct the masculine culture and the stereotypes that are an integral part of the science and engineering professions cultures. Washburn (2007) suggested that using the media to promote expanded interests in STEM careers could help broaden the views of these professions and create more social support for individuals in them.

The U.S. government is in the best position to shift policies and other variables in the overall STEM system in the United States (Hira, 2010). Instead, the U.S. government has a tendency to address only a very small part of the problem (Hira, 2010). The U.S. federal government's enactment of both the Civil Rights Act of 1964 and Title IX in 1972 helped minimize overt sexism, as previously noted. One of the overt discrimination barriers still documented in literature is wage inequity (Barber, 1995; Brawner et al., 2012). Barber (1995) and Brawner et al. (2012) suggested that a U.S. federal tax incentive may help remove wage discrimination in private industry.

The U.S. Federal government's Office of Federal Contract Compliance Programs (OFCCP) established federal wage compliance to ensure that equal pay acts were instituted in the government (U.S. Department of Labor, 2011). U.S. taxpayers fund 200 new compliance officers in the U.S. federal government to review compensation fairness in the federal government and provide recommendations to resolve any cases uncovered (U.S. Department of Labor, 2011). However, the government has not committed to leveraging these 200 new compliance officers to take on the role of compliance for private industry

(U.S. Department of Labor, 2011). Equal pay then, for women in the private sector, is either up to industry to become fair and more transparent in compensation or up to women to stand up for themselves.

Government, industry, and society in general have a role in improving environments for sex-segregated occupations (McIlwee & Robinson, 1992). The concepts of strengthening Affirmative Action, redefining work-family relationships, and changing power relations focus require more change (McIlwee & Robinson, 1992). Changes require not just improvements, but changing the game entirely for women in STEM professions, largely by reinvigorating the feminist movement in the modern day context (McIlwee & Robinson, 1992). More work is needed to change the profession so that it is fair and balanced for women.

Industry

Industry has the longest list of improvements proposed in the literature. Two solutions to help overcome barriers, instituting mentoring programs and better work-life balance policies, have been part of the checklist of improvements for decades (Glass & Minnotte, 2010; Kerr et al., 2012; Marques, 2011; McLaren, 2009; Powell, 1992; Preston, 2004). No documented evidence exists in the literature reviewed on this topic to prove that mentoring or plans to improve work-life balance have been of value in keeping women in STEM fields, although many women in studies cite mentoring has helping them in their professional lives (Glass & Minnotte, 2010; Kerr et al., 2012; Marques, 2011; McLaren, 2009; Powell, 1992; Preston, 2004).

With regard to work-life balance policies that offer flexible hours, workplace cultures have to have the stigma against flexible arrangements removed before any policies have a

Tip: Use “who” to refer to people. Use “that” to refer to things.

chance at being successful (Hewlett, 2007). Some more progressive workplace policies that acknowledge instituting more equity, include more targeted career development for women and leadership development for the managers who work with them (McLaren, 2009). The latter would be a victory for women in STEM, as it moves away from the blame-the-victim tactics that are often a part of proposed solutions.

Diversity programs have increasingly been introduced in the workplace and have been expected to have a positive effect on STEM fields, potentially providing a platform to address the underlying problems of stereotypes and implicit bias in the workplace (Barber, 1995; Beasley & Fisher, 2012; Ibison & Bailey, 2009; Servon & Visser, 2011). If companies plan to attract the best combination of talent, they should recruit and retain a diverse workforce (Ibison & Baily, 2009). Having more women in the STEM workforce will potentially help prevent other women from leaving and may increase the number of women in STEM professions over time (Drury, Siy, & Cheryan, 2011). More research in this area is necessary in order to determine if diversity programs can have a long-term impact on the retention and recruitment of women in STEM.

Heilbrunner (2013) highlighted that motivational behaviors include the influence by both internal and external factors. While the environment where one works is important, an individual’s self-efficacy is also important (Heilbrunner, 2013). The focus on the individual is important to consider in motivation for organizations. If organizations focused only on improving or changing the extrinsic factors, they would miss the importance of individual differences, and the personalities and their values that contribute to them (Furnham et al., 2009).

Intrinsic Considerations for Overcoming Barriers

STEM fields will continue to work within male-dominated work environments for the foreseeable future. The extrinsic barriers will not go away overnight. Some scholars acknowledged this, suggesting that in addition to participating in the workplace solutions, women could work on a few personal skills to help them survive and persist in STEM fields (Kerr et al., 2012; Khanin, Turel, & Mahto, 2012; Morganson et al., 2010). These skills include dealing with stress, being assertive, and engaging in personal reflection.

Tip:
Introduce the major topics that will be discussed in the section.

Developing good coping skills for job stressors is one suggestion (Morganson et al., 2010). Coping skills are good skills for anyone to have in any career. Coping mechanisms help employees stay, and are useful to develop as a transportable skill (Kerr et al., 2012; Khanin, Turel, & Mahto, 2012; Morganson et al., 2010). Kerr et al. (2012) argued that perceived status or power in any environment can be a motivator or de-motivator to persist, as the psychology of a person's perceived status may or may not help those overcome barriers or stressors.

Other strategies proposed by Marques (2011) included emphasis on over-delivering, building a reputation for being competent and assertive, and having a career development plan that those in positions to help you get there know about. Part of maintaining competence is to maintain currency with industry knowledge and skills, either through internal or external courses or industry conferences (Preston, 2004). Maintaining a level of current industry knowledge helps scientists and engineers continue to develop the skills required to stay current and maintain professional licenses (Preston, 2004).

Knowing oneself and one's values is another suggestion, helping to ensure that the STEM fields are a good fit for an individual from the onset. Matusovich et al. (2010)

concluded that college students who persisted simply had strong interest in engineering itself, whereas those that had entered engineering because of an outside influence or because of simply being good at math were less likely to persist. Matusovich et al. (2010) suggested that if a person has a strong interest in engineering, they will have a higher rate of persisting, despite challenges. Jones et al. (2010) emphasized that these interests are better predictors of persistence than competency beliefs.

Tip: Avoid back-to-back headings without any text. Instead, write a brief introduction for each section.

Employee Motivation, Retention, and Turnover

Motivation for Individuals

Theories focused on explaining and understanding human motivation have been emerging for centuries. Freud (as cited in Nebel, 1978) explained motivation through instinct theory, suggesting that unconscious thought, or instincts, motivated behavior.

Philosophers such as Locke (1789), Mill (1869), and Bentham (1689) all developed theories that are in some way grounded in the principle that human beings seek a balance of experiencing more pleasure than pain (Nebel, 1978; Steers et al., 2004). Psychologists Thorndike, Woodworth, and Hull (1943) later developed drive theories, which suggested the motivation of humans was based on past experiences (Steers et al., 2004). Later, cognitive theories emerged, focused on an individual's expectation of future events (Nebel, 1978).

Motivation in Groups

A major influencer in industrial psychology and understanding group motivation was Elton Mayo, who performed the Hawthorne studies from 1927 to 1932 (Robbins & Judge, 2009). One of the significant discoveries in the Hawthorne studies was the increased motivation and productivity of a small group of women, sectioned from the rest of the group and made to feel as if they were elite, compared to the other workers (Robbins & Judge,

Tip: Limit the use of [secondary sources](#). If you need help locating the primary source, reach out to the [librarians](#).

Tip: For rules on when to use [et al.](#), see the [APA Style Elements](#) guide.

2009). Notably, women were absent less for sickness and personal reasons in this perceived elite group (Robbins & Judge, 2009). Social factors, such as status, seem to increase motivation and commitment within workers.

Another discovery was that group norms, established informally by the group and not by any other sets of controls, drove performance motivation (Robbins & Judge, 2009). The Hawthorne Studies previously verified the significance of social factors in workers' level of satisfaction, and that social norms of efficiency had a more significant effect than capability (Etzioni, 1964). Communications across the hierarchy, particularly in attending to the social needs of the worker, are also an important factor in employee motivation (Etzioni, 1964).

Katz and Kahn (1966) cautioned that organizational approaches to management should not completely reject the concept of formal structure for an organization. Referred to as the structuralist approach with roots in the structure-conduct-performance paradigm, this technique is a synchronized effort to ensure that individuals and organizations are in sync with each other is also important (Etzioni, 1964). Latham (2009) suggested that increasing job satisfaction is an outcome of good job performance. Regardless of organizational structure, minimizing dissatisfaction across the group is a key to organizational motivation and performance (Etzioni, 1964).

Integrate theories related to the topic in order to demonstrate the current state of knowledge on the topic.

Contemporary Workplace Motivation Theories

Many different theories have been proposed to understand and address motivation within the workplace setting. While some theories have focused on internal factors of the employee, such as equity theory, others, such as reinforcement theory, have focused on external factors within the workplace environment. Still others, such as Maslow (1964), have explained motivation by combining different internal and external factors. Each of these

theories has viewed motivation differently, but put together, all of these theories have helped to gain a deeper understanding of human motivation in the workplace.

Equity theory, which suggests that individuals compare their rewards with others and seek to eliminate the inequities, is another contemporary theory (Robbins & Judge, 2009). Equity theory contends that individuals will compare to others, both inside and outside of their companies (Robbins & Judge, 2009). Through this comparison, they assess the fairness of their current state (Robbins & Judge, 2009). Equity theory sees motivation as a largely social experience, as individuals are concerned with the fairness in their environment. In this view, it's not just the reward that employees receive, it's the perceived fairness of management when giving rewards.

Compare and contrast key theories.

Reinforcement theory, alternatively, is based in behavioristic theory (Robbins & Judge, 2009). Reinforcement theory suggests that the environment, not the individual, has the most influence in employee motivation (Robbins & Judge, 2009). An individual will repeat behaviors that are positive for them (Robbins & Judge, 2009) without any focus on social comparisons. When an individual is rewarded, such as with a bonus, they are more likely to repeat that behavior again. Ultimately, according to this theory, rewards from an employee's environment will motivate them to work for future rewards.

Herzberg (1959) expanded the view of motivation to look at multiple factors, rather than single influences. Herzberg's (1959) work in two-factor theory motivation suggested that there are extrinsic and intrinsic factors related to job satisfaction and motivation respectively (as cited in Furnham et al., 2009). The extrinsic factors include hygiene factors such as salary, working conditions, and relationships with other employees (Furnham et al., 2009). The intrinsic factors, or motivators, relate to the individual's job such as achievement,

development, and recognition (Furham et al., 2009). One intrinsic factor that may influence work motivation is goal-setting.

Goal-setting theory, based on setting a goal, or a challenge, and performance feedback, complements self-efficacy theory, because goal-setting theory is instrumental in helping individuals set and reach goals. Self-efficacy is elevated, assuming the performance feedback is positive (Robbins & Judge, 2009). Goal-setting, especially setting specific goals, is important in terms of employee motivation (Latham, 2009). Latham (2009) cautioned, however, to understand the balance between ability and motivation in expecting outcomes. “Performance is the product of ability and motivation” (Latham, 2009, p. 49). Latham suggested that although motivation and ability link to performance, a person has to have at least some ability to move forward with a task before he or she can be completely motivated to reach certain goals. Alternatively, if an individual realizes he or she has the ability to do something well, they are more apt to continue doing it (Latham, 2009). Therefore, human motivation in the workplace is much more complex than just rewards, fairness, or goals. Employees must also believe they are capable of completing goals they set in order to receive reinforcements from their employer.

Make connections between the different theories or research presented.

In a comprehensive model of motivation, Maslow (1964) suggested that the binding principle for human motivation is the higher motive emerges once the lower needs have been gratified. Self-actualization is “the ongoing actualization of potentials, capacities, and talents, as fulfillment of a mission, as a fuller knowledge of, and acceptance of, the person’s own intrinsic nature, and as an unceasing trend toward unity, integration or synergy within the person” (Maslow, 1964, p. 25). People have to first satisfy the needs of physiological, safety, belonging, and self-esteem before reaching self-actualization (Maslow, 1964).

Maslow described growth as a “rewarding and exciting process, where the fulfillment of yearnings and ambitions is whetted by, rather than gratified by the experience” (p. 30). The growth process for someone primarily motivated by self-actualization is continuous.

It is important to understand that the first four layers of physiological, safety, belonging, and self-esteem can only be satisfied with considerable influence and in some cases, even dependence from others (Maslow, 1964). Latham (2009) brought a modern view on Maslow’s hierarchy of needs and the links to the workplace, focusing on the link to employee performance and growth. There are needs that must be met in a certain order, to deliver the highest performance outcome: (a) physiological (food, water, shelter), (b) security (insurances), (c) belonging (feeling like part of something, acceptance by a team), (d) self-esteem (confidence, respect for and respected by), and (e) self-actualization (desire to feel fulfilled, to maximize potential; Latham, 2009). Latham (2009) offered some ways employers can contribute to helping employees meet Maslow’s hierarchy of needs, such as providing access to healthy food, helping ensure employees know the expectations related to keeping their job, team-building, praise for good work, and helping employees explore how to grow professionally. The current study was designed to expand on existing theories related to motivation by developing a model focused specifically on the motivation of women in STEM professions.

Motivation of Women in the Workplace

Women face unique barriers within the workplace when it comes to motivation. Balancing career success with decisions to delay building a family are real issues confronting women, and upward mobility comes at a cost, for some, such as having a partner or having children (Smith et al., 2012). The desire to be the ideal mother, ideal wife, and ideal professional perpetuates a feeling of failure for some highly-educated career women as they

Tip: Your literature review should [synthesize](#) the research. Each paragraph should contain multiple sources. Notice that the author does not quote, but provides a general overview of the sources while remaining the dominant “voice” in the paragraph.

struggle to balance being everything to everyone (Pas et al., 2014). Women internalize all of these roles, and in trying to gain approval from society, the workplace, and their private social circle, they place a demand of energy on themselves that has proven difficult to sustain (Pas et al., 2014). Smith et al. (2012) suggested that the workplace should accept that society still places the primary responsibility of parenting and home responsibilities on women and advocated not necessarily for equality for women in the workplace, but equity for women in the workplace. Creating a fair workplace that takes into consideration the pressures on women, is what is important if organizations are going to engage women long-term.

Pas et al. (2014) suggested that highly-educated career women should not be mislabeled as less motivated to advance in their careers simply because they are also balancing a family. Perhaps a woman’s personal definition of advancing in her career is different from the traditional, male-shaped rise through the hierarchy view. London (1983) discussed three dimensions of career motivation: career centrality, career insight, and career ambition. Pas et al. (2014) summarized these definitions as follows: “Career centrality is the importance of a career in one’s life, career insight is the degree to which one makes strategic plans to obtain career goals, (and) career ambition is the will to achieve a higher position in the field” (p. 9). The definition of career success, from an organizational and societal perspective, is often a combination of career insight and career ambition (Pas et al., 2014). The individual, then, is left to balance career centrality based on their personal situation, which, more often than not, changes over time (Pas et al., 2014). All three are factors in motivation. Career success for the organization and career success for the individual are defined differently by both parties. How best to motivate and retain employees is not a *one-size-fits-all* task.

Tip: For help with when and when not to use *italics*, see these [Guidelines on Using Italics](#).

Retention and Job Satisfaction

Retention is closely linked to job satisfaction. Noe et al. (2010) suggested that values and perception are important factors in job satisfaction, emphasizing that job satisfaction is unique to each individual. While customizing the workplace to meet the ideals of every individual is probably not practical, understanding what is important to individuals, or groups of individuals that share similar values, may help companies motivate and retain talented employees.

Tip: Contribute your own ideas and analysis.

For example, life events and personal desires may outweigh professional advancement at a given time in an individual's lifespan. Being employed in an interesting job may be important to the individual, but advancement may not be. This strategy goes against the typical hierarchical progression that is assumed in some motivation and retention policies. Another way of viewing company policies on career paths may be to view rewards based on an individual's value to the company. If employability is more important to the individual than career advancement, and the individual's skills are valuable to the company, exposure to other roles within the company may be a win for the worker and for the company in retaining key talent (Sullivan & Baruch, 2009). In time, these types of retention practices may also change the cultural perception that motivation directly relates to a linear trajectory up the company hierarchy.

Noe et al. (2010) proposed that while not unique to individuals, there are several practices that may help improve working conditions in general, and provide a satisfactory environment. An employee's identification with a job is a contributor to motivation, and a sense of belonging is a contributor to identifying with a job (Katz & Kahn, 1966). Katz and Kahn (1966) noted that an individual's sense of belonging to a group and a sense of being

important to the organization resulted in decreased turnover and absenteeism. Workplace safety, personality fit, task complexity, management support, organizational culture, compensation and benefits are all important factors in employee retention (Noe et al., 2010). When employees are dissatisfied with these factors, they often leave. Turnover is the term used to describe employee voluntary exits from a company.

Katz and Kahn (1966) noted that rewards are motivational only if they link to the desired behaviors, resulting in an individual's desire to continue increasing performance. Random rewards are received more positively by employees, particularly more experienced employees who tend to show more satisfaction when rewards are granted on an intermittent schedule (Latham, 2009). Rewards for system benefits given collectively and rewards for individuals are different, received with different levels of appreciation depending on the individual's needs (Katz & Kahn, 1966). System benefits include salary, health benefits, and cost of living increases (Katz & Kahn, 1966). Individual benefits, such as bonuses or promotions, are based on individual merit (Katz & Kahn, 1966).

These benefits do not necessarily have to be in the form of money. Social rewards, for example a higher title or a bigger office, are just as important in some respects than simply pay itself (Etzioni, 1964). Friedman and Lackey (1991) emphasized that extrinsic rewards importance to the worker, such as perks, prizes, and bonuses are often inflated and suggested that incentives that increase a worker's control over their lives, such as time off or flex-time arrangement, contribute far more to worker satisfaction.

Flex-time, or flexible work policies aid workers in achieving work-life balance. These policies may include flexible working hours, paid leave for family or personal matters, working from home (telecommuting), or other similar practices. Exercising a flexible work

policy is often at the approval of an individual's manager, leaving workers subject to the social expectations of the manager they work for, which often times leaves the worker with very little flexibility (Gill, 2012).

No industry-wide evidence exists that flexible work policies help retain women in STEM professions, although some companies with flexible work policies have been highlighted as good places to work in general. In April 2013, Catalyst, a research organization focused on women in the workplace, published a report that interviewed 726 MBA graduates, both men and women, from 20 Fortune 500 companies to determine the importance of flexible work arrangements for high potentials in the workplace (Beninger & Carter, 2013). Flexible work arrangements are more valued by women than men according to the study conclusions (Beninger & Carter, 2013).

One attractive flexible work policy for women is telecommuting; women are almost twice as likely as men to telecommute during their careers (Beninger & Carter, 2013). The women who do opt to telecommute often consciously downsize their aspirations in the workplace because although their work policy may document telecommuting as an acceptable way of working, men and women who telecommute are not typically rewarded equally when compared with those who work a traditional work week at the office (Beninger & Carter, 2013).

External social support, for families with two full-time working professionals, also seems critical to career longevity and work-life balance (Baumgartner & Scheinder, 2010). The correlation between external support, work-life balance, and career longevity could prove important, as high levels of organizational commitment have been linked to women who also have high levels of social support (Baumgartner & Scheinder, 2010).

Turnover

Lambert and Hogan (2009) suggested that the work environment is very important in shaping people's job satisfaction and organizational commitment. Baumgartner and Schneider (2010) noted that although women progress professionally at the lower levels within an organization, progress becomes somewhat halted at the upper levels, in turn, increasing turnover. Understanding what factors contribute to voluntary turnover in the workforce, and more specifically, in the female workforce, is important background for this dissertation study.

There are two types of turnover, voluntary turnover and involuntary turnover. Both are important to business because they cost companies money. There are many causes of voluntary turnover, both external and internal to organizations. External factors may include, for example, a growing economy where the availability of jobs is high or increasing, a change in personal circumstance, relocation, and many others. Internal factors closely link to job satisfaction attributes such as reward and recognition (Furnham, et al., 2009; Lee, 2012).

Most employers actively manage ways to help prevent turnover because turnover has direct and indirect costs to business (Lambert & Hogan, 2009). Direct costs include recruiting, testing, training, and costs to backfill positions with temporary staff or overtime (Lambert & Hogan, 2009). Knowledge loss, inexperienced staff, and sometimes decreased morale are some of the indirect costs common to and associated with turnover (Lambert & Hogan, 2009). Age is also a factor in turnover, especially in STEM professions, as many STEM workers feel age discrimination is practiced in these professions and is a very real deterrent to staying long-term (Hira, 2010). Turnover rates are higher for women, especially in the earlier stages of their careers (Lee, 2012). However, the differences as to why men and

women leave the workplace are not substantially different, although women are more likely than men to leave their jobs for family-related reasons (Lambert & Hogan, 2009; Lee, 2012).

There is a paradox related to women's satisfaction in the workplace. Women consistently show higher job satisfaction than men overall, but have increased voluntary turnover rates (Lee, 2012). Lee also noted that higher women turnover rates may be a root cause of inequities of the workplace, as the biases related to the value of investing in women become self-fulfilling. Lee also suggested that higher satisfaction rates could merely be a consequence mirroring the fact that the proportions of women that do stay are satisfied.

Barclay, Stoltz, and Chung (2011) proposed that job insecurity and workplace bullying are social factors that contribute to a worker's motivation for voluntary turnover. Barclay et al. also cited factors that link to attitude and perceived control. Barclay et al. suggested factors such as a worker feeling a lack of identity with the career they are presently in, and having the confidence to explore a different career that better fits their present interests and life responsibilities contribute to motivation.

Latham (2009) noted the importance of minimizing demotivation by ensuring people feel fairly treated in the workplace. It is a mistake for organizations to assume that removing a symptom, rather than a cause of a de-motivator, will help, as if the cause persists, another symptom will surface (McClelland, 1984). When people feel like they have been treated unfairly, they begin to have a lack of trust in their workplace (Latham, 2009). Organizations can create trust by being transparent about the distribution of wages, applying company policies consistently, and taking into account employee feedback (Latham, 2009).

The psychological contract between an employee and the workplace takes into account very basic human needs and desires such as being treated with dignity and offering

growth (Latham, 2009). Breaking this contract can be extremely demotivating because of the impact of distrust and violating the basic psychological contract, most likely ending in an employee's decision to leave the company (Latham, 2009). Latham (2009) emphasized that keeping psychological contracts with employees was critical to minimizing employee turnover.

Summary

More research is needed to further understand and address barriers women face within STEM professions. The problems facing women in STEM fields are certainly bigger than any one person, institution, or company. U.S. Federal legislation has helped improve equality in education and in the workforce; STEM professions do benefit from these laws as they help open doors to male-dominated environments. It is what happens once women are in the STEM university and workplace environment that remains troublesome.

Many government-sponsored studies have been done on attracting girls and young women into STEM professions and the University environment. Today, women represent more than half of the college population and entry of women into the university system is increasing, the percentage of women in STEM professions in the workplace remains small compared to their male counterparts. Non-profits, businesses, and universities have further explored why women leave STEM professions. Over the past 15-20 years, there has been a marked shift in the literature, emphasizing the responsibility of private industry to address the deeply rooted cultural and structural barriers to women in STEM fields. The workplace is keen to advertise equal opportunities, flexible workplace policies and environments that welcome diversity and inclusion, but the application of these programs seems inconsistent for women in STEM professions.

Briefly summarize key points of the literature review.

Discuss why your study is important.

The barriers for women in STEM seem fairly consistent over time, with new barriers being added as societal norms seemingly are outpaced by the growth of women in the workplace. Discovering new insights into overcoming these barriers for the women working in STEM is important in addressing retention and motivation and reducing turnover. Arguably, the current workplace motivation models do not address the problems for women in STEM professions, as no evidence exists that any model has addressed how to effectively keep women from leaving STEM professions.

Discuss how your study will contribute to the literature.

Researchers have largely focused on what keeps women from pursuing and staying in STEM professions. The topics covered in the literature review addressed what keeps women from pursuing and staying in STEM professions. However, there is no known research that has examined why some women choose to stay in the STEM field. This study is an opportunity to fill the knowledge gap that exists today regarding what motivates women to actually stay in STEM professions. The goal of this study was to discover a theory and develop a model related to the motivation of women in STEM professions. An overview of the qualitative approach, using grounded theory to discover theory from the data (Glaser & Strauss, 1967), is provided in Chapter III.

Bridge to Chapter III.

Tip: Chapter II is expected to be 30 to 50 pages.

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