PREDICTING THE JOB AND LIFE SATISFACTION OF WOMEN ENGINEERS: A TEST OF LENT'S (2004) UNIFYING SOCIAL COGNITIVE CAREER THEORY OF WELL-BEING

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The undersigned, appointed by the dean of the Graduate School, have examined the dissertation entitled

PREDICTING THE JOB AND LIFE SATISFACTION OF WOMEN ENGINEERS:

A TEST OF LENT'S (2004) UNIFYING SOCIAL COGNITIVE CAREER THEORY OF WELL-BEING

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and hereby certify that, in their opinion, it is worthy of acceptance.

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DEDICATION

This dissertation is dedicated to my parents. Special thanks to my mom, Hyun-Sook Shin, and my dad, Won-Hee Lee.

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I would like to begin by thanking my parents, Won-hee Lee and Hyun-Sook Shin, for their wonderful support ~~for~~ of my education and professional development. As their youngest daughter, I know it was not an easy decision for them to let me explore ~~new~~ my education in the U.S. Thank you for your unconditional encouragement and support along this cross-cultural professional journey. You always believed in me and were with me when I needed your support. Without you, I know that I would not have accomplished all I have.

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Abstract

The current study tested Lent's (2004) unifying social cognitive career theory of well-being among a sample of 377 women engineers in the context of work. Path analysis was used to examine the interplay among contextual supports and barriers (i.e., environmental supports and barriers, work and family conflict, role model), cognitive (i.e., self-efficacy, outcome expectations) variables, personality traits (i.e., positive affect), behavioral variables (i.e., goal-directed activity) as hypothesized in unifying SCCT model. Results indicated that the hypothesized models provided a good fit to the data. Additionally, the current study investigated the direct and indirect effects of unique contextual supports and barriers of women engineers on job satisfaction via key cognitive variables (i.e., self-efficacy and outcome expectation). Results indicated that the indirect effect from environmental supports and barriers, self-efficacy, and outcome expectations on job satisfaction were significant ($p < .05$). Implications for research and practice are discussed in relation to enhance job and life satisfaction among women engineers.

Chapter I

Introduction

Women are an underrepresented group in engineering (Hill, Corbett, & St. Rose, 2010) compared to men. The gender gap in engineering in higher education and the workplace has been a concern for educators and government policy makers in the United States. The loss of talented female engineers is not only a consideration for the personal loss for women's career development, but also for the negative impact on the U.S. economic growth in terms of national competitiveness, global research, and markets. Interestingly, this gender gap has increased in recent years. Female students earn high school math and science credits at the same rate as male students. Female students also earn slightly higher grades in these classes (U.S. Department of Education, National Center for Education Statistics, 2007). However, there is a transitional moment when female students turn away from a STEM career path between high school and college. Many female students are far less likely to plan to major in a STEM major than their male counterparts. For example, according to the National Science Foundation (2008), only 15 percent of all female freshmen reported that they planned to major in a STEM field, compared to 30 percent of all male freshmen.

Unfortunately, this gender disparity in science and engineering work fields is even more severe after graduation. After gaining a bachelor's degree in engineering, fewer female students seek work in engineering. Research shows that women comprise nearly 20% of engineering graduates. However, only 11% of professional engineers are women (National Science Foundation, 2011). This low percentage of women engineers has not changed for nearly 20 years, even though the percentage of women who earn bachelor's

degrees in engineering has increased from 17.3% to 20.1% from 1995 to 2010 (National Science Foundation, 2011). Women engineering graduates are not persisting in engineer careers after starting work in engineering fields or are not choosing to enter engineering fields after graduation. These assumptions are supported by previous research and statistics. The Society of Women Engineers (SWE, 2007) reports that 25% of women who enter engineering career fields decided to leave their job after the age of 30. This percentage is much higher than the 10% of male engineers who left engineering. Fouad at el. (2011) also reported that15 % of engineering women graduates never entered an engineering field after receiving a degree in engineering in a study among 560 engineering female graduate participants. Among them, most women (80%) who had never entered an engineering field chose to work in non-engineering positions not related to their major. This shows that women have been systematically filtered out from the engineering workforce compared to men after graduation.

Given this occupational pipeline, which continues to narrow from secondary education to the labor force among women engineers, there is a social need to examine factors that influence the job satisfaction among women engineers. Lower job satisfaction eventually leads to higher turnover and a loss of talented women in the engineering workforce (Hill, Corett, & Rose, 2010). Unfortunately, there are relatively few studies to examine what happens to women after graduation in engineering, and what makes women engineers decide to leave engineering jobs, especially in terms of job satisfaction and some contextual barriers.

Several studies have been conducted to examine the contextual or organizational factors that increase job satisfaction and persistence of women engineers. Most of these

studies have focused on contextual supports and barriers in terms of facilitating job satisfaction. Among them, workplace support is one of the key factors that influence job satisfaction. For example, Fouad and her colleagues (2011) found that the most satisfied women engineers were more likely to perceive support from supervisors and co-workers, and the least satisfied women engineers were more likely to experience the feeling of their efforts being systematically undermined by their supervisors and co-workers. In addition, Trauth, Quesenberry, and Huang (2009) examined three important organizational factors that affect women's retention in the engineering IT workplace by conducting interviews with 92 women engineers. These researchers found out that three organizational factors, work-life balance, organizational climate, and mentoring, mainly influenced the persistence of women engineers in the workplace. These factors can be related to women engineers' job and life satisfaction in general.

Work-life balance refers to "negotiation of time and energy demands between one's professional and personal lives" and "management of work-family conflicts" (Trauth et al., 2009). In general, most American workers (95%) reported that they experience work-family conflicts (Williams & Boushey, 2010). However, work-family balance and management of work-family conflicts were more significant to women scientists because women scientists who perceived high levels of work-family conflict were more likely to leave their job when compared to their male colleges (National Science Board, S & E Indicators, 2004). Furthermore, this result also supports women engineers' experience. Work-life imbalance is associated with reduced job satisfaction (Thomas & Ganster, 1995), increased job stress (Armstrong et al., 2007), and influenced well-being in negative ways (Igbaria et al., 1994) of women engineers. Webster (2002)

discussed that even though the family structure and expectations for female roles can vary by cultural context, most women continue to be expected to provide the primary role of caregivers for domestic and childcare responsibilities. Thus, work-life balance is the essential factor that may also affect women's underrepresentation in the engineering field.

Another key factor that influences job satisfaction among women engineers is organizational climate. Organizational climate is somewhat distinct from organizational culture (Sparrow, 2001). Organizational culture refers to "a pattern of shared basic assumptions that is considered valid and used as a mechanism to perceive, think, and feel about organizational problems" (Schein, 2004). On the other hand, organizational climate refers to more implicit and reflects the distinctive patterns or regularities of behavior that is rooted in an organization's underlying values, beliefs, and assumptions (Denison, 1996). Ahuja's (2002) reviews indicated that unwelcoming, male-dominated, hostile organizational climates negatively influence women engineers' job satisfaction and persistence in their career. Interestingly, the organizational climate was not a gender neutral experience (Roldan et al., 2004). Due to the characteristics of engineering fields, "masculine values systems" caused unwelcoming climates to women engineers, and women were more likely to be physically and psychologically marginalized or excluded (Morgan, 1998). Similar findings have also been reported that male-centered working conditions and organizational climates affect the work satisfaction of women engineers (Tattersall et al., 2006) in other countries.

There is considerable research to highlight the importance of mentoring in order to retain women engineers in the workforce. Even though mentoring has been reported to

be correlated with professional advancement in engineering professional work fields for both men and women (Sumner & Werner, 2001; Allen et al., 2006), women are more likely to successfully maintain their career when exposed to a role model who is successful in their field and who can be emulated (Marx, Stapel, & Muller, 2005). However, due to the skewed gender ratio, it is not easy for women engineers to find women mentors in their career fields. Lyness and Thomson (2000) reported that women professionals in engineering are more likely to experience mentoring barriers than male professionals. Also, female executives reported that their mentoring experiences were less effective than their male peers. Ahuja (2002) highlighted that the absence of mentoring is one of major barriers to women engineer's retention and suggests that mentoring contributes to women careers' advancement in engineering. Previous studies suggested that female role models improve women's attitudes toward STEM fields (Stout et al., 2011) and protect their performance from negative stereotypes in male-dominant work fields (Marx & Roman, 2002).

Though some of the studies related to organizational factors have been conducted with women in engineering, no empirical research with integrative perspectives has been conducted to examine the social, cognitive, affective, and behavioral aspects together among women engineers beyond graduation. Increasing women's job satisfaction in the engineering workforce is a critical area of intervention for women engineers' persistence. Among vocational career theories, the unifying social cognitive theory of well-being (Lent, 2004) captures these psychological processes, including the social, cognitive, affects, and behavioral parts. Lent's (2004) model provides a solid theoretical framework in terms of structures and relations among cognitive contributors (e.g., personal control

beliefs, future outcome expectancies, goal mechanisms), personality traits and affective contributors (e.g., positive affectivity, negative affectivity, extraversion, optimism) behavioral contributors (e.g., goal-directed activity), and social contributors (e.g., social support, goal-relevant resources, modeling, encouragement, barriers). Also, Lent (2004) highlighted the importance of applying this theoretical model to fit to a specific domain, because this model was developed with a context-free construct. Lent and Brown (2008) developed a proposal of a unifying social cognitive career model of well-being in the context of work, using work satisfaction as domain-specific well-being. They hypothesized that personality or affective traits are related to job and life satisfaction via cognitive, affective, behavioral, and social paths. More specially, this model includes seven sets of key variables to examine work satisfaction in the work-domain: (a) work satisfaction, (b) overall life satisfaction, (c) personality and affective traits, (d) goal-directed activities, (e) self-efficacy, (f) work conditions and outcomes, and (g) goal-and efficacy-relevant environmental supports and obstacles. To date, there has been no study to test this integrative social cognitive career theory model in engineering. Only two studies (Duffy & Lent, 2009; Lent et al., 2011) have tested the application of this model to a work domain, specifically using sample Italian teachers and U.S. teachers. In terms of participation, these two studies examined the model with both male and female teachers. Even though the majority of these two studies were female teachers, women engineers' cognitive process could be different from previous studies because the teaching work field is a female-dominated, and engineering is a male dominated field. Thus, it is necessary to examine this integrative social cognitive career theory of well-

being among women engineers to expand the understanding of the cognitive, behavioral, affective, and social aspects of women engineers that contribute to their job satisfaction.

As mentioned above, though there was no study to test the unifying model of social cognitive career theory of well-being in the engineering fields, there are a few studies that have been conducted to examine unifying social cognitive career theory model of well-being with college students in STEM fields in educational domains. Previous studies reported the good overall fit to the data with the unifying social cognitive career theory model to examine academic satisfaction in engineering fields (Lent et al, 2003; Lent et al., 2005, Lent et al, 2010). The major variables of the unifying SCCT model examined in the engineering and computing science fields were engineering self-efficacy, engineering outcome expectation, academic goals, interests, support, and barriers, and it was explored how those variables increase academic satisfaction.

Inconsistent results have been reported related to outcome expectation. Outcome expectation was reported as useful predictors of interests or choice with STEM students (e.g., Byars-Winston et al., 2010; Quimby, Seyala, & Welfson, 2007). However, Lent et al. (2011) reported that outcome expectations did not significantly predict interests or choice goals among computing major students. The paths between outcome expectation and interests or choice goals were also not significant in other studies with engineering students (Lent et al., 2003, 2005; Schaefers, Epperson, & Nauta, 1997) and computing students (Lent et al., 2008). The reasons for the inconsistencies related to outcome expectation are unclear. Considering the possibility that engineering educational and work settings might not be gender neutral between female and male students' experiences in an engineering educational setting, the outcome measurement of previous studies

might be unable to accurately capture the types of potentially gender different outcome expectations because it used one measure for both female and male engineering students.

Inconsistent results have also been found in the relation between contextual supports and barriers and choice goal activities. Lent and colleagues (2003) reported that contextual barriers and supports explained 56% of the variance in self-efficacy beliefs and were indirectly related to interests and goals via self-efficacy. On the other hand, another study with computing science college students suggested that contextual barriers and supports had both direct and indirect effects on goals via self-efficacy (Lent et al, 2008). Interestingly, prior research has found that paths in a model were different between female and male engineering college students. Social support was a significant predictor in making major choice goals for female engineering students. However, the path from social support to major choice goal was not significant for male engineering students (Lent et al., 2005). Due to a lack of studies examining these gender differences, it is critical to further explore the interplay of key cognitive variables and social and contextual variables between women and men in both the engineering educational domains and the work domains.

In addition, the role of positive affect in the unifying social cognitive career theory model needs to be explored more in an engineering context. Lent, Traveira, and Lobo (2011) tested the longitudinal relationships with 158 Portuguese college students, and found the significant direct path from positive affect to goal progress. Positive affect was changed over time being affected by self-efficacy and social support in the longitudinal studies.

In summary, given the paucity of empirical studies for female engineering students beyond graduation using integrative perspectives, testing the unifying social cognitive career theory model may be critical in making interventions for maintaining a talented women engineer workforce. The current study fills several gaps of previous studies in the engineering domain. First of all, in previous engineering literature, there was no study examined cognitive, behavioral, social-contextual, and affective contributors to both job and life satisfaction of women engineers, though a few studies separately examined one of these outcomes by focusing on contextual organizational factors. Thus, the current study provides an integrative understanding of this population. Secondly, even though engineering fields are not gender neutral career fields, there has been a lack of studies to examine gender differences that focus solely women engineers' experiences. Thus, this study highlights the unique career barriers and supports of women engineers and how these contextual factors interplay to increase job satisfaction. Thirdly, this current study extends previous SCCT empirical studies in terms of sample population. A significant limitation of previous SCCT studies is the application of this model to a working population, because the SCCT model has been mostly tested with collage populations. Thus, this study extends the applicability of the SCCT model from a college sample to workers beyond college graduation. Lastly, this study contributes to further explore the inconsistent results from previous SCCT literature, especially the relations among key cognitive variables, contextual variables, and affective variables.

Purpose of the present study

The primary purpose of the present study is to test Lent's (2004) integrative model of psychological well-being among women engineers in the context of work. This

model mainly examines the interplay among seven sets of variables: (a) life satisfaction, (b) work satisfaction, (c) personality and affective traits, (d) goal-directed activity, (e) self-efficacy, (f) work conditions and outcomes, and (g) goal-and efficacy-relevant contextual supports and barriers. A secondary purpose of the present study is to investigate the unique contextual supports and barriers of women engineers (e.g., same gender role model, work and family balance, environmental supports and barriers) that have not been examined before. Specially, the current study investigated the direct effect and indirect effect of contextual supports and barriers on job satisfaction via cognitive variables in unifying the social cognitive career theory model among women engineers. The following hypotheses are proposed (See Figure 1):

Hypothesis 1: The hypothesized structural model will provide a good fit to the data.

Hypothesis 2: Unique contextual supports and barriers of women engineers directly and indirectly predict job satisfaction via key cognitive variables (i.e., self-efficacy and outcome expectation).

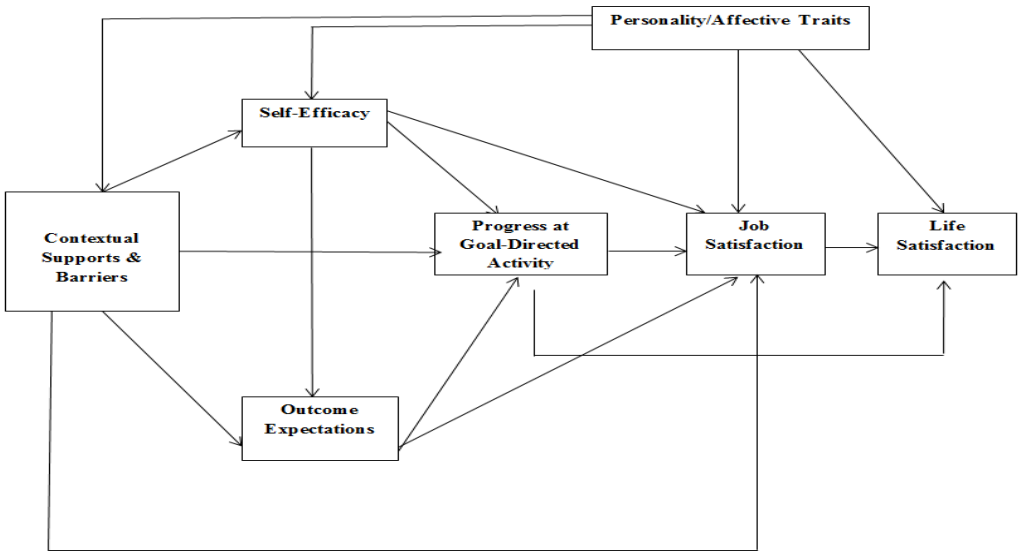

Figure 1. The Proposed Unifying Social Cognitive Career Theory Model of Well-Being.

Chapter II

Literature Review

This chapter provides an integrative literature review of variables used to test a psychological well-being model of Lent's (2004) Integrative Social Cognitive Career Theory (SCCT) within the domain of the engineering work field. This chapter begins with a brief description of the theoretical framework, the unifying Social Cognitive Career Theory of Well-being, and follows with empirical related to the theory. Next, a review of empirical studies on Social Cognitive Theory (SCCT) in engineering domain are highlighted, and social-context contributors to the career development of women engineers and the work and life satisfaction of women engineers are reviewed.

In sum, this chapter provides an emphasis on job satisfaction and psychological well-being, followed by a discussion of previous and current studies related to major constructs that will be tested in the current study in terms of cognitive, behavioral, personality, and social-context contributors.

Theoretical Framework: Integrative Social Cognitive Career Theory

Lent (2004)'s integrative social cognitive career theory model of well-being and psychosocial adjustment provides a strong theoretical framework for subjective well-being based on the basic principles of SCCT (See Figure 1). Lent (2004) proposed two different models, one is the model of normative life conditions and another is the model of restorative well-being. Both models explore the contributions of personality, affective, and social cognitive variables to well-being. Based on this theoretical framework, Lent and Brown (2008) applied the integrative SCCT model under the normative life conditions to the work domain. The present study will test the applicability of integrative

SCCT model based on Lent and Brown's (2008) specific work-domain model and explore the main predictors of work satisfaction among women engineers.

Life satisfaction. Ryan and Deci (2001) differentiated between two different perspectives of well-being. One is the *eudaimonic* perspective that was inspired by Aristotle and focuses on actualizing human potential. The focus of this perspective is more on cognitive and behavioral process rather than feelings. Eudaimonic well-being has been studied mainly through Ruff's theory of psychological well-being (Ryff & Keyes, 1995). Another one is the *hedonic* perspective that was inspired by Aristippus and is focused on the experiencing maximal pleasure or on the balance between positive and negative affect. Hedonic well-being has been studied mainly through Dinner's subjective well-being scale (Diener et al., 1999). The present study will employ a hedonic perspective to measuring well-being and psychosocial adjustment of women in engineering because it is a clearly defined and validated approach to measuring general life satisfaction (Dinner, Emmons, Larsen, & Griffin, 1985). Related to work satisfaction, Heller, Watson, and Ilies (2004) suggested a bi-directional path between work satisfaction and general life satisfaction. For example, people who are generally happy are likely to find happiness in their work place and people who are satisfied with their job are likely to find happiness in their life.

Personality and affective traits. Lent's (2004) model assumes that personality and affective traits affect domain and life satisfaction directly and indirectly via cognitive, behavioral and social processes. Studies reported that job and life satisfaction are related to positive and negative affective traits (Connelly & Viswesvaran, 2000; Thoresen, Kaplan, Barksly, Warren, & De Chermont, 2003) and to several Big Five

factors (neuroticism, extraversion, and conscientiousness; Heller et al., 2004). In addition, self-efficacy (Judge & Ilies, 2002) and environmental factors such as perceived work atmosphere or environmental supports (Warr, 1999) are related to positive and negative affectivity and the Big Five factors. For example, people who have a tendency to experience positive affect are more likely to view their personal competency and environmental supports more favorably than do those with high negative affect. Therefore, the present study examine a direct path from positive and negative affect to job and life satisfaction and an indirect path from positive and negative affect to job and life satisfaction via self-efficacy and perceived work environments.

Goals and goal-directed behavior. Goals have been defined as the determination to pursue a particular outcome or to achieve a particular level of performance (Bandura, 1986; Locke & Latham, 1990). This definition refers to "consciously articulated, personally relevant objects that individuals pursue in their daily lives" (Elliot, Sheldon, & Church, 1997, p. 915). The goal construct has been highlighted in previous studies related to subjective well-being (Ryan & Deci, 2001; Diener et al., 1999; Sheldon & Kasser, 1998). The theory hypothesizes that making progress in valued work goals enhances domain specific satisfaction and life satisfaction. Also, cognitive variables that represent competency or environmental mastery beliefs affect goal and goal-directed behavior variables (Synder, Rand, & Sigmon, 2002). For example, people who have strong beliefs about one's capability tend to be involved in goal-related activities. Cantor and Sanderson (1999) reported that environmental resources and perceived positive work condition can enhance people's goal progress. As seen in previous studies, goal and goal-directed behavior might be the essential behavioral element mediating cognitive, social

environmental variables on job and life subjective well-being. Therefore, this present study assumes that goal and goal-directed activity directly affect work satisfaction and general life satisfaction. In addition, the meditating role of goal directed activity between social and environmental variables (e.g., environmental resources and support), cognitive variable (e.g., self-efficacy), and outcome expectation (e.g., perceived work condition) and work satisfaction will be examined in current study.

Self-efficacy. Self-efficacy refers to personal beliefs about one's capability to achieve their goals or goal directed behaviors. The original concept of self-efficacy was drawn from social cognitive theory (Bandura, 1997). In social cognitive career theory self-efficacy highlights the agent role of individuals in the interplay among environmental factors, personality affective traits, and goal directed behaviors and work satisfaction (Lent & Brown, 2008). Previous studies have highlighted that self-efficacy is directly associated with job satisfaction (Caprara, Barbaraneli, Borgogni, & Steca, 2003) and indirectly affect job satisfaction by motivating goal-directed behavior or enhanced outcome expectation such as perceived work condition in the context of work (Lent & Brown, 2008).

Expected or received work outcomes. Lent (2004)'s integrative model of psychological well-being includes the major social cognitive constructs that appear in the earlier SCCT model (Lent et al., 1994) such as self-efficacy, goals, person inputs, contextual factors, and outcome expectations. In the integrated subjective well-being model in the context work, outcome expectations are subsumed under perceived working conditions and outcomes representing what one expects and what one received from work (Lent & Brown, 2008). Singer and Coffin (1996) found that positive outcome

expectations are associated with work satisfaction. Furthermore, Lent and Brown (2008) suggested that the perceived work conditions or outcomes may indirectly influence satisfaction by enhancing goal-directed behavior. Thus, this present study explores the direct path from perceived working conditions and outcomes to goal directed activities and work satisfaction.

Goal-and efficacy-relevant environmental supports and obstacles. Goal and efficacy-relevant environmental supports and obstacles are subsumed under social variables. Social variables include social connectedness (Lee & Robbins, 1998), social support (Brunstein, 1993), and racial and gender barriers (McWhirter et al., 1998). Environmental supports and obstacles are hypothesized to facilitate or hinder pursuits of one's personal goal and goal-directed activity or affect self-efficacy (Lent & Brown, 2008). Studies reported that goal-relevant supports and environmental resources tend to facilitate subjective well-being (Cantor & Sanderson, 1999; Diener & Fujita, 1995), and obstacles or barriers that hinder goal progress and goal-directed behavior may diminish work satisfaction (Lent & Brown, 2008). Related to women's career development, Lent et al. (1994) suggested that social support variables influence nontraditional career self-efficacy in pursuing nontraditional career related tasks for women. Therefore, this study is designed to test the influence of social variables such as emotional support from significant others and perceived barriers experienced by women in male-dominant careers to cognitive variable, behavioral variables, and work satisfaction.

Unifying Social Cognitive Career Theory of Well-Being in Education and Work Domain: Review of the Empirical Literature

Educational settings. Based on the Lent's model (2004), a small set of studies have examined social cognitive perspectives on well-being in educational or work settings. Most of these studies examined the academic and educational satisfaction among college students.

Lent et al. (2007) tested social cognitive factors to academic and overall life satisfaction in 153 engineering students at a large eastern university. Among 153 students, 124 were male (81%) and 21 were female (13%). Students were enrolled in an introductory engineering design course, and most (74%) were primarily first-year students. In terms of ethnicity, 68% were White, 5% were African American, 17% were Asian American, and 3% were Hispanic. This study tested the hypothesis that self-efficacy, outcome expectations, and social support would predict academic satisfaction indirectly via their relations to goal progress that would serve as an essential precursor of academic satisfaction. The results of this study generally supported the utility of social cognitive model of academic satisfaction among engineering students. Consistent with hypotheses, self-efficacy, academic goal progress in engineering major, and environmental supports significantly predicted the academic satisfaction of engineering students. However, outcome expectation did not significantly predict goal progress or academic satisfaction. The researchers questioned whether the measure of outcome expectations presents the important ideas that students expect to obtain from their engineering major and suggested using alternate measures of outcome expectations or reward attainment. This is the only study to test social cognitive career theory of well-being with an engineering population, though this study did not include the trait affectivity in the model.

Lent and his colleagues (2005) conducted two studies to examine the core variables of social cognitive career theory of well-being among college students. Students were enrolled in introductory psychology classes at a large eastern U.S. university, and most were first-year (67%) students. The findings indicated that life satisfaction was predicted by academic-domain social cognitive variables such as self-efficacy, perceived goal progress, environmental supports and resources . Also, this study found that positive affect contributed to the prediction of academic and life satisfaction. However, outcome expectations did not predict academic satisfaction directly nor indirectly via goal progress.

With college populations, there were two studies that extend the literature on the effect of social cognitive factors of academic adjustment and life satisfaction through longitudinal analysis. First, Lent at al. (2009) explored the academic adjustment and life satisfaction of Portuguese college students. Participants were 252 students enrolled in undergraduate studies in either psychology (n = 129), pre-medicine (n = 24), or education (n = 99) at a university in northern Portugal. The sample was diverse in terms of year at college, including 48 freshmen, 76 sophomore, 46 juniors, 81 seniors, and one special status students. In terms of ethnicity, 90% of the participants were Portuguese. The unique aspect of this study was to expand the definition of academic well-being to include perceived academic adjustment and stress as well as life satisfaction. The result indicated that positive academic adjustment predicted overall life satisfaction. Academic adjustment was predicted by academic self-efficacy and by environmental supports for students' academic goals. Though goal progress did not directly predict academic adjustment, stronger self-efficacy and environmental supports predicted goal progress.

Interestingly, self-efficacy and positive affect bi-directionally predicted each other: That is, higher self-efficacy predicted positive affect and high positive affect predicted high self-efficacy. In addition, environmental supports predicted positive affect, but environmental supports were not predicted by positive affect. Thus, this study shows that positive affect and academic adjustment, which was defined as academic satisfaction, overall academic functioning, and less academic stress could be enhanced by self-efficacy and perceived environmental social supports.

Second, Lent, Traveira, and Lobo (2011) tested a social cognitive model of well-being in two studies with Portuguese college students. The study was a cross-sectional study to test academic self-efficacy, environmental support, goal progress, academic satisfaction and stress, positive affect, and overall life satisfaction with 366 students. Participants included 94 female students and 271 male students who were enrolled in engineering (n = 311), psychology (n = 48), and education (n = 7). Most were freshmen (n = 125) and sophomore (n = 132), and others were juniors (n = 83), seniors (n = 14), and special status students (n = 12). The results were consistent with previous studies such that self-efficacy and environmental supports predicted goal progress. In addition, positive affect explained an additional 5 % of the variance in goal progress. Positive affect predicted environmental supports and self-efficacy as well. However, goal progress did not directly relate to academic satisfaction, but goal progress predicted life satisfaction indirectly through academic stress.

The second study of Lent, Traveira, and Lobo (2011) examined the longitudinal relationships in the model with 158 Portuguese college students (67 men, 91 women) who were enrolled in psychology (n = 80) or engineering (n = 78). The participants were

85 freshmen and 73 sophomores. This study examined the academic self-efficacy, goal progress, environmental support, academic satisfaction, academic stress, life satisfaction, and trait positive affect at two times with a 15-week interval. The autoregressive path (i.e., the relation of each variable with itself between times 1 and 2) explored among positive affect, environmental support, self-efficacy, goal progress, academic satisfaction, academic stress, and life satisfaction. The autoregressive path coefficients for these variables were stable over the 15-week interval time period. T1 positive affect did not significantly predict T2 self-efficacy, academic satisfaction, stress, or life satisfaction. In addition, T1 goal progress did not produce significant variance in T2 academic satisfaction, stress, or life satisfaction. Also, they conducted a cross-sectional test with this sample. Interestingly, only environmental support predicted academic satisfaction, and only self-efficacy significantly predicted stress. Self-efficacy and environmental support predicted positive affect and positive affect also predicted self-efficacy and increase to the behavior which facilitated environmental support. However, goal progress did not produce a significant path to self-efficacy.

This longitudinal study showed that T1 positive affect predicted T2 support, T1 self-efficacy and environmental support predicted T2 positive affect. Self-efficacy and social support were significant predictors in positive affect over time. Interestingly, the results of study presented that T1 environmental support did not predict T2 self-efficacy, which was not inconsistent with previous study (Lent et al., 2009).

Work domain setting. Thus far, there have been two studies that tested the unifying social cognitive career theory of well-being in work domains. Both studies tested this model with teacher populations are in the U.S and are in Italy. Duffy and Lent

(2009) collected data from 366 U.S. teachers in the North Carolina. Most were female teachers (80%). The range of teaching experience varied from 1 to 42 years. In terms of ethnicity, more than 90%were White. This study hypothesized that five sets of predictor variables, self-efficacy, positive affect, goal progress, goal-related support, work conditions [person/organization (P/O) fit and needs/supplies (NS) fit] would predict work satisfaction. This study is the first to include goal self-efficacy along with task self-efficacy and general teacher self-efficacy in terms of predicting work satisfaction. The results of this study were consistent with previous studies that perceived organizational support (Rhoades & Eisenbeger, 2002), positive affect (Connolly & Visweswaran, 2000), and self-efficacy (Lent et al., 2005; Lent et al., 2007) predicted job satisfaction. The relations of goal support and self-efficacy to work satisfaction were mediated by work conditions.

Lent et al. (2011) conducted the second study with 235 Italian teachers. Most were women (80%). The findings of the study supported the results of Duffy and Lent (2009) in terms of good model fit and the effect of work condition, self-efficacy, and positive affect on job satisfaction. However, different than Duffy and Lent's findings with U.S. teachers, self-efficacy did not significantly predict job satisfaction, and self-efficacy indirectly predicted job satisfaction via work conditions. Furthermore, similar to the findings of Duffy and Lent (2009), positive affect was significantly related to self-efficacy. This finding suggests that positive affect could enhance self-efficacy and environmental support.

Empirical Studies for Social Cognitive Career Theory (SCCT) in Engineering

Due to the lack of empirical studies of the unifying social cognitive career theory with engineering sample, this section examined the empirical studies related to engineering with social cognitive career theory (Lent, Brown, & Hackett, 1994) in order to extend the perspectives to understand social cognitive variables in this career domain. Social Cognitive Career theory (SCCT; Lent, et al., 1994) was developed from Bandura's (1986) social cognitive theory and Hackett and Betz's (1981) career self-efficacy theory. SCCT (Lent, et al., 1994) hypothesized the influence of personal and contextual and environmental factors on producing core sociocognitive factors such as self-efficacy and outcome expectation to affect interest, goal and finally performance attainments. Self – efficacy is the key concept of the SCCT model. This theory originally highlighted the development of interests, the choice of educational and career options, and performance and persistence in educational and vocational fields. This model posits that career interests directly affect vocational goals and that educational or career self-efficacy predicted goals.

SCCT is a relatively new career theory and very useful theoretical framework to examine the contextual, sociocognitive factors and behavioral factors related to the vocational issues of diverse sample. Several studies have tested this model with diverse race and ethnicity sample (e.g., Flores & O'Brien, 2002; Fouad & Smith, 1996, Gainor, & Lent, 1998). Recently, Lent and his colleagues (Lent et al, 2003; Lent et al., 2010; Lent et al. 2007) tested the SCCT model among college students in engineering and computing sciences. Lent and Brown (2006) suggested that SCCT researchers need to

design or develop new measures that take into account the unique characteristics of the specific domain of interest and level of details that researchers want to examine in their study. Thus, Lent and his colleagues developed engineering-specific measures that were adapted from academic milestones measures (Lent et al., 2001; Lent et al., 2003).

The common measures that have been used in research with college engineering students were engineering self-efficacy, outcome expectation, social support and resources, barriers, interest, goal and academic satisfaction or persistence in engineering majors. Among these key variables, empirical findings have supported the linkage between socio-cognitive factors and academic satisfaction or persistence in engineering domain. For example, Lent et al. (2003) found that engineering self-efficacy and coping efficacy were significant predictors of engineer interest. In addition, Lent et al. (2008) tested the SCCT model with computing science college students. The data fit of the model well. An analysis with the full sample found that the SCCT model explained significant variance in computing students' interest (40%) and persistence goals (33%). This result is consistent with the previous studies in where the choice model accounted for 37-38% of the variance in interests and 34-35% of the variance in choice goal for engineering majors (Lent et al., 2003; Lent et al., 2005).

There are inconsistent finding related to the outcome expectations variable in the SCCT engineering domain. Lent et al. (2003) reported that outcome expectations did not have a significant effect on interests, goal, and persistence. This result was supported by other studies of engineering college students (Lent et al, 2005; Lent et al, 2007; Lent et al, 2011; Schaefers, Epperson, & Nauta, 1997) and computing science students (Lent et al, 2008).

On the other hand, outcome expectations were reported to be a useful predictor of interest or major choice in other previous studies with STEM college students (e.g., Byars-Winston et al., 2010; Quimby, Seyala, & Wolfson, 2007). However, these inconsistent results between outcome expectation and major choice in previous studies have not been clearly explained. Lent et al. (2011) questioned the accuracy of the outcome expectation measure when it captured the most compelling types of expected outcomes that would be applicable to engineering students. The original concept of "outcome expectancies" refers to people's belief about the anticipated positive or negative events, however, outcome expectation as measured in Lent's study represented anticipated positive aspects with engineering. Another possibility is that outcome expectation could differ from gender. For example, female students who have high engineering self-efficacy might have not only positive outcome expectation, but also negative expectation such as higher anticipated work-family conflict or negative social stigma as engineering female students compared to male students. Thus, more studies need to explore the reasons for these inconsistences in the predictive utility of outcome expectations in the SCCT model.

In terms of examining group differences, Lent et al. (2008) tested the SCCT model across gender, educational level, and university groups in a sample of students in computing disciplines. Among the 1208 students, 70% were male and 30% were female. The model fit across gender indicated adequate and comparable fit in both the constrained and unconstrained measurement models suggesting structural equivalence across gender group. Also, the structural coefficients were invariant across male and female students. However, Lent et al. (2005) indicated a difference in the relation

between social support and goal across gender group. In this study, social support was significant in predicting female students' major choice goal, however, it was not significant for male students. Thus, more studies would need to further explore about the effect of contextual variables on goals across gender groups. Furthermore, the different sample size between female and male students could affect the path coefficients among SCCT model. It would be important to consider the gap of sample size when comparing groups' paths.

Also, Lent et al. (2008) study examined the measurement and structural invariance across educational level (i.e., first and second year students vs. those in their third year and beyond) on the SCCT model. The constrained and unconstrained measurement models did not differ significantly among groups and structural coefficients of SCCT model also did not vary across educational levels.

Lastly, Lent et al. (2008) examined differences in model fit as a function of university type (i.e., PWIs vs. HBCUs). After testing measurement equivalence, the model did not differ from university types, and the structural paths were comparable across university type. However, Lent et al. (2005) presented the path between support and barriers was larger in the sample of student attending a Historically black college and universities than students at a predominately White university, suggesting that the social support provided from HBCU environment may be helpful in counterbalancing social barriers.

Some inconsistent findings related to environmental factors have been reported in SCCT studies among engineering students. Lent et al. (2001) defined contextual support and barriers as environmental factors that individual perceive as having the potential to

assist or block their efforts to implement a particular educational or occupational goal. Lent et al (2008) reported that contextual support and barriers in engineering or computing science students yield direct paths to goals. However, previous studies (e.g., Lent et al., 2005) supported the Bandura's (1999, 2000) hypothesis that contextual support and barriers related to goals indirectly through self-efficacy. Another limitation pertains to sampling. Most of previous studies (Lent et al., 2003; Lent et al., 2005, Lent et al, 2007; Lent et al., 2008; Lent et al., 2010) on engineering have tested the SCCT model with the college students enrolled in engineering introductory classes. Thus, the main target populations in these studies were freshmen. Further, there is some limitation in terms of testing social cognitive factors related to actual commitment in engineering because college students can easily change their major. The studies explore outcome expectation or planning to career goal (persistence or nonpersistence). These concepts are the perception or thinking for the future and may not represent their behavioral commitments.

In addition, previous studies did not enough pay attention to gender issues. Most of previous studies in engineering (Lent et al., 2003; Lent et al, 2007; Lent et al., 2008; Lent et al., 2010; Lent et al., 2011) tested the SCCT model with combined samples of female and male engineering students. However, female engineering students and male engineering students' experiences related to contextual, socio cultural variables, and behavior variables could be different across gender compared to gender-neutral education or career fields. To back up this, Luzzo and McWhirter (2001) highlighted that women perceived significantly greater career-related barriers than men. Lent et al. (2005) found out that social support directly influenced major choice goals for female engineering

students, but there was no significant effect from social support to major choice goal for male engineering students. However, few studies examined only female engineering students' experience using the SCCT model. Some studies are necessary to examine the unique experiences related to contextual, socio cultural variables, and behavior variables of women in engineering.

Contextual Factors of Women Engineer's Well-Being: Barriers and Supports

Contextual supports and barriers are defined as environmental factors that individual perceived as having to assisting or blocking from their efforts to enhance a particular occupational or educational goal (Lent et al, 2000). In previous studies related to women engineers, contextual support and barriers are critical factors because women engineers face unique career barriers and challenges that affect their job satisfaction, eventually causing many to leave engineering. For example, Fouad (2007) reported that empirical research has consistently indicated that environmental socialization experiences result in female's efficacy being undermined in non-traditional fields for women. Women engineers or women in nontraditional fields are more likely to be discouraged from participating in their work (Blickenstaff, 2005). Vocational psychologists have begun to examine engineering-related barriers and supports associated with self-efficacy, coping efficacy, outcome expectation, and interests (Lent et al., 2003) among college students. These studies have examined the effect of on engineering-related self-efficacy, which in turn affects interests, goals, and persistence in engineering.

Lent et al. (2005) reported that the female engineering students perceived more social support and fewer barriers related to pursuing a career in engineering than male students. This result implies that environmental factors including supports and barriers

could be influential to in female engineering students' career development in engineering. Contextual support and barriers are essential factors that need further examination in engineering, especially women engineers because women anticipate significantly more career-related barriers than men peers (AAUW, 2002).

Fouad et al. (2010) highlighted the importance of barriers and supports in persisting in STEM-related fields. Her research team identified male and female perceptions of the barriers and supports for pursing a math and science related major or career. In addition, she also examined the gender differences in perceptions of supports and barriers at three different education levels: middle school, high school, and college. A taxonomy was derived from coding the interviews of 113 students. The final taxonomy included five major domains of barriers and support in continuing math and science: (1) parental and familial influence, which included encouragement from parents on homework and parental knowledge in math/science, (2) institutional and school influences, which included teaching methods, encouragement from teachers and counselors, and classroom learning environment, (3) financial and environmental influences,which included opportunities and resources for extracurricular activities and perceptions of gender role stereotypes, (4) social influences included peer influences and role models, and (5) internal influences included interests in and perceptions of difficulty in math and science subjects.

Significant gender differences or gender and educational level interactions were not found though a significant main effect was presented for educational level differences for both barriers and supports in math and science. Interestingly, Fouad et al. (2010) found that barriers and supports differ from educational level. For example,

teachers/instructor influence is critical at all educational levels, however, the teaching methods exert stronger influences over time. Even though this study did not find that significant gender differences in perceptions of supports and barriers, it is necessary to explore the gender differences among workers beyond college because experiences of gender may be more obvious in the working setting versus school settings.

Unfortunately, there are few studies that have examined the perception of difference of environmental supports and barriers for workers, especially engineers using the SCCT model. Related to the challenges that women engineer face, literature has been highlighted environmental factors, especially organizational/institutional factors. For example, organizational factors (e.g., organization size, climate, and environment) negatively affect women's persistence in engineering fields because women engineers perceive an unwelcoming, male-dominated, hostile organizational environment (Ahuja, 2002). Furthermore, women of color in STEM fields might experience additional challenges related to ethnic discrimination (Ong et al., 2011). In addition to organizational, Webster (2002) found that traditional family structures and expectation for traditional female roles made women engineers to feel difficult for making a balance between work and their personal lives. Finally, women engineers report feelings of isolation due to the lack of the role models in their field. Thus, this section will review three major contextual challenges of women engineers in organizational and societal settings in previous literatures of engineering fields: organizational culture, isolation, and limited role models.

Organizational culture. In engineering and engineering related fields, the unwelcoming climate of workplace is one of the essential factors that discourage women

engineers from pursing and remaining in this field (Fassinger, 2001). Also, Tapia et al. (2004) reported that the majority of retention and recruitment literature highlighted assimilating women engineers, especially women of color, into a masculine organizational culture that is opposed to women's value and culture. This masculine centered organizational culture, which excludes other cultural values of women or women of color, could negatively influence women's choice of engineering related work or persistence in engineering fields (Ahuja, 2002).

Isolation and lack of role modeling. According to a study of Servan and Visser (2010), women in engineering related fields experienced feelings of isolation and marginalization in their workplace. Women who experienced feelings of isolation are more likely to leave their career than are others who do not feel isolated. Also, the feelings of isolation of women engineers can be a cause and consequence of the lack of mentors or role model in their fields (Ahuja, 2002). Thus feelings of isolation and difficulty in accessing mentors who have similar cultural background are likely to affect women engineers' job satisfaction and persistence. Furthermore, the lack of mentor and professional isolation could block women engineers from obtaining essential information related to their job advancement or success in their job fields. In fact, a previous study reported that women were more likely than men to have a tendency to lack information related to professional development because they often are excluded from professional networks (Fassinger, 2002). This was also supported by Lyness and Thompson's study (2000) that reported that female professionals in engineering have more difficulty finding a good mentor than male professionals, and this affected their career development. These

findings suggest that the lack of a mentor and professional isolation are major barriers for talented women engineers in pursing their career and increasing their job satisfaction.

Among women who have already made a decision to work in STEM fields**,** having a female role model was significant in terms of protecting their performance from negative stereotypes (Marx & Roman, 2002) and improving positive attitudes toward STEM fields (Stout, Dasgupta, Hunsinger, & McManus., 2011). Stout et al. (2011) explained that female students in STEM fields are highly influenced and encouraged by female teachers and peers. The major point of her research supported that when young female undergraduates interact with only male professors and professionals in STEM field, they showed less-positive feelings, less self-confidence, and less motivation to pursue STEM major and careers. However, female students reported more-positive feelings, more self-confidence, and more motivation to pursue STEM major and careers when paired with female professionals, instructors, and peers. The result of this study with "Same-sex role model as a social vaccine; just as a biomedical vaccine protects our bodies, contract with female engineers acts as a social vaccine that protects female engineering students' mind against stereotypes."

Job Satisfaction and Psychological Well-Being of Women Engineers

One goal of this present study is to examine major factors that affect the life satisfaction of women engineers. When considering the purposes of this study, the subjective well-being was examined because it is an empirically-derived and validated approach to measuring well-being with a clear definition (Diener et al., 1999).

Freud stated that "work and love" are essential factors for psychologically well-adjusted human beings' lives. Both women and men need not only the satisfactions of

relationships with family and friends, but also the satisfaction of work in order to increase life satisfaction. The work has mainly examined in industrial/organizational (I/O) fields and vocational psychology fields. Industrial/organizational psychologists have been more focused on how to enhance productivity of organization, essential factors of effective leaders in the working setting, and how to maximaize the employees' ability at working setting (Barak, 2005; Spector, 2005). Vocational psychologists, on the other hand, have examined the aspects of work related to psychological functioning and developmental process with more individual perspectives (e.g., Brown & Lent, 2005; Savickas, 2005). Commonly, vocational and I/O psychologists both support the belief that work can enhance well-being, and promote individuals' satisfaction and achievement through their own work (Bluestein, 2006; Brown & Lent, 2005; Spector, 2005).

Moreover, in terms of an individual perspective, there are considerable studies that examined the relationship between workers' mental health and having a work (Blustein, 2006; Feather, 1990). More specifically, these studies found that the loss of work has been caused the problem of self-esteem, relational conflicts, substance and alcohol abuse, and other psychological and physical problems. According to previous research (Brown & Lent, 2005; Spector, 2005), higher levels of perceived rewards at work reduced the severe mental health symptoms and contributed to enhanced psychological well-being. Thus, working plays an essential role in psychological health and well-being.

Related to work and the psychological well-being of women, even though there are some myths that a women's career commitment can cause family conflicts by having a negative effect on women's marriages and families, employed women are more likely

to experience higher life satisfaction when compared to housewives (Betz, 2008; Sears & Barbie, 1977). Brown and Lent (2008) reported a reciprocal relationship between work satisfaction and overall life satisfaction. The results supported that work satisfaction and life satisfaction affect each other, and increasing work satisfaction is one way to enhance life satisfaction. Thus, it is important to examine psychological well-being in the work domain context among women engineers.

Previous studies supported that perceived goal progress and goal directed activity influence an individual's well-being in the work setting (Koestner, Lekes, Powers, & Chiconine, 2002; Pomaki, Maes, & TerDoest, 2004). However, other studies reported that perceptions of goal progress have not been associated with well-being at work (Wiese, 2007; Wiese & Freund, 2005). Although perceived goal progress may be expected to directly increase a sense of satisfaction or subjective well-being, these inconsistent findings suggest that the relation between goal progress and satisfaction in the work domain might a complex process. Grant, Little, and Phillips (2007) also supported the idea that the goal pursuit process is complicated and multiply determined. There are several possible explanations for the inconsistent findings related to association between goal progress and satisfaction. First, there can be contextual influence that affects this relationship. For example, goal progress can be a critical factor that can predict subjective well-being at work or school where individual goal achievement is more highlighted, especially within a relatively short period of time rather. In other places, an individual's goal achievement or progress may be less emphasized or provide a comparatively longer term period in tracking goal progress. Pomaki, Karoly, and Maes (2009) also stated that the characteristics of samples in studies might influence these

inconsistent results. For example, the samples of most of studies which reported the strong associations between goal progress and satisfaction were college students samples (Koestner et al., 2002) where goal progress is more likely to take place within a short period of time (e.g., a few weeks for mid-terms and finals). However, compared to college student groups, workers may have a bigger variety in terms of timelines for goal progress and less have structured timelines compared to a college students. Thus, it would be meaningful to test this relationship among employee samples.

In addition, environmental supports and barriers influence job satisfaction among women engineers. Specifically, in terms of the influence of barriers on job satisfaction, Fouad and Singh (2011) reported that women engineers felt least satisfied with their jobs when they were undermined by supervisors and co-workers who belittled and treated women engineers in a patronizing manner at the work place. In addition, Fouad and Singh found that current engineers' job satisfaction was reduced when they experienced condescending behavior in disrespectful ways from their supervisor rather than from their co-workers. Women engineers who have lacked clarity in their roles and who experienced conflicting task requests and requirements from their supervisors or co-workers were more likely to express lower job satisfaction.

In terms of positive factors in increasing job satisfaction, Fouad and Singh (2011) examined the contextual and cognitive variables related to job satisfaction. They found that women engineers who expected positive outcomes to result from their efforts were more likely to report higher job satisfaction. In addition, women engineers who reported a high self-confidence in their ability to cope with multiple life roles and navigate their organizations' political situation were more likely to experience high job satisfaction.

Moreover, the supports of their work environment played a key role in increasing the job satisfaction among women engineers. First, women engineers reported higher job satisfaction when they were assigned to projects with tangible training opportunities that helped them develop and learn new skills. Second, women engineers reported that they felt most satisfied with their job when they perceived that their co-workers and supervisor were supportive. Third, organizational climate is also very important for women engineers to increase their job satisfaction (Trauth, Quescenberry, & Huang, 2009; Fouad & Singh, 2011). Women engineers were most satisfied with their job when organizations recognized their contributions, valued on their work, and cared about the employees' well-being. Soe and Yakura (2008) also highlighted that mentoring and mentoring programs are important for women engineers to increase their job satisfaction and retention in their fields.

Finally, support from their family and friends is another essential factor that enhanced the job satisfaction among women engineers (Amstrong et al., 2007; Fouad & Singh, 2011). In sum, support from organizations, family, and friends matter in increasing the job satisfaction of women engineers. Also, professional development and training opportunities, self-confidence about their coping skills for their multiple life roles, and positive outcome expectation were the most positive buffering factors in women engineer's pursuing their career with satisfaction.

Summary

This chapter summarized and reviewed (a) the theoretical framework of the unifying social cognitive career theory of well-being (b) previous empirical studies related to the unifying social cognitive career theory of well-being in educational and

work settings (c) previous empirical studies of SCCT in engineering fields and (d) contextual supports and barriers which affect job satisfaction and well-being among women engineers. The proposed study aims to examine cognitive, behavioral, and emotional process of job and life satisfaction of women engineers in the U.S. Specific focus is given to contextual supports and barriers because these factors can serve as unique and important foci of future research and intervention efforts.

Chapter III

Method

The present study examined the applicability of Lent's (2004) social cognitive career theory model of job and well-being with a sample of women engineers. In particular, this study explored the personality trait (positive affects), cognitive variables (i.e., self-efficacy, outcome expectations), behavioral variables (goal-directed progress), and contextual variables (i.e., environmental support and barrier, work and family conflict, role model) on job satisfaction and life satisfaction among women engineers. This chapter addresses the research design, sample size and characteristics of the sample included in the present study. Also, this chapter introduces the procedure of data collection. Finally, this chapter explains the instruments used to measure the constructs in this study.

Participants

Participants were 377 women engineers who have been working in engineering fields more than 1 year. The participants in the study ranged in age from 22- 65 with a mean age of 36.8 (*SD* = 10.53). Of these participants, 285 identified as White, European American (75.6%), 36 identified as Asian American (9.5%), 14 identified as Hispanic (3.7%), 13 identified as African American (3.4%), 14 identified as multiracial (3.7%), 10 identified as Asian international (2.7%) , 5 identified as "other" (1.3 %). The average number of working hours a week for participants was 45.4 hours (*SD* = 8.69).

Among the participants, 74 (19.7%) reported that they received their degree in civil engineering, 73 (19.4%) received their degree in mechanical engineering, 56 (15%) received their degree in chemical engineering, 42 (11.1%) received their degree in

electrical and computer engineering, 25 (6.6 %) received their degree in industrial engineering, 9 (2.4 %) received their degree in aerospace engineering, and 85 (22.5) received their degree in other engineering areas (e.g., geological engineering, biomedical engineering, environmental engineering, agricultural engineering).

In terms of relationship status, 215 participants (43%) reported that they were married, 95 (25.2 %) reported that they were single, 43 (11.4%) reported that they were partnered, and 10 (2.7%) reported they were divorced. Most participants (n = 158; 41.9%) reported that they have children. Among them, the average age of children was 8.52 years-old (*SD* = .7.48) with range of 2 years old to 34 years old. In terms of educational attainment, 75 (20%) reported that they earned a Bachelor's degree, 71 (18.8%) reported that they earned a master's degree, 71 (18.8%) reported that they earned a doctoral degree, and 160 (42.4 %) indicated "other".

Procedures

Data have been collecting through an online survey using Qualtrics. Participation involved completing an online survey that takes about 15-20 minutes. Participants were recruited through email announcements sent to women alumni from engineering college at large U.S. universities. Permission to contact women alumni was obtained from Colleges of Engineering at Cornell University, The University of Texas-Austin, Purdue University, University of Washington, University of Michigan, Texas A & M University, and California Institute of Technology, University of Missouri, Missouri University of Science and Technology. Members of professional organizations for women engineers, such as the Society of Women Engineers, were also invited to participate.

A snowball approach to collecting was utilized by asking participants to forward the information about the study to their female colleagues. Email announcements included information regarding the purpose of this present study and the scope of the study. They also included eligibility criteria for participation, potential benefits and risks, information concerning privacy and confidentiality, and the researchers' contact information. The announcements indicated that a donation ranging from $50-$1000 would be made to the engineering college for female engineering students' career development fund based on the participation rates of women alumni from each school.

Measures

Measures selected for this study were based on previous studies using the SCCT theoretical framework, STEM related studies, and women's career development studies. Specifically, participants' overall life satisfaction was assessed with the Satisfaction with Life Scale (SWLS; Dinner, Emmons, Larsen, & Griffin, 1985). Work satisfaction was e measured with Job Satisfaction scale (Brayfield and Rothe, 1951) Index of Job Satisfaction (Judge, Locke, Durham, & Kluger, 1998). The personality and affective traits was measured with the Positive Affect (PA) items of the Positive and Negative Affect Scales (PANAS; Watson, Clark, & Tellegen, 1988). The goals and goal-directed behavior in engineering work field was assessed with a 7-item scale adapted from Lent et al. (2005). Self-efficacy was assessed with a measure of academic coping efficacy (Lent et al., 2003) and a measure of personal strivings (Emmons, 1999), both adapted to the engineering work setting. Expected or received work conditions and outcomes was measured with the Perceived Organizational Support Scale-Short Form (SPOS; Eisenberger, Huntington, Hutchison, & Sowa, 1986). Goal-and efficacy relevant

environmental supports and Barriers were measured with a slightly modified version of Perceived Environmental Supports Barriers scale (Lent et al., 2001). Scales modified for participants in the present study were reviewed in their original format by expert raters and modification will be made to the scales based on feedback from reviewers.

Demographic questionnaire. Participants completed a brief demographic questionnaire related to age, race/ethnicity, marital status, number of children, job title and position, working hours, educational background, and major (See Appendix K).

Life satisfaction. Participants' overall life satisfaction was assessed with the Satisfaction with Life Scale (SWLS; Dinner, Emmons, Larsen, & Griffin, 1985). This scale consists of 5 items (e.g., " So far I have gotten the important things I want in life.", "I am satisfied with my life"),which are rated on a Likert-type scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). A high score indicate more satisfaction with life. Mean scores will be obtained to determine level of life satisfaction. This scale has been found to yield internal consistency reliability coefficients ranging from .72 to .87 (Diener et al, 1985; Utsey et al., 2002). Furthermore, convergent validity has been established by significant positive correlations with measures of subjective well-being (Diener et al., 1985) and discriminant validity from the Positive and Negative Affect scale has been supported (PANAS; Watson et al., 1988). Coefficient alpha for scale scores in the present study was .87.

Job satisfaction. Job satisfaction was measured with Job Satisfaction Scale (Brayfield and Rothe, 1951). This scale consists of 5 items (e.g., "I feel fairly well satisfied with my present job"), which are rated on a Likert-type scale ranging from 1(*strongly disagree*) to 7 (*strongly agree*). In terms of internal consistency reliability,

coefficients have ranged from 80 to .95 (Duffy & Lent, 2009; Lent et al, 2011; Ilies & Judge, 2003; Judge et al., 2005; Judge & Ilies, 2004). In terms of validity, this scale correlated with Job Descriptive Index (r = .89) and life satisfaction (r = .68). Coefficient alpha for scale scores in the present study was .85.

Personality and affective traits. Personality and affective traits were measured with the Positive Affect (PA) items of the Positive and Negative Affect Scale (PANAS; Watson, Clark, & Tellegen, 1988). This 10 items scale assessed the tendency to experience positive emotions (e.g., "excited, strong, proud") using Likert-type scale ranging from 1 (*very slightly or not at all*) to 5 (*extremely*). High scores indicate high levels of positive affect. This scale has been found to yield internal consistency reliability coefficients ranging from .86 to .93 (Watson et al, 1988). Construct validity has been demonstrated through negative correlations with state anxiety (r = -.35) and depressive symptoms (r = -.36) (Watson et al., 1988). PA has been reported to positively correlate with interest in work activities (r = .57) and intrinsic motivation (r = .32) (Bye, Pushkar, & Conway, 2007). Coefficient alpha for scale scores in the present study was .90.

Goals and goal-directed behavior. The goals and goal-directed behavior in engineering were assessed with a 7-item scale adapted from Lent et al. (2003), which was originally developed to assess progress in an academic setting. The measure asks participants to indicate how much progress they were making toward to variety of job tasks (e.g., "Completing all job assignment effectively", "Learning and understanding the professional knowledge required in each of your job assignment"). Participants responded by indicating how well they feel they are working toward each goal, from 1

(no progress at all) to 5 (excellent progress). Lent et al. (2005) reported an internal consistency reliability estimate of .89. In terms of validity, this scale positively correlated to domain-specific goal self-efficacy (r = .46) and life satisfaction (r = .42) (Lent et al., 2005). Coefficient alpha for scale scores in the present study was .88.

Self-efficacy. Self-efficacy was assessed with using an adapted measure of academic coping efficacy (Lent et al, 2003). Participants indicated how confident they cope with various barriers or challenges in the workplace using 7 items (e.g., cope with a lack of support from my supervisor). Participants will response to each statement using a Likert-type scale from 1 (no confidence) to 10 (complete confidence). High scores reflect stronger coping efficacy beliefs. This scale has been found to yield internal consistency reliability coefficients of .89 (Lent et al, 2003). In terms of validity, this scale correlated positively to domain-specific goal self-efficacy (r = .46) and life satisfaction (r = .42) (Lent et al., 2005). Coefficient alpha for scale scores in the present study was .81.

To assess specific self-efficacy in the work domain, self-efficacy was also assessed with the Self-Efficacy Strivings of Career Development Strivings Assessment (Dik, Sargent, & Steger, 2008). Participants were asked to list three of their current strivings in an open-ended, sentence completion format. This measure was adapted from Emmons' (1999) personal strivings measure. Participants indicated how confident they felt that they could attain the goal using a 5-point scale that ranged from 1 (not at all true) to 5 (completely true). High scores reflect strong self-efficacy to attain the goal. In terms of validity, this scale correlated positively to outcome expectation strivings (r = .61) and intrinsic motivation (r = .28) (Dik, et al., 2008). Lent et al. (2005) reported an internal

consistency reliability estimate of .89. Coefficient alpha for scale scores in the present study was .62.

Expected or received work condition and outcomes. Expected or received work conditions and outcomes were measured with the Perceived Organizational Support Scale-Short Form (SPOS; Eisenberger, Huntington, Hutchison, & Sowa, 1986). Participants will respond to 16 highest-loading items from the original 36-item SPOS scale using a 7-point scale from 1 (*strongly disagree*) to 7 (*strongly agree*). Example items are "The organization values my contribution to its well-being", "The organization is willing to extend itself in order to help me perform my job to the best of my ability", and "The organization shows very little concerns for my." The original scale development study reported that the SPOS scores yielded internal consistency reliability estimates ranging from .80 to .93 (Eisenberger et al., 1986). The internal consistency estimate of SPOS-Short version was .95 (Duffy & Lent, 2009). In terms of validity, SPOS score moderately correlated with job involvement (r = .33) and organizational commitment (r = .60) (Rhoades & Eisenberger, 2002). Coefficient alpha for scale scores in the present study was .95.

Goal-and Efficacy-Relevant Environmental Supports and Barriers. Goal-and efficacy relevant environmental supports and barriers were measured with a slightly modified version of the Perceived Environmental Support and Barrier Scale (Lent et al., 2001). Participants responded to items using a Likert-type scale ranging from 1 (*not at all likely*) to 5 (*extremely likely*). Participants indicated how likely they would be to experience contextual supports from 9 items (e.g., "get encouragement from my family for pursing my job") and barriers from 5 items (e.g., "receive negative comments or

discouragement about your job from family members"). High support and barrier scores reflect, respectively, stronger positive and negative expectations relative to the pursuit of an engineering job. Both environmental support and barrier scores have been found to yield internal consistency reliability coefficients ranging from .79 to .92 (Lent et al, 2001; Lent et al, 2003). In terms of validity, support percepts were moderately related to positive affectivity (r = .34) (Lent, et al, 2001) and barrier related to coping efficacy (r = -.15) (Lent et al., 2011). Coefficient alpha for scale scores on the environmental support subscale was .82 and on the environmental barrier subscale was .67 in the present study.

Role model was measured with a slightly modified version of the Inspiration/Modeling subscale of the Influences of others on Academic and Career Decisions Scale (IOACDS) (Nauta & Kokaly, 2001). Participants response to items using a Likert-type scale ranging from 1 (*strongly disagree*) to 5 (strongly *agree*). Participants will indicate how likely they would feel have a same-sex role model in their career from 7 items (e.g., "there are women engineers I am trying to be like in my career pursuits"). High role model scores reflect that participants are inspired from their role model in their career. This scale has been found to yield internal consistency reliability coefficients ranging from .87 to .91 and in terms of validity, Inspiration/ Modeling scale was significantly related to score on the Social Provision Scale (r = .22) (Nauta & Kokaly, 2001). Coefficient alpha for scale scores in the present study was .92.

Work and Family Conflict was measured with Work-to-Family Conflict Scale (Netemeyer, Boles, & McMurrian, 1996). Participants responded to the 5 items using a Likert-type scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). Participants

indicated how much they perceived the conflict between family roles and work-related to activities (e.g., "The demands of my family or spouse/partner interfere with work-related activates"). High scores reflect higher conflicts between work and family. This scale has been found to yield internal consistency reliability coefficients of .91 and work-family conflict scale was negatively related to work-family conflict self-efficacy subscale (r = -.55) (Hennessy, 2005). Coefficient alpha for scale scores in the present study was .94.

Research Design

A descriptive quantitative research design conducted in the present study. Structural equation modeling (SEM) techniques were used to test the overall model fit of the integrative social cognitive career model of psychological well-being.

Several fits indices were used to examine the applicability of the model with women engineers using comparative fit index (CFI), and root mean square error approximation (RMSEA). Good fit is determined by CFI scores > .90, and RMSEA and scores < .05 (Kline, 2005). The hypothesized model tested both indirect effects and direct effects of contextual supports and barriers on job satisfaction in engineering fields through self-efficacy and outcome expectations given the results of previous research (Lent et al., 2005). Bootstrapping was used to test for significance of indirect effects among variables using Macro in SPSS (Preacher, & Hayes, A., 2008).

Chapter IV

Results

This chapter presents the data analysis procedures used in the current study. First, data screening and missing data analysis procedures will be explained and conducted. Second, the plan of analysis will be described. Third, the result of the preliminary analyses including correlations among the study's variables and descriptive information of the sample of women engineers. Finally, Structural Equation Modeling (SEM) will be used to test the model of women engineers' psychological well-being and job satisfaction and these results will be presented.

Data Cleaning and Missing Data

The initial data set includes 686 participants. A liberal estimate of 20% missing data on the study's variables was used to determine case deletion. According to Scholmer, Bauman, and Card et al. (2010), this estimate has been suggested for studies in which deletion of a large number of participants could adversely affect statistical power. Using this criterion, a total of 289 cases were deleted due to more than 20% missing data.

Next, data were examined to assess the pattern of missingness. To check the randomness of missing data, the Missing Values Analysis in SPSS 21.0 was conducted. Little's MCAR test was not significant ($\chi^2 = 583.66$, $p > .05$) suggesting the data were missing completely at random (MCAR) (Schlomer, Bauman, & Card., 2010).

In the next step, expectation maximization (EM) procedure was used to replace the missing values. According to Schafer (1997), EM is general technique for finding maximum-likelihood estimates for parametric models when the data are not fully observed. The EM estimates the covariance matrix, means, and the correlations between

variables with missing values through an iterative process. Furthermore, this method has proved to be superior to other common missing value imputations such as mean substitution (Scholmer et al., 2010).

After imputing missing data, the data were examined to ensure they met multivariate assumptions (Tabachnick & Fidell, 2007). Data were screened to identify univariate, multivariate, and age outliers. First, after examining the z-scores that were greater than |3.33| for all dependent and independent variables, 13 univariate outliers were deleted. Second, based on a review of Mahalanobis Distance scores, 7 additional cases had Mahalanobis distance values above the critical chi-square value of 27.87 and were deleted as multivariate outliers. After the deletions of univariate and multivariate outliers, the data set consisted of 377 cases.

In the next step, normality of data was examined by assessing skewness and kurtosis. Most variables were between 0 and -1 for skewness and between 1 and -1 for kurtosis. According to the guidelines (skewness > 2, kurtosis > 7) of Curren, West, and Finch (1996), this data set met the assumption of normal distribution. Next, data were examined for linearity and multicollinearity of multivariate assumptions. According to Tabachinick and Fidell (2007), linearity was tested by examination of bivariate scatterplots and no violation was revealed given the oval-shaped depiction of plots. The multicolllinearity of the data was tested by using Tolerance Values and Variance Inflation Factor (VIF). Based on Field (2005)'s guidelines indicating collinearity of the data when tolerance values are below .10 and VIF values are greater than 10, there was no collinearity among the variables. This, the final data set included 377 cases.

Plan of Analysis

Structural equation modeling procedures were conducted to test the fit of the hypothesized unifying SCCT model of women engineers' psychological well-being using AMOS 21statistical package and the maximum likelihood (ML) estimation method. Prior to SEM analysis, latent variables were created for the unidimensional constructs of outcome expectation (perceived organizational support), positive affect, and goal progress scales using item parceling procedures (Russell, Kahn, Spoth, & Altmaier, 1998). To create the item parcels, data were screened using maximum likelihood exploratory factor analysis (EFA) to check that each scale has a unidimensional factor structure with an examination of scree plots, eigenvalues, and factor loadings (Little, Cunningham, Shaher, & Widaman, 2002). According to the guideline of parceling items (Bandalos & Finney, 2001), latent variable was each indexed by 2-5 indicators. Items parcels were created by using the results of the EFAs to balance loadings across item parcels for latent variables. In current study, four parcels were created for perceived organizational support, and three were created positive affect and goal progress

The SEM analysis consisted of several steps. For the first step, to test measurement model, a confirmatory factor analysis (CFA) was conducted to determine if all the latent variables in the model were adequately measured. Second, to test structural model, a path analysis was conducted to determine if the data fit the hypothesized unifying SCCT model of women engineers. The ratio of chi-square statistic to degree-of-freedom (χ^2/df), and specific indices including root mean square error approximation (RMSEA), Tucker-Lewis index (TLI), incremental fit index (IFI), and comparative fit index (CFI) were used to assess both the measurement and structural models. The reason

of not testing the chi-square test of significance (χ^2) in the current study is that χ^2 test of significance is sensitive to sample size and difficult to interpret given its lack of standardization (Kline, 1998). Although the (χ^2/df) is affected by the χ^2 statistics, dividing this statistic by its degrees-of-freedom reduces its sensitivity to sample size. Thus, to ensure more accurate examinations when choosing models and interpreting findings , χ^2/df, RMSEA, TLI, CFI will be considered in the current study because these model fit indices have been reported as being less susceptible to bias by extraneous factors such as sample size and model misspecification (Hu & Bentler, 1998; Martens, 2005). An adequate fit to the data is reported when $\chi^2/df \leq 3$, CFI and TLI values $\geq .90$, RMSEA $\leq .08$. When $\chi^2/df \leq 3$, CFI, and TLI values $\geq .95$ and RMSEA $\leq .06$, the data represents a very close fit to the model (Kline, 2005; Loehlin, 1998; Steiger, 1998). Model fit was assessed using recommended indices for testing both measurement and path models.

Hypothesized path models including life satisfaction, job satisfaction, positive affect, self-efficacy, outcome expectation, goal progress, and environmental support and barrier were examined. The hypothesized model included both indirect effects and direct effects of perceived supports and barriers on job self-efficacy in engineering fields through self-efficacy and outcome expectations given the results of previous research (Lent et al., 2005). Bootstrapping was used to test for significance of indirect effects among variables using Macro in SPSS (Preacher, & Hayes, A., 2008). According to Hayes and Scharkow (2013), the macro is superior to other methods (e.g., SOBEL), as it adjusts all paths for the potential influence of covariates not proposed to be mediators in the model and allows to test multiple mediators in the model.

Preliminary Analyses

The means, standard deviations, and bivariate correlations for satisfaction of life Scale, job satisfaction, positive affect, outcome expectation, self-efficacy, goal progress, environmental supports, environmental barriers, work and family conflict, and role model scales are reported in Table 1.

Table 1. Means, Standard Deviations, and Correlations among the Main Variables

Variable	M	SD	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
1. SWLS	5.53	.99	-	.61*	.52*	.43*	.24*	.19*	.40*	.37*	.14*	.25*
2. JS	5.39	1.04		-	.63*	.54*	.29*	.18*	.35*	.26*	.24*	.24*
3. PA	3.54	.68			-	.49*	.31*	.23*	.35*	.18*	.24*	.16*
4. OE	4.91	1.07				-	.20*	.17*	.49*	.27*	.21*	.29*
5. SE	7.0	1.32					-	.06	.19*	.28*	.20*	.24*
6. RM	2.97	1.02						-	.47*	.10	.01	.07
7. ES	4.01	.62							-	.42*	.14*	.18*
8. EB	4.11	.63								-	.07	.47*
9. GPS	*4.09*	*.57*									-	*.01*
10. WFC	*4.07*	*1.58*										-

Note. * = $p < .01$ level; SWLS = satisfaction with life; JS = job satisfaction; PA = positive affect; OE = outcome expectations; SE = self-efficacy; RM = role model; ES = environmental supports EB = environmental barriers; GPS = goal progress scale; WFC = work and family conflict.

Primary Analyses

To address the primary research questions, a series of structural equations modeling analyses on the covariance matrices for samples of women engineers using AMOS 21 were conducted. Prior to SEM analysis, item parcels were created for outcome expectation (perceived organizational support), positive affect, and goal progress scales. Item parcels were used to create multiple indicators for each of the other constructs. Four parcels were created for outcome expectations (i.e., perceived organizational support), and three were created positive affect and goal progress. Also, according to recommendation of Lent et al. (2009), multiple measurements of constructs for self-efficacy (i.e., goal striving self-efficacy, coping self-efficacy), contextual support

(i.e., role model, environmental support) and barriers (i.e., work and family conflict, environmental barriers) were used in current study.

SEM was used with a two-step approach. First, the one large measurement model with all of the latent variables and indicators was tested to ensure the plausibility of 7factors representation of the latent constructs. In testing the measurement models, one factor loading for each construct was fixed to 1 and all other loadings and paths among the latent constructs were freely estimated using confirmatory factor analysis (CFA). The result of the measurement model [χ^2/df ≤ 3TLI and CFI > .90; RMSEA> .06] showed good model data fit in in general. The means and standard deviations, and factor loadings for this current study's measured variables were reported in Table 2. Also, the Table 3 shows the fit indices for the measurement model.

Table 2. Means and Standard Deviations of Measured Variables

Variable	*M*	*SD*	Factor Loading
Self-Efficacy			
Indicator 1 (Coping Self-Efficacy)	7.00	1.32	.43
Indicator 2 (Goal self-Efficacy)	4.00	.65	.66
Outcome expectation			
Indicator 1	4.80	1.28	.90
Indicator 2	4.94	1.16	.93
Indicator 3	4.78	1.33	.90
Indicator 4	4.97	1.10	.84
Goal progress			
Indicator 1	4.03	.69	.89
Indicator 2	4.09	.64	.79
Indicator 3	4.14	.60	.88
Positive Affect			
Indicator 1	3.52	.86	.89
Indicator 2	3.70	.73	.58
Indicator 3	3.62	.77	.56
Contextual Supports			
Indicator 1 (Environmental Support)	4.01	.63	1.0
Indicator 2 (Role Model)	3.00	1.02	.44
Contextual Barriers			
Indicator 1	4.11	.64	.86
Indicator 2	4.10	1.58	.55
Job Satisfaction			
Indicator 1	5.41	1.33	.73
Indicator 2	5.29	1.36	.83
Indicator 3	5.45	1.16	.91
Indicator 4	5.74	1.20	.87
Life Satisfaction			
Indicator 1	5.36	1.21	.85
Indicator 2	5.66	1.12	.80
Indicator 3	5.80	1.10	.85
Indicator 4	5.77	1.12	.76
Indicator 5	5.06	1.33	.64

Note. All factor loadings are statistically significant at the $p < .001$ level .

Table 3. Goodness-of-Fit Indicators for Measurement Model

Model	χ^2/df	CFI	IFI	TLI	RMSEA	90% CI for RMSEA
Measurement model	1.96	.96	.96	.95	.05	(0.04, 0.06)

Note. CFI = comparative fit index; IFI = incremental fit index; TLI = Tucker-Lewis index; RMSEA = root-mean-squared error approximation.

Next, a path analysis was conducted to examine the fit of the data to the hypothesized SCCT model. Results of the path analysis suggested that the data was an excellent fit to the hypothesized model [χ^2/df ≤ 3, CFI, IFI, and TLI values ≥ .95 and RMSEA ≤ .06]. Specially, the RMSEA reported the excellent fit, .05(CI = .04 - 06) at 90 % confidence interval. The goodness of fit indices of the hypothesized unifying SCCT model was reported in Table 4.

Table 4. Goodness-of-Fit Indicators for the Path Model

Model	χ^2/df	CFI	IFI	TLI	RMSEA	90% CI for RMSEA
Model A	2.10	.95	.95	.94	.05	(0.04, 0.06)

Note. CFI = comparative fit index; IFI = incremental fit index; TLI = Tucker-Lewis index; RMSEA = root-mean-squared error approximation; Model A = the proposed hypothetical model.

An examination of the parameter estimates revealed that most of paths were statistically significant. For example, the paths from positive affect to contextual supports and barriers, self-efficacy, and job and life satisfaction were significant ($p < .05$). Also, the paths from supports and barriers to self-efficacy and outcome expectations were statistically significant ($p < .05$). Self-efficacy indirectly impacted job satisfaction via

outcome expectations. The path from job satisfaction to life satisfaction was significant ($p < .05$). Contrary to expectations, goal progress did not play a key role in the hypothesized model with this sample of women engineers. For example, the path from environmental supports to goal progress, outcome expectations to goal progress and goal progress to job satisfaction were not significant in the hypothesized model. Also, the direct paths from environmental supports and barriers to job satisfaction were not significant (See Figure 2).

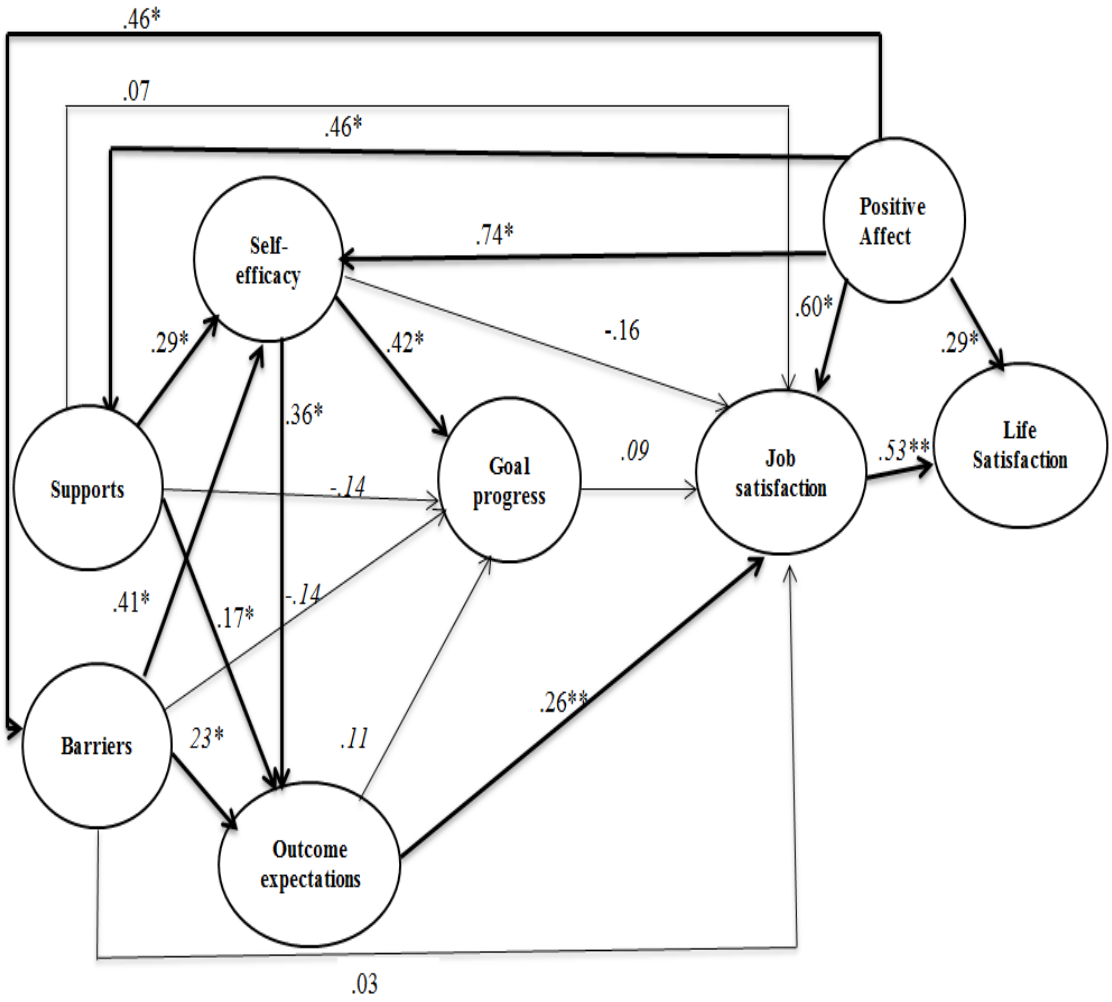

***Figure 2*. Testing the Hypothesized unifying Social Cognitive Career Theory Model**
Note.* $p < .05$.

Bootstrapping estimates were conducted to test the indirect effects of contextual supports and barriers on job satisfaction via cognitive variables (e.g., self-efficacy, outcome expectations). Results (see Table 5) indicated that the indirect effect from environmental supports, self-efficacy, outcome expectations on job satisfaction were significant ($p < .05$). Also, the indirect effect from environmental supports, self-efficacy, and outcome expectations on job satisfaction were significant ($p < .05$). The direct effects from both contextual supports ($B = .18$, $SE = .08$) and contextual barriers ($B = .14$, $SE = .07$) to job satisfaction were not significant ($p < .01$). The model explained 33% of the variance for both contextual supports and barriers in job satisfaction.

Table 5. Summary of Indirect Effects

	Bootstrap estimates		
Path/effect	Mean *B*	Mean *SE*	95% CI
Support→ SE→ OE→ Job Satisfaction	.40	.06	.29-.54
Barriers → SE→ OE→ Job Satisfaction	.29	.05	.19-.40

Note. Estimates of indirect effects are based on standarized coefficients. SE = sef-eifficacy; OE = outcome expectations.

Chapter V

Discussion

This chapter includes an overview of the current study and provides an in-depth exploration of these findings based on previous studies. Also, this chapter provides the theoretical, empirical and practical implications of testing Lent's (2004) Unifying Social Cognitive Career Theory of Well-being model with a sample of women engineers. Finally, the limitations of the study and potential avenues for future research will be discussed.

Overview of Findings

This study tested Lent's (2004) Unifying Social Cognitive Career Theory of Well-being model among a sample of women engineers. This is the first study to apply the model to the work experiences of women engineers, and the findings extend previous studies of the unifying SCCT well-being model (Lent, Brown et al., 2005, 2007; Lent, Singley et al., 2005, Lent, Taveira, Sheu, & Singley, 2009) by showing that the data fit the model well when applied to women engineers.

In particular, positive affect played a significant role in this unifying SCCT model. First, positive affect significantly predict job and life satisfaction. This finding is consistent with previous studies (Connelly & Viswesvaran, 2000; Thoresen, Kaplan, Barksly, Warren, & De Chermont, 2003) that reported job and life satisfaction is related to positive affective traits.

Also, positive affect significantly predicted self-efficacy and environmental supports and barriers. These findings are consistent to previous studies indicating that self-efficacy (Judge & Ilies, 2002) and environmental factors such as perceived work

atmosphere or environmental supports (Warr, 1999) are related to positive affectivity. The results imply people who have a tendency to experience positive affect are more likely to have view their coping competency and environmental supports and barriers more favorably.

Goal progress did not play a key role in the unifying SCCT model with this sample of women engineers. The results indicated that goal progress was not related to environmental supports, outcome expectations, or job satisfaction. The latter is consistent with a previous study reporting that perceptions of goal progress were not associated with satisfaction at work (Wiese, 2007; Wiese & Freund, 2005). However, according to Lent's (2004) theoretical framework, life satisfaction is influenced by goal progress. Several studies reported that people are more likely to be satisfied when they actively involved in goal directed activity and make progress (Brustein, 1993; Koestner et al., 2002; Lent et al., 2005). A possible explanation for these inconsistent results can be related to characteristic of the sample. Most previous studies (Lent et al., 2005; Lent et al., 2003; Lent et al., 2007) tested the model with college samples. In the college educational setting, goal progress in goal directed activity can be a critical factor in academic satisfaction because students are more likely to be exposed to short-term goal and receive immediately feedback on the outcomes of goals progress through quizzes or exams. However, compared to college students, women engineers may have a larger variety of timelines for goal progress and may not immediately see the outcome of goal process. As such, the time gap between goal progress and outcomes may not immediately influence satisfaction to work. Additionally, adult works might need more time to make progress on work-related goals (e.g., more than one year for a long-term project).

One of the key cognitive variables in SCCT model, outcome expectation, did not predict goal progress, but did have a significant effect on job satisfaction. This shows that women engineers in our sample who perceived organizational support were more likely to have higher satisfaction on their job. However, perceived organizational support may not impact goal progress among women engineers. There are inconsistent findings related to outcome expectations in other SCCT studies in the domain of engineering. In some of these studies, outcome expectations were a useful predictor of interests or major choice (e.g., Byars-Winston et al., 2010; Quimby, Seyala, & Wolfson, 2007), but in others, outcome expectations were not significantly related to interests, goals, and persistence (Lent et al, 2005; Lent et al, 2007; Lent et al, 2011; Schaefers, Epperson, & Nauta, 1997) in samples of engineering college students. Because these inconsistent results in previous studies have not been clearly explained, Lent et al. (2011) questioned the accuracy of the outcome expectation measure in capturing the most compelling types of expected outcomes relevant to engineering students. In the unifying subjective well-being SCCT model in the context work, outcome expectations are subsumed under perceived working conditions and outcomes representing what one expects and what one received from work (Lent & Brown, 2008). Duffy and Lent (2009) also measured perceived organizational support as an outcome expectation and reported a significant link between perceived organizational support and job satisfaction among a sample of teachers. However, in their studies, perceived organizational support negatively influenced goal progress. Considering these inconsistent results in previous studies, more research related to the effects of outcome expectation in academic or work domains is needed.

The effects of perceptions of proximal supports and barriers on goal progress and job satisfaction were also not fully supported in this study. In previous studies, inconsistent findings have been reported in the relations between contextual supports and barriers and goal activities. Lent and colleges (2003) reported that contextual barriers and supports explained 56 percent of the variance in self-efficacy beliefs and were indirectly related to goals via self-efficacy. However, another study reported that contextual barriers and supports had both direct and indirect effects on goals via self-efficacy (Lent et al., 2008). The finding of this study showed that the contextual supports and barriers had indirect effects on goal directed activity via self-efficacy. Also, contextual supports and barriers were directly related to self-efficacy and outcome expectations.

Additionally, contextual supports and barriers did not directly affect job satisfaction, but contextual supports and barriers indirectly affected job satisfaction via key cognitive variables (i.e., self-efficacy and outcome expectation). These findings were consistent with previous SCCT studies in academic, social, and work domains (Caparara et al., 2003; Duffy & Lent, 2009; Judge & Bono, 2001; Lent et al., 2005; Lent et al., 2007) and suggest that women engineers with more confidence in coping challenges and performing their work-related tasks and with more perceiving organization support may be more satisfied with their work. Furthermore, these findings highlight that women engineers are active agents in promoting their satisfaction on their work, rather than being passive beneficiaries of their contextual support or barriers. Psychologists can empower women engineers to steer themselves toward satisfaction at

work and life by engaging in self-efficacy building and increasing in perceiving positive outcome expectations.

Theoretical Implications

Results of this study supported the utility of unifying SCCT theoretical framework among women engineers. From research theoretical and research perspectives, Lent and Brown (2006) highlighted the importance of studying predictors of job satisfaction within the context of a unified model rather than in bivariate form because predictors are examined in isolation from one another and may not accurately reflect reality. Thus, this research has implication regarding the utility of the unifying SCCT model to understand women engineers' job and life satisfaction through comprehensively understanding the dynamic influences of contextual, cognitive, behavioral variables.

Furthermore, the present study included unique contextual supports and barriers of women engineers such as same gender role models, work and family conflict, environmental support and barriers related to their work and family. This study aided in the potential extension to understand the role of unique contextual supports and barriers of women engineers and how these contextual factors interplay to increase job and life satisfaction through cognitive and behavioral variables.

Moreover, this study extended the applicability of the SCCT model from a college sample to workers beyond college graduation. Most of studies in SCCT have been conducted with college sample; few studies have tested the SCCT model with workers. This study supported that unifying SCCT model framework could be powerful theoretical model to understand the psychological well-being of workers through social cognitive, affect, behavioral and contextual factors.

Practical Implications

The results of the current study provide various suggestions for interventions targeted at increasing the job satisfaction and life satisfaction of women engineers. First, the findings have implications for mental health professionals who work with women engineers who are dissatisfied with their jobs. Considering the critical role of self-efficacy and outcome expectation, which is are modifiable variables (Duffy & Lent, 2009; Lent & Brown, 2006), mental health professional might increase the job satisfaction and psychological well-being of women engineers by designing activities to build self-efficacy beliefs. In particular, this is the first study that included goal self-efficacy and coping self-efficacy under the latent variable of self-efficacy in the engineering domain. Thus, various strategies that mental health professional might use to enhance women engineers' goal related self-efficacy (e.g., helping women engineer's achieve their realistic goal step by step) and coping self-efficacy (e.g., providing workshop for coping strategies to deal with common challenges among women engineers) would be beneficial for women engineers. These activities to increase general self-efficacy in work may allow women engineers to gain positive work experiences and increase perceived organizational support.

Second, the findings of this study have implications for educators or work administrators in terms of providing environmental supports and increasing role models of women engineers in work settings to help women engineers increase job and life satisfaction by developing self-efficacy beliefs. Environmental supports tend to facilitate subjective well-being (Cantor & Sanderson, 1999; Diener & Fujita, 1995). Further, having a female role model was significant in terms of protecting their performance from

negative stereotypes (Marx & Roman, 2002) and improving positive attitudes toward their work in STEM fields (Stout, Dasgupta, Hunsinger, & McManus, 2011). This study specifically measured the effect of having a female role model on participants' career, and findings showed that it has significant effect on increasing job satisfaction via self-efficacy and outcome expectation. Educators or women engineers' organization need to provide or introduce good role model for women engineers and develop more tailored programs to provide organizational support to women engineers.

Third, the findings show that contextual barriers (e.g., environmental barriers, work and family conflict) had significant effects on job and life satisfaction through social cognitive variables (e.g., self-efficacy and outcome expectations). These findings were supported by previous studies reporting that organizational and family factors (e.g., organization size, climate, and environment, work-family conflict) negatively affected women's persistence in engineering fields because women engineers perceived an unwelcoming, male-dominated, hostile organizational environment (Ahuja, 2002). Thus, the results suggest several implications for practice. In terms of enhancing outcome expectations (perceived organizational supports) and self-efficacy among women engineers, it would be critical to reduce environmental barriers and work and family conflicts. For example, women engineers who present with challenges in perceiving outcome expectations and low self-confidence in their work might benefit from programs that focus on reducing work and family conflicts (e.g., assertive communication workshop/ problem solving interventions) and dealing with unique challenges or barriers in their careers.

Fourth, the findings highlight the important role of trait affect in increasing self-efficacy, job and life satisfaction. Also, the paths from trait affect to contextual supports and barriers were significant in this study. Even though trait affect (e.g., positive affect) may not be the most modifiable aspect in making changes through counseling or interventions, the findings still have crucial implications for practice. Mental health professional or counselors might help women engineers to increase job and life satisfaction by providing affect management workshops or interventions using several strategies for promoting positive affect (Sheldon, & Lyubomirsky, 2006) and cognitive and behavioral concomitants of trait affect (Brown, Ryan, & McPartland, 1996).

Limitations and Future Directions

Like all research, the current study contains some limitations. First, a cross-sectional design was used, which does not allow for exploring temporal predominance or causality among the variables. Future studies should consider longitudinal tests of the unifying psychological well-being SCCT model to test temporal predominance and causality among the core variables in the model. Second, even though the measures in the current study generally indicated adequate psychometric properties, this current study contained limited representations of some of the latent constructs. Kline (2005) recommended using multiple instruments to represent constructs to improve measurement, thus it would be useful to include additional measures of the study's variables in future studies. Third, this study used mono-method and mono-source approach to data collection, relying on participants' self-reports to an on-line survey. Future research can consider obtaining data through other means and sources, such as supervisor's evaluations of women engineers' goal progress activities. Fourth, this study

involved a sample of women engineers who graduated from prestigious engineering programs in the U.S. and who were mostly White and European American. Thus, the generalizability of this study's finding to women engineers in other countries or other racial/ethnic groups is limited. Racial/ethnic group differences were not examined due to the lack of numbers of various ethnic groups of women engineers in the current study. It would be worthy to examine the racial/ethnic group differences among women engineers in the future studies because White women and women of color may have different experiences in the work settings. Fifth, the participants of current study included various engineering fields. However, considering the different percentage of women engineers and different working culture in each engineering field, generalization of the findings from this study may be limited to each engineering field. It would be useful to examine a specific engineering field to take into account the unique characteristic across subfields.

Other research directions could be highlighted for the next steps in this area. First, experimental or intervention studies include key factors in unifying SCCT model (e.g., promoting self-efficacy and outcome expectations, facilitating goal progress, providing environmental supports through workshops) would contribute to test the unifying SCCT model's practical utility in the work setting. While previous SCCT studies have focused on examining the role of variables through model testing, there are no experimental or intervention studies. Considering the strength of SCCT model that findings studies can be directly linked to career interventions, intervention or experimental studies would be fruitful directions for future study.

Second, a qualitative approach for the next step would be useful to capture underrepresented voices of women engineers who changed their career paths due to low

job and life satisfaction. The participants of this study did not include the participants who changed the career path from engineers to others due to the criteria of the target population. However, the qualitative data would provide deeper and detail information for helping women engineer drop out from engineering fields with preventive perspective.

Conclusion

In the U.S. and other countries, the gender gap in engineering in higher education and the workplace has been a concern for educators and policy makers. Given the increasingly narrow occupational pipeline from secondary education to the labor force among women engineers, there is a significant social need to examine factors that influence the job and life satisfaction among women engineers because women engineers who have high job and life satisfaction are more likely to persist their career without dropping out or changing their career paths. Thus, the primary purpose of the present study was to test Lent's (2004) integrative model of psychological well-being including contextual, cognitive, behavioral, affects factors among women engineers in the context of work.

This study's finding supported several SCCT propositions regarding the positive relationships among contextual support and barriers, cognitive variables (self-efficacy, outcome expectation), positive affect, and job and life satisfaction. However, findings suggested the goal progress was not a significant factor among this sample of women engineers. Furthermore, results did not support direct effect of environmental supports and barriers to job satisfaction. This results suggest that mental health professionals and psychologists could empower women engineers to steer themselves toward satisfaction at work and life by engaging in self-efficacy building and increasing perceptions of positive

outcome expectation in the field of engineering. Most importantly, this study provides vital information for implications for practice, at both organizational and individual levels, to increase women engineers' job and life satisfaction. Tailored interventions or efforts to enhance job satisfaction by skill-building can increase women engineers' participation in what will be an essential part of boosting the U.S. and global economies.

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APPENDIX A

SATISFACTION WITH LIFE SCALE

Directions: Below are five statements that you may agree or disagree with. Using the 1 - 7 scale below, indicate your agreement with each item by placing the appropriate number on the line preceding that item. Please be open and honest in your responding.

Strongly Disagree	Disagree	Slightly Disagree	Neither Agree Nor Disagree	Slightly Agree	Agree	Strongly Agree
1	2	3	4	5	6	7

1. In most ways my life is close to my ideal.

2. The conditions of my life are excellent.

3. I am satisfied with my life.

4. So far I have gotten the important things I want in life.

5. If I could live my life over, I would change almost nothing.

APPENDIX B

JOB SATISFACTION

Directions: Below are five statements that you may agree or disagree with. Using the 1 - 7 scale below, indicate your agreement with each item by placing the appropriate number on the line preceding that item. Please be open and honest in your responding.

Strongly Disagree	Disagree	Slightly Disagree	Neither Agree Nor Disagree	Slightly Agree	Agree	Strongly Agree
1	2	3	4	5	6	7

1. I feel fairly satisfied with my present job.

2. Most days I am enthusiastic about my work.

3. Each day of work seems like it will never end.

4. I find real enjoyment in my work.

5. I consider my job rather unpleasant.

APPENDIX C

POSITIVE AFFECT SCALE

Directions: This scale consists of a number of works that describe different feelings and emotions. Read each item and then circle the appropriate answer next to that work. Indicate to what extent you have felt this way in general.

Use the following scale to record your answers.

Very slightly Or not at all	A little	Moderately	Quite a bit	Extremely
1	2	3	4	5

1. Interested
2. Excited
3. Strong
4. Enthusiastic
5. Proud
6. Alert
7. Inspired
8. Determined
9. Attentive
10. Active

APPENDIX D

GOAL PROGRESS SCALE

Directions: Now we would like for you rate each of the same goal statements in terms of how much progress you are making toward each on at this point in time. That is, indicate how effectively you feel you are meeting or working toward each goal at present, regardless of how important the goal is for you.

No Progress At All	A Little Progress	Fair Progress	Good Progress	Excellent Progress
1	2	3	4	5

How much progress are you making toward each of these goals at this point in time (i.e., so far this semester:

1. Excelling at your job position
2. Completing all job assignment effectively
3. Working effectively on all of your tasks
4. Remaining in your job position
5. Completing requirements of your job satisfactorily
6. Achieving/maintaining high performance in all of your job assignment
7. Learning and understanding the professional knowledge required in each of your job assignment

APPENDIX E

SELF-EFFICACY STRIVINGS

Direction: Please write down your most important work-related goals in your job. Using the 1 - 5scale below, indicate your agreement with each item by placing the appropriate number on the line preceding that item. Please be open and honest in your responding.

Not at all True of me	To a small extent	To a moderate extent	To a large extent	Completely true
1	2	3	4	5

Examples:

"I am trying to network with people in my chosen field."

"I am trying to do the work that my supervisor expects of me."

"I am trying to complete additional training to learn new skills"

(Goal1) At this point in my career development, I am trying to…

(Goal 2) At this point my career development, I am trying to ….

(Goal 3) At this point in my career development, I am trying to…

Now, rate each striving along several criteria using the 5-point scale above.

SELF-EFFICACY STRIVINGS

: Please indicate the extent to which you are confident that you could attain the goal.

APPENDIX F

SELF-EFFICACY SCALE

Directions: Here we are interested in knowing how well you believe you could cope with each of the following barriers, or problems, that individual could possibly face in pursuing their career. Please indicate your confidence in your ability to cope with, or solve, each of the following problem situations.

No confidence at all Some Confidence Complete Confidence
1 2 3 4 5 6 7 8 9 10

How confident are you that you could:

1. Cope with a lack of support from co-workers or supervisor.
2. Complete job tasks despite any stressors you are experiencing.
3. Continue on in your job given if you did not feel well-liked by your colleagues or supervisors.
4. Find ways to overcome communication problems with colleagues or supervisor in your job.
5. Balance the pressures of working with the desire to have free time for fun and other activities
6. Continue on in your career even if you felt that, socially, the environment in these fields was not very welcoming to you.
7. Find ways to work effectively despite having competing demands for your time.

APPENDIX G

PERCIEVED ORGANIZATIONAL SUPPORT

Directions: Below are statements that you may agree or disagree with. Using the 1 - 7 scale below, indicate your agreement with each item by placing the appropriate number on the line preceding that item. Please be open and honest in your responding.

Strongly Disagree	Disagree	Slightly Disagree	Neither Agree Nor Disagree	Slightly Agree	Agree	Strongly Agree
1	2	3	4	5	6	7

1. If the organization could hire someone to replace me at a lower salary it would do so (R)
2. The organization fails to appreciate any extra effort from me. (R)
3. The organization strongly considers my goals and values.
4. The organization would ignore any complaint from me. (R)
5. The organization disregards my best interests when it makes decisions that affect me. (R)
6. Help is available from the organization when I have a problem.
7. The organization really cares about my well-being.
8. Even if I did the best job possible, the organization would fail to notice. (R)
9. The organization is willing to help me when I need a special favor.
10. The organization cares about my general satisfaction at work.
11. If given the opportunity, the organization would take advantage of me. (R)
12. The organization shows very little concern for me. (R)
13. The organization cares about my opinions.

14. The organization takes pride in my accomplishments at work.

15. The organization tries to make my job as interesting as possible.

16. The organization values my contribution to its well-being

APPENDIX H

ENVIRONMENTAL SUPPPORT AND BARRIER SCALES

Directions: Many factors can either support of hinder individuals' work and social adjustment. Here we are interested in learning about the types of situations that may support your progress in job. Using the 1-5 scale, please indicate how much you agree or disagree with each of the following statements.

Strongly Disagree	Disagree	Unsure	Agree	Strongly Agree
1	2	3	4	5

At the present time, I …

1. Have access to a "role model" (e.g., someone I can look up to and learn from by observing) in my professional field.
2. Feel support from important people in my life (e.g., family) for pursing my professional in engineering.
3. Feel that there are people "like me" in this professional field.
4. Get helpful assistance from a supervisor, if I felt I needed such help
5. Get support from my co-workers for pursing my professional as an engineer.
6. Get helpful assistance from my supervisor.
7. Feel that my family members support the decision to pursue work as an engineer.
8. Feel that close friends or relatives would be proud of me for being an engineer field.
9. Have access to a "mentor" who could offer me advice and support.
10. Receive negative comments or discouragement about your job from family members

11. Worry that such a career path would require too much time or work
12. Feel that you don’t fit in socially with other co-works in this field.
13. Receive negative comments or discouragement about your job field from your friends.
14. Feel pressure from parents or other important people to change your job to some other field.

APPENDIX I

ROLE MODEL SCALE

Below are statements that you may agree or disagree with. Using the 1 - 5 scale below, indicate your agreement with each item by placing the appropriate number on the line preceding that item. Please be open and honest in your responding.

Strongly Disagree	Disagree	Unsure	Agree	Strongly Agree
1	2	3	4	5

At the present time, I …

1. There are women engineers I am trying to be like in my career pursuits.
2. There is no women engineer who is particularly inspirational to me in the career path I am pursuing.
3. In the career path I am pursuing, there is women engineer I admire.
4. There is no women engineer I am trying to be like in my career pursuits.
5. I have a women mentor in my career field.
6. I know of women engineer who has a career path I would like to pursue.
7. In the career path I am pursing, there is no women engineer who inspires me.

APPENDIX J

WORK-TO-FAMILY CONFLICT SCALE

Below are statements that you may agree or disagree with. Using the 1 - 7 scale below, indicate your agreement with each item by placing the appropriate number on the line preceding that item. The words “work” and “job” refer to all work-related activities that you do as part of your paid employment. The word “family” refers to the following family roles that pertain to you including being a parent, being a spouse/partner, and overall home life.

Strongly Disagree	Disagree	Slightly Disagree	Neither Agree nor Disagree	Slightly Agree	Agree	Strongly Agree
1	2	3	4	5	6	7

1. The demands of my work interfere with my home and family life.
2. The amount of time my job takes up makes it difficult to fulfill my family responsibilities.
3. Things I want to do at home do not get done because of the demands my job puts on me.
4. My job produces strain that makes it difficult to fulfill family duties.
5. Due to work-related duties, I have to make changes to my plans for family activities.

APPENDIX K

DEMOGRAPHIC QUESTIONNAIRE

1. **What is your current age?**

2. **What is your gender?**
   a. Male
   b. Female
   c. Other
3. **What college/ university did you graduate from?**

4. **Are you currently working as an engineer?**
   a. Yes
   b. No

5. **If you are an engineer, do you work fulltime or part-time?**
   a. Full-Time
   b. Part-Time
   c. Other (Please specify)

6. **What is your job title?**

7. **In what setting do you work (e.g., engineering company, school, and research organization)?**

8. **How long have you been working as an engineer?**

9. **On average, how many hours do you work in a week?**

10. **Please check your race/ethnicity or nationality.**
    a. White, European American
    b. African American

c. Hispanic (e.g., Mexican American, South American, Spanish American)
d. Asian American
e. Asian International
f. European International
g. Biracial/ Multicultural
h. Other nationality (Specify)

11. What is your relationship status?

a. Single
b. Partnered
c. Married
d. Divorced
e. Separated
f. Others (Specify)

12. Do you have children?

a. Yes
b. No

13. If you have children, please indicate the current age(s) of your children.

14. What is your highest degree?

a. B.A.
b. M.A.
c. Ph.D.
d. Other(Specify)

15. In what area of engineering did you receive your degree?

a. Chemical Engineering
b. Civil Engineering
c. Electrical and Computer Engineering
d. Engineering Physics
e. Engineering Technology

f. Industrial Engineering
g. Information and Communication Technology
h. Mechanical Engineering
i. Aerospace Engineering
j. Surveying Engineering
k. Other(Please specify)

16. If you would like to be contacted for a future follow-up study to share your experiences in engineering or informed the result of this current study, please provide your contact information below.

a. Name
b. Email-Address
c. Mail-Address
d. City
e. State
f. Zip Code
g. Country

17. If you have any feedback, comments, or some thoughts which you want to share with the researcher, please feel free to write it down.

APPENDIX I

INFORM CONSENT FORM

The purpose of this study is to learn more about personal, socio-cognitive/ behavioral, and environmental factors that influence the job and life satisfaction of women engineers. Your participation in this study will provide a better understanding of women engineers' unique career development and the essential factors of their psychological well-being. The information gained from this study may benefit current women engineers as well as future generations of female engineering students.

Your participation will involve filling out an online survey that will take about 20 minutes. Participation in this research is entirely voluntary and may be discontinued at any time. Your contact information and all personal data will be kept confidential, and the anonymity of responses will be maintained in any presentations/publications of the data.

In return for your involvement in the study, we will make a contribution to your college/university to support programs for female engineering students.

Eligibility to participate:

We are limiting this study to women engineers who have at least 6 months of work experience.

Potential risk:

You have the right to be informed of all potential risks associated with your participation in this study. The questions in this survey do not pose any immediate risk or harm to you as a participant. You many benefit from participating in this study by thinking more about your personality, support and barriers related to your job, goal directed activities, and psychological well-being.

However, the research questionnaires request that you provide information about yourself that you may not want other people to know. To insure that your responses to this study are not viewed by another person, please do the following:

1. There is a possibility that your responses can be viewed by an outside party if you do not EXIT/CLOSE your Internet browser (e.g., Netscape Navigator, Internet Explorer, etc.) as soon as you finish responding to the questionnaire because your responses might be visible if you (or someone else) click the BACK button on the browser. In order to ELIMINATE this possibility, you should EXIT/CLOSE the browser as soon as you finish responding to the survey and have submitted your responses.

2. There is a possibility that your responses can be viewed by an outside party if you leave your browser on and leave the computer terminal before finishing the questionnaire (e.g., answer the phone, leave the computer unattended, etc.). In order to avoid inadvertent access to your responses by a third party, do not leave the terminal or stop responding to the questionnaire until you have completely finished and closed the browser.

Although we are seeking your consent to complete a web-based survey, we are also interested in conducting follow-up interviews about the work experiences of women engineers. If you are interested in being contacted at a later time to share your experiences, you will be asked to provide your contact information at the end of the survey. Providing this information does not obligate you to participate in future studies as you can choose whether or not to participate in follow-up studies at the time that we send you information about those studies. Your contact information will be kept confidential and separate from your responses.

VITA

Hang-Shim Lee was born in Seoul, South Korea. She double majored in English Language and Literature and Psychology at Ewha Womans University, and earned master's degree in counseling psychology at the same university. She earned her Ph.D. degree in Counseling Psychology at the University of Missouri-Columbia. Her main research interest is women and ethnic minorities' career development. In particular, she is interested in psychological well-being in the workplace. Also, she specializes in multicultural and cross-cultural counseling psychology.