

Occupational Commitment of Women in STEM Fields: The Impact of Coping Self-Efficacy and Mentoring

الإلتزام المهني لدى النساء في ميادين العلوم و التكنولوجيا و الهندسه
الرياضيات: الكفاءة الذاتية للتأقلم و التوجيه الأكاديمي

by

LAMA BLAIQUE

A thesis submitted in fulfilment

of the requirements for the degree of

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DECLARATION

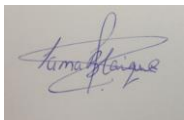
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Abstract

Continued under-representation of women employed in Science, Technology, Engineering and Mathematics (STEM) fields drastically reduces the available talent pool of technical skills. There have been many initiatives to enrol more females in STEM related courses and careers, however, the leaky pipeline continues to create problems for technical labour markets. Females constitute 42% of students pursuing STEM subjects pre-university in the USA, once at university only 33% of STEM undergraduates are women, and after graduation less than 20% are employed in STEM related jobs (UKRCWSET, 2009, Munoz-Boudet 2017, Stofan 2017). Other studies report similarly low representation of women in Europe, Australasia, Canada, and the Middle East (Hill *et al.*, 2010; Buse, 2011; Mills, 2011; Hunt, 2010).

The literature still falls short on identifying and explaining the factors that could contribute to females' persistence and commitment in STEM fields. The aim of this thesis is to investigate the factors that might affect persistence and occupational commitment (OC) in these fields. The study aims to shed light on the dynamic approaches adopted by females in STEM fields to overcome occupational career challenges. The main questions that this thesis investigates are: How do females succeed in committing to their STEM occupations? How does mentoring impact OC? How does mentoring impact coping self-efficacy (CSE)? And how does CSE influence OC?

The theoretical framework for the research is the career self-management model; an updated model of the Social Cognitive Career Theory (SCCT) (Lent & Brown 2013). The study also draws on Bandura's (2006) self-efficacy theory and Krams (1985)

two-dimensional functions of mentoring. OC is investigated through the lens informed by Meyer, Allen and Smith's (1993) three-dimensional model. This study contributes to the literature on women in STEM by providing an overview of female participation and occupational commitment worldwide and in the MENA region. It includes a detailed section on the challenges and barriers that Arab women face in STEM industries.

The methodology used in the study is a partially mixed sequential dominant status design where the qualitative design is considered the core component. Semi-structured interviews were used for the first phase of data collection followed by an online survey questionnaire in the second phase. The qualitative data were analysed in Nvivo12 software applying the Gioia methodology and the results revealed four aggregate dimensions. The quantitative data were analysed using Stata and the results supported the following hypotheses: coping self-efficacy has a positive effect on occupational commitment, goal setting mediates the relationship between the two, and mentoring has a positive effect on occupational commitment

Since the core component research design for this study is qualitative research, it is important to note that as a multiple case study design, this research investigated a specific number of women in STEM occupations and is not representative of the total population (Yin 2009). Findings relating to career development and advancement of females in STEM, as well as findings about contextual factors and their impact on other variables in this research, are nested in a cross-sectional design. Thus, a longitudinal study of the career stages of females who work in STEM might provide further insight on the impact of the mentoring functions. The study did not attempt to distinguish between formal or informal mentoring. Future studies might contribute to the SCCT investigating specific forms of mentoring.

In seeking to understand the important ramifications of coping self-efficacy on participants' careers, the study examined in depth the sources of participants' self-efficacy that were considered when assessing their capabilities. The results of this research also extend SCCT by highlighting the significant role that protean attitudes play in enhancing career outcomes. The study's findings support previous research on the importance of mentoring as a contextual support for career outcomes. Context specificity accentuates the need to adopt a more integrated stance regarding research on role models and professional identity. It also could lead to more efficacious knowledge and understanding about the reasons behind the leaky pipeline in STEM industries and occupations.

The study calls for career advancement intervention strategies aimed at enhancing females' efficacy beliefs about their interests, values and talents. Females who work in STEM should be mindful of protean attitudes that will give them autonomy and enable them to continuously assess and improve their skills and knowledge in such fast moving and demanding domains. Organizations are advised also to recognize the growth needs of female minorities in STEM by encouraging a culture of role modelling and exposure to inspiring figures, co-workers, and senior management. In order to recruit and maintain females, organizations are recommended to incorporate mentoring programmes that build on advancing learning and growth opportunities for females.

Women joining and committing to their occupations in STEM fields still severely lag behind and the persisting leaky pipeline continues to be a major issue in this respect. Scholars indicate that some of the main reasons why females are not committing to their occupations in STEM industries is due to lack of confidence and support rather than lack of talent or academic aptitude (Sonner & Holton 1995, Dawson *et al.*, 2015). In the light of these issues, this research contributes to

knowledge on the role of some identified internal drivers (coping self-efficacy, protean attitude, professional identity, and personal learning development) and contextual support (mentoring and the quality of the mentoring relation) on females' occupational commitment in STEM fields. The framework presented in this thesis can be improved and expanded upon to examine other aspects of career development that may have valuable impacts on reducing the under-representation of females in STEM.

الملخص

إن استمرار نقص تمثيل النساء الموظفات في مجالات العلوم والتكنولوجيا والهندسة والرياضيات يحد بشكل كبير من مخزون المهارات التقنية المتوفرة. وقد أطلقت مبادرات عدة لإلحاق المزيد من الإناث في مساقات تعليمية ومهن ذات صلة بمجالات العلوم والتكنولوجيا والهندسة والرياضيات، ولكن تسرب الإناث من هذه المهن ما زال يتسبب بالكثير من المشاكل في أسواق العمل التقنية. تشكل النساء نسبة 42 % من مجموع طلاب مرحلة ما قبل الجامعة الذين يتخصصون في مواد العلوم والتكنولوجيا والهندسة والرياضيات، بينما لا تزيد نسبة خريجات هذه الاختصاصات عن 33 % كما لا تزيد نسبة الخريجات اللواتي يتم تعيينهن في وظائف ذات صلة بمجالات العلوم والتكنولوجيا والهندسة والرياضيات عن 22 % (UKRCWSET 2009، مونوز-بوديه 2017، ستوفان 2017). تشير دراسات أخرى إلى نقص تمثيلي مشابه للنساء في أوروبا والمنطقة الأسترالية الآسيوية وكندا والشرق الأوسط (هيل وآخرون 2010، بوسيه 2011، ميلز 2011، هانت 2010).

وما زالت الكتابات حول هذا الموضوع عاجزة عن تحديد وتفسير العوامل التي قد تساهم في استمرار بقاء الإناث والتزامهن في مجالات العلوم والتكنولوجيا والهندسة والرياضيات. إن الغاية من هذه الرسالة هي تحري هذه العوامل التي قد تؤثر على استمرار البقاء والالتزام المهني في هذه المجالات. كما تهدف الرسالة إلى تسليط الضوء على الأساليب الديناميكية التي تتبعها الإناث في مجالات العلوم والتكنولوجيا والهندسة والرياضيات لاجتياز التحديات المهنية. وتتحرى الدراسة ذلك من خلال مجموعة من الأسئلة الأساسية، هي: كيف تنجح النساء في الالتزام بمهن العلوم والتكنولوجيا والهندسة والرياضيات؟ كيف يؤثر التوجيه على الالتزام المهني؟ وكيف يؤثر على الكفاءة الذاتية للتكيف؟ وكيف تؤثر الكفاءة الذاتية للتكيف على الالتزام المهني؟

يتبنى إطار العمل لهذه الدراسة نموذج الإدارة الذاتية للمهنة، وهو نموذج مستحدث لنظرية الإدراك الاجتماعي المهنية (لينت وبراون 2013). كما تستند الدراسة على نظرية باندورا (2006) للكفاءة الذاتية ووظائف التوجيه الثنائية الأبعاد التي طرحها كرامز (1985). أما الالتزام المهني فتم دراسته من خلال النموذج الثلاثي الأبعاد الذي طرحه كل من ماير وآلين وسميث (1999).

تساهم هذه الدراسة في إثراء الكتابات المتعلقة بموضوع النساء في مجالات العلوم والتكنولوجيا والهندسة والرياضيات حيث تقدم لمحة عامة عن مشاركة الإناث والتزامهن المهني على مستوى العالم وفي منطقة

الشرق الأوسط. كما تضم قسماً مفصلاً عن التحديات والعوائق التي تواجهها النساء العربيات في مجالات العلوم والتكنولوجيا والهندسة والرياضيات. أما المنهجية المستخدمة في هذه الدراسة فهي تصميم مختلط جزئياً للمركز المهيمن التسلسلي حيث يعتبر للتصميم النوعي مكوناً أساسياً للدراسة. أجريت مقابلات شبه منظمة في المرحلة الأولى من جمع البيانات ثم استبيان إلكتروني في المرحلة الثانية. تم تحليل المعلومات النوعية باستخدام برنامج Nvivo 12 ومنهجية Gioia وقد أظهرت النتائج مجموعة من أربعة أبعاد. أما البيانات الكمية فقد تم تحليلها بواسطة برنامج Stata وقد عززت النتائج الفرضيات التالية: للكفاءة الذاتية تأثير إيجابي على الالتزام المهني، حيث يتوسط تحديد الأهداف العلاقة بينهما، وللتوجيه تأثير إيجابي على الالتزام المهني. وبما أن المكون الأساسي للتصميم البحثي الذي تتبناه هذه الدراسة هو البحث النوعي، فمن الضروري أن نشير إلى أن الدراسة، التي تستند في تصميمها إلى عدة دراسات حالة، تتقصى عدداً محدداً من النساء في مهن العلوم والتكنولوجيا والهندسة والرياضيات ولا تمثل مجموع عدد السكان (بن 2009). تتداخل النتائج المتعلقة بتطوير النساء وتقديمهن الوظيفي في مجالات العلوم والتكنولوجيا والهندسة والعلوم مع النتائج المتعلقة بالعوامل السياقية وتأثيرها على باقي المتغيرات في هذه الدراسة عبر تصميم مقطعي عرضي. لذا قد تقدم الدراسة الطولية للمراحل المهنية التي تخوضها الإناث في مجالات العلوم والتكنولوجيا والهندسة والرياضيات رؤية أفضل عن تأثير وظائف التوجيه. لم تعتمد هذه الدراسة إلى التمييز بين التوجيه الرسمي وغير الرسمي. وقد تساهم الدراسات المستقبلية في إثراء نظرية الإدراك الاجتماعي المهنية التي تتحرى أشكالاً محددة من التوجيه.

انطلاقاً من سعيها لفهم التداعيات الهامة للكفاءة الذاتية للتكيف على مهن المشاركات، قدمنا بحثاً متعمقاً لمصادر الكفاءة الذاتية التي تم أخذها بعين الاعتبار عند تقييم قدرات المشاركات. كما تتوسع نتائج هذه الدراسة في نطاق نظرية الإدراك الاجتماعي المهنية من خلال إبراز الدور الأساسي التي تلعبه المواقف المتغيرة في تعزيز النتائج المهنية. تدعم نتائج هذه الدراسة السابقة عن أهمية التوجيه كدعم سياقي للنتائج المهنية. كما تبرز خصوصية السياق الحاجة إلى تبني موقف متكامل في ما يخص الأبحاث المتعلقة بالقدرات والهوية الاحترافية. كما قد تؤدي إلى تحصيل معرفة فعالة والوصول إلى فهم أفضل لأسباب ابتعاد الإناث عن مهن ومجالات العلوم والتكنولوجيا والهندسة والرياضيات.

تدعو هذه الدراسة إلى وضع استراتيجيات تدخّل للتطوير الوظيفي تهدف إلى تعزيز معتقدات الكفاءة الذاتية لدى الإناث عن اهتماماتهن وقيمتهم ومواهبهن. وعلى الإناث العاملات في عالم العلوم والتكنولوجيا والهندسة والرياضيات الانتباه إلى المواقف المتغيرة التي قد تمنحهن الإستقلالية وتمكنهن من تقييم مهاراتهم ومعرفتهن وتحسينها باستمرار في هذه المجالات المتغيرة والسريعة التغير. كما تنصح الدراسة المؤسسات بالتعرف

على حاجات الأقليات النسائية للنمو في مجالات العلوم والتكنولوجيا والهندسة والرياضيات وذلك عبر تنمية ثقافة الاقتداء وتعريضهن للأشخاص الملهمين مثل الرموز وزملاء العمل والإدارة العليا. وتوصى المؤسسات أيضاً بإدخال برامج التوجيه التي تعتمد التعليم المتقدم وتوفير فرص النمو المهني حفاظاً على الإناث في وظائفهن.

ما زالت مشاركة النساء والتزامهن بمهن العلوم والتكنولوجيا والهندسة والرياضيات متأخرة جداً وضئيلة إلى حد كبير. يرجع العلماء عدم التزام الإناث بهذه المهن إلى عدة أسباب رئيسية منها ضعف الثقة بالنفس ونقص الدعم وليس انعدام المهارة أو القدرة الأكاديمية بالضرورة (سونر وهولتون 1995، دواسون وآخرون 2015). واستناداً إلى المسائل المذكورة، تساهم هذه الدراسة في إثراء المعرفة حول دور بعض المحفزات الداخلية المتعارف عليها (الكفاءة الذاتية للتكيف، المواقف المتقلبة، الهوية الاحترافية، والتطور الشخصي التعليمي) والدعم السياقي (التوجيه ونوعية العلاقة التوجيهية) وتأثيرها على التزام الإناث في مهن العلوم والتكنولوجيا والهندسة والرياضيات. يمكن تحسين إطار عمل هذه الدراسة وتوسيعه لدراسة جوانب أخرى من التطوير الوظيفي التي قد يكون لها تأثير قيم في الحد من النقص التمثيلي للإناث في مجالات العلوم والتكنولوجيا والهندسة والرياضيات.

DEDICATION

To my husband who always held my hand no matter how things got crazy. We did it!

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For all those people whose names I mentioned and many more, thank you for making a dream come true.

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List of Abbreviations

STEM	Science, Technology, Engineering, and Mathematics
SCCT	Social Cognitive Career Theory
SE	Self-Efficacy
CSE	Coping Self-Efficacy
CDSE	Career Decision Self-Efficacy
OCC	Occupational Commitment
AOC	Affective Occupational Commitment
NOC	Normative Occupational Commitment
COC	Continuance Occupational Commitment
MEF	Mentoring Functions
QUM	Quality of the Mentoring Relations
PLD	Personal Learning Development
GSE	Goal Setting
PAT	Protean Attitude
MENA	Middle East and North Africa

M	Mean
SD	Standard Deviation
CMB	Common Method Bias
CMV	Common Method Variance
CFA	Confirmatory Factor Analysis
EFA	Exploratory Factor Analysis
CR	Composite Reliability
SEM	Structural Equation Modelling

CHAPTER ONE

Introduction

1.1 Statement of the Research Problem:

With technical innovations being a dynamic force behind economic growth for many countries worldwide, apprehensions are emerging related to the decreasing numbers of individuals who are joining these technical career domains. The under-representation of women in Science, Technology, Engineering, and Mathematics (STEM) fields drastically reduces the available talent pool that would aid in enhancing technical innovation. Recent statistics in the USA show that 74% of STEM employees are men while 26% are females (Munoz-Boudet 2017, Stofan 2017). Females make up more than 20% of Engineering university graduates, however only 11% of these women end up working in the field of Engineering (Marcus 2014, Munoz-Boudet 2017). Although females account for 60% of university graduates, only 35% graduate with an undergraduate degree in STEM (Munoz-Boudet 2017). Females in Australia, for example, make up 17% of the workforce in the Physics industry and 41% of Science and Medicine (Holman 2018). Similar under-representations have been reported in most other countries worldwide (World Bank Education Statistics 2017, Hill *et al.* 2010, Hunt 2016). The shortage of Math and Science professionals threatens attempts to react to the vast technical and scientific challenges taking place around the world. Thus, several initiatives have been taking place in various countries to increase the recruitment of qualified individuals in STEM majors and jobs and to develop a larger and more diversified talent pool (Byars-Winston *et al.* 2010). In addition to the benefits of having a diversified talent pool, recent work on this area of study indicates that attempting to

balance gender misrepresentation in the workplace and entrepreneurship could lead to a boost in aggregate productivity worldwide by 16%. Increasing the number of females working in STEM industries could result in enhancing women's economic prospects since STEM jobs pay women more compared to occupations in other sectors (Munoz-Boudet 2017, Toossi 2012). Foreclosed and limited STEM educational and occupational opportunities for a certain group of individuals cause waste of talent in subsequent occupations (Leung *et al.* 2008).

1.2 Aim and Scope:

Women in STEM Related Careers:

The aim of this research is to investigate and understand psychological and social factors impacting on the persistence of females in STEM fields. Previous research has concentrated on growing the number of women who choose to study STEM majors at various educational levels (Byras-Winston & Fouad 2008). Between 1992 and 2008, statistics in the US show that the number of qualified females graduating from STEM majors has been on the rise (NSF 2008, Cech *et al.* 2011, Bilimoria *et al.* 2008), which led scholars to conclude that some interventions in the education system were successful in attracting females to study these subjects and consequently helping them graduate. However, females are not persisting in their careers in these fields. According to the current literature, females and ethnic/racial minorities are drastically under-represented in STEM occupational fields, especially in technical areas such as Computer Science and Biomedical Research (Froeschle & Normington 2010). Despite many attempts to employ more females in STEM related courses or careers, the leaky pipeline still shows troubling figures. Females make up 42% of students pursuing Science, Engineering and Technology (SET) subjects pre-university in the USA, once at university only 33% of SET undergraduates are women, and after graduations less than 20% are employed in SET related jobs. Other

studies discuss similar misrepresentations in Europe, Australasia, Canada and the USA (Hill *et al.*, 2010; Hunt, 2010).

A group is deemed under-represented when its numbers in a certain domain is immensely lower compared to its count in the total community (Carnevale *et al.* 2011). Another definition proposed over 40 years ago by Kanter (1977, 2008) is when a male dominated industry would comprise more than 70% male employees. Where under-representation in itself does not have to be a problem if people can choose their occupations based on their skills and interests, it does have negative implications when systematic obstacles and impediments emerge, prohibiting certain groups from making career decisions and choices compared to the range of freedom other groups have (Byars-Winston 2013). This falls in line with the representative bureaucracy theory that suggests that a public personnel delegate of the people in terms of gender, ethnicity, and race will aid in providing and safeguarding the well-being of all groups in official decision-making mechanisms. The theory explains that the operative depiction of group well-being takes place as a result of individual representatives echoing the point of views of those who have the same demographic background (Bradbury & Kellough 2011).

Allen (1998) has previously argued that studies on women have traditionally been conceptualized under two main categories: those that concentrated on the domination aspect, that is the ways men acted their power over women, and those that focused on the power that women need to act, that is empowerment. Throughout the literature on women in STEM we can realize that the majority of the studies fall in line with Allen's depiction. Researchers identified several factors that may be leading to the "leaky pipeline" of women in STEM fields, such as the existence of an unfriendly environment that includes condescension, poor accommodation for family obligations, sexual harassment, disparities in pay, biased job duties and appointments, and varying guidelines to judge work (Hill *et al* 2010). Others also

explained that women's under-representation in the workplace can be due to biased selection processes preferring men in certain performance positions which may also lead to subjective and arbitrary advancement opportunities (Betz 2005). Other studies have focused on female versus male academic capabilities in Math and Science subjects among high school students to disprove notions of cognitive ability barriers as an explanation for the under-representation of females in STEM fields. Most of the findings did not find any compelling biological differences between the sexes' Math and Science abilities. Furthermore, in cases where some ability disparities were proven to exist, they were minimal and could not explain the overwhelming under-representation of women in academic faculties and leading posts. Some researchers categorized the factors contributing to the under-representation of women in STEM careers as pertaining to either cultural bias in hiring processes (Reskin 2003) or structural factors, which may include a "chilly climate" that results in gender segregation and male dominance (Sandler *et al.* 1996). Various studies focused on the campus and classroom climates in terms of discrimination and sexism and concluded that a perceived fit of these students with their academic environment has consequent effect on their behaviours and choices (Morgenson *et al.* 2007). Some researchers investigated social-psychological mechanisms that may include personal beliefs about one's ability, proficiencies, expected roles, and personal fit which start at the early stages of the educational process and continue throughout women's careers (Cech 2007). Despite the fact that the findings and recommendations of these studies may have been taken into consideration and are being applied across many organizations, women's working representation in the field has not encountered any significant shift for more than ten years (Fouad *et al.* 2011).

Scholars tackling cognitive factors focused on self-perception and its influence on achievement attitudes (Schunk & Meese 2006). One cognitive factor that has been well researched in the literature is the concept of self-efficacy where Bandura (2006) explains that a person's level of motivation and behaviours are related more to what he or she believes rather than what is the objective situation. Social-psychological factors have been considered a crucial part of the workplace sex segregation (Correll 2001).

STEM Definition:

Up until now there is no consensus on a single definition of what makes a STEM job. One of the proposed definitions comprises technicians and groups STEM jobs under five sub-groups: engineers and engineering technicians, computer occupations, life and physical science, mathematical science and surveyors, architects and technicians (Carnevale *et al.* 2011, The Standard Occupational Manual 2010). Based on the Standard Occupational Classification¹ Manual, STEM employees are those working in jobs principally deploying Science, Technology, Engineering, and Mathematics in practice. These comprise mathematicians and computer professionals, engineers, engineering technicians, physical scientists, life scientists, and science technicians.

STEM is thought to be subject matter directed; thus, it contains teachers, researchers, managers, practitioners and technicians. Despite the fact that most STEM employees hold at least a bachelor's degree, the field also contains employees with Associate degrees and high school diplomas.

¹ The Standard Occupational Manual was published for the first time in 1980 and was revised in 2000 and 2010. The occupations are categorized according to the work performed, education, skills, and training.

1.3 Objectives of the Study, Research Questions, and Hypotheses:

The literature still falls short on explaining and uncovering the factors that might contribute to females' persistence and commitment in STEM fields. The aim of this study is to try to understand the factors that might affect female persistence and occupational commitment in these fields through using mixed method analysis. Only a small number of researchers (Berglund & Tillmar 2011, Buse *et al.* 2013) have attempted to investigate women's persistence in STEM fields from a cognitive perspective, thus mixed method research is deemed pertinent to try to comprehend the aspects behind the career decisions of persisting women. In the first phase of this research design, semi-structure interviews have been administered where participants were given a large opportunity to express and illustrate their experiences, analyse the meaning of their experiences and decision-making processes from their own perspective in order to offer abundant and more distinctive data than would be attained through quantitative method only. In the second phase, a survey was administered in order to test relations between three variables; namely, coping self-efficacy, mentoring and occupational commitment.

Our focus throughout this study is on career supporters of females persisting in STEM fields. Career supporters are considered contextual factors that may enhance the creation and quest for career development among individuals. These supportive environmental circumstances are discussed through career development literature (Tinsley and Faunce 1980) but have not usually been subjects of continued research consideration. Support variables, despite their importance, have gained less *research attention* than they deserve (Lent *et al.* 2000). The focus is on the effect that mentoring might have on coping self-efficacy and occupational commitment as a support variable.

Despite the numerous research related to females in STEM fields, the focus has been mainly on the outcome rather than the process, that is what majors do female students end up choosing or what career fields do they end up selecting rather than how did females working in STEM persist, or how did they manage to succeed and commit to their occupations and why. In addition, most of the research has been conducted in academic rather than occupational settings. The objective of this study is to heighten the attention on the process elements of persistence and occupational commitment of females working in STEM fields. This study sheds light on the dynamic approaches females in STEM fields adopt in order to overcome the occupational challenges. Therefore, the main operationalization of the research questions for this study are:

1. How do females succeed in committing to their STEM occupations?
2. How does mentoring impact occupational commitment?
 - What is the relation between mentoring and occupational commitment?
3. How does mentoring impact coping self-efficacy?
 - What is the relation between mentoring and coping self-efficacy?
4. How does coping self-efficacy influence occupational commitment?
 - What is the relation between coping self-efficacy and occupational commitment?

In addressing these research questions, the study attempts to test three main hypotheses:

H1: Mentoring has a positive effect on occupational commitment.

H2: Mentoring has a positive effect on coping self-efficacy.

H3: Coping self-efficacy enhances occupational commitment.

1.4 Research Methodology:

This study uses a partially-mixed sequential dominant status design adopted from collection Tashakkori & Teddlie (2010) where the main method adopted is qualitative research and the supplemental component is the quantitative. The qualitative research design attempts to answer the above proposed research questions. The sample was identified using purposive criterion sampling and the sample size was 28 participants. The data were collected using semi-structured interviews. The data were analysed by, first, conducting a literature review thematic analysis. Then, the Gioia methodology (Gioia *et al.* 2012) was used to analyse the interview dataset using Nvivo. The results of the qualitative research were used to inform the design of the survey questionnaire. In phase two, quantitative research was conducted to further explain the results of phase one and to test the hypotheses. Data were collected through a survey. The sample size was 375 female respondents who work in STEM fields. Confirmatory factor analysis was administered. Analysis was performed using Stata. The results of both the qualitative and quantitative methods of data collection were compared and an interpretation of the commonalities and differences is presented.

1.5 Contribution to Knowledge:

While research on women in STEM industries is a highly discussed topic, studies investigating the under-representation of women in occupational settings are still limited compared to in educational settings. This study contributes to knowledge by trying to comprehend the diverse aspects that may cause some females to persist in STEM related fields while others leave, so that educational institutions can better educate females for these challenges when entering the labour force. Such findings

might also assist organizations in developing work environments that would appeal to and retain females. HR specialists and vocational advisers should implement more efficacious approaches to motivating and retaining females in STEM fields. The focus in this thesis is on that small portion of women who have actually succeeded in persisting and committing to their occupations. By doing so, this research offers several contributions to knowledge. For example, the results of this study stress the important role that self-efficacy plays in shaping career choices. The study findings further reinforce the notion that career advancement interventions should be used to enhance females' efficacy beliefs about their interests, values and talents. The results of this study also contribute to the SCCT by drawing on the important role that mentoring plays as a contextual factor in enhancing the coping self-efficacy and occupational commitment of females working in STEM. Support variables, despite their importance, have gained less research attention than they deserve (Lent et al. 2000). The study contributes to knowledge by attempting to provide an in-depth explanation concerning the career and psychological-related functions of mentoring.

1.6 Limitations:

This research has several limitations. As discussed earlier, the core component research design for this study is qualitative research, so it is important to note that as a multiple case study design, this research investigated a specific number of participants (Yin 2009) and thus may not be representative of a whole population. Another limitation is that the results of this study are based on self-reported data. The survey did not attempt to distinguish between formal or informal mentoring. The literature dictates that a formal mentoring schemes may generate better outcomes for mentees than informal mentoring relations (Campbell 2007). These are some of the study's limitations, a detailed discussion is presented in the last chapter of this research.

1.7 Outline of the Thesis Chapters:

The outline of this research is as follows. In Chapter two, the relevant literature is reviewed, analyzed and discussed. The first section in chapter two addresses occupational commitment, definitions of occupational commitment, the relevance of occupational commitment for women who work in STEM industries and finally, Meyer's three-dimensional model is discussed. Also, in Chapter two, the theoretical framework based on social cognitive career-theory (SCCT) is presented. Variables of the SCCT are explained in a detailed section on self-efficacy and mentors as contextual supporters. Then, protean attitude is discussed followed by the statement of hypotheses of the thesis research. Chapter two ends with a summary of the main concepts examined.

In Chapter three, the methodology and mixed methods research design is presented together with a figure illustrating the overall design of the empirical research. The core component is the qualitative research in phase1. The qualitative methods are explained including the issues of data collection and sampling. Then, the quantitative section of Chapter three explains the data collection and the sampling approach adopted in the second phase of the study. Chapter three explains the methods of data analysis for phase 1 followed by the data analysis for phase 2.

In Chapter four, the results of the qualitative study (phase 1) are presented. Chapter five presents preliminary information and analysis related to the quantitative data. Chapter six reports and analyses the results of the quantitative (phase 2) study. Using the Gioia methodology, the analysis of the interview data sets reveals 54 first order concepts that result in fifteen second order themes which are further distilled into four aggregate dimensions. Internal drivers which contained coping self-efficacy and

new concepts from the literature review thematic analysis such as professional identity and personal learning development is the first dimension. Occupational commitment, the second aggregate dimension contains normative, affective and continuance occupational commitment. The third dimension is contextual supporters that refer to mentoring functions and the quality of the mentoring relation. The last dimension is the barriers. The findings of the quantitative analysis support the hypotheses Mentoring has a positive impact on occupational commitment. Coping self-efficacy has a positive impact on occupational commitment. In addition, goal setting mediates the relationship between coping self-efficacy and occupational commitment. A summary of the main findings of the research is presented at the end of Chapters four and six.

Chapter seven presents the main overall findings for the mixed methods research and discusses the contributions to the literature. The findings of both the qualitative, as the core component, and the quantitative, as the supplementary component, analysis indicate the important roles that mentoring and coping self-efficacy play in strengthening occupational commitment. The main contribution to knowledge that this research offers is by indicating the importance of three aspects in strengthening the occupational commitment of women in STEM fields. These aspects are mentoring as a contextual factor, self-efficacy as an internal driver, and protean attitude. At the end of chapter seven a summary of the thesis is also presented.

Finally, in Chapter eight the recommendations, limitations, and conclusion are presented. Renewed understandings have been discussed in this research relating to the role of some identified internal drivers (coping self-efficacy, protean attitude, professional identity, personal learning development) and contextual supports (mentoring) on females' occupational commitment as a minority in STEM fields. The core component research design for this study is qualitative research, therefore,

it is important to note that as a multiple case study design, this research investigated a specific number of participants (Yin 2009) and thus may not be representative of a whole population. Females in STEM struggle with lack of availability of mentoring programs within their organizations. Future research could highlight the importance of mentoring programs that could benefit both the mentee and the organization in general. This may motivate organizations to adopt more mentoring programs that will aid in attaining and retaining women in STEM fields.

CHAPTER TWO

Literature Review and Development of Research Hypotheses

The under-representation of women in STEM industries has been a major issue of investigation for many scholars (Sassler *et al.* 2017). While figures show an increasing number of females graduating from STEM majors over the last three decades, women's participation in the workplace is still lagging (Micheltmore & Sassler 2016) despite the high salaries offered in these industries and the increasing job opportunities (Xie & Killewald 2012). The number of females graduating from STEM majors has increased from 23% in the 1980s to around 50% in 2010 (National Science Foundation 2013). In the workplace, women's representation has slightly increased to around 12% in the Engineering field (Corbett & Hill 2015), is decreasing in Computer Science (Hill 2015, Micheltmore & Sassler 2016), and remains stagnant since the 1980s in other STEM industries (Diprete & Buchman 2013).

Many interpretations have been put forward, amongst the vast literature, attempting to explain the under-representation of women in STEM. Some studies explained that women show less interest in STEM subjects and thus are less likely to pursue STEM majors and careers later on in their lives (Morgan *et al.* 2013). Others have referred to gender variations in work expectations and the role of gender ideology in forming both men and women's employment aspirations. Such studies indicate that attitudes concerning family responsibilities guide females' career decisions in many significant ways (Micheltmore & Musick 2014). Another group of researchers deviated their attention to the demand side and focused on the discriminating recruitment processes. Drawing from the expectations theory, they argued that employers' biased evaluations and presumptions prevent women from receiving job offers or promotions which ultimately lead to gender segregation (Kmec 2011).

Persisting prevalent impressions that women are not as committed to their work as men also lead to biased assessments of females' expertise and abilities where they end up missing on promotions, challenging job offers, or equal pay (Reuben *et al.* 2014).

A large amount of literature has been investigating females' under-representation in STEM majors in comparison to occupational settings where the leaky pipeline is still a major concern. Most of the studies conducted on females in STEM vocations have dealt with examining the barriers and challenges females face in the workplace and the reasons that cause them to leave these industries (Glass *et al.* 2013, Singh *et al.* 2013). This study attempts to understand the issue of female under-representation in STEM industries from a different perspective. The focus is on the women who are committing and persisting in their occupations while the majority are not. The study aims to heighten the attention on contextual support variables and the process elements of commitment amid the slow progress in reducing the occupational segregation gap (Mandel & Semyonov 2014). A considerable amount of research has emphasized the need for further understandings of the factors retaining to gender occupational inequality in STEM fields in order to implement change and attempt to narrow the gap (Glass *et al.* 2013, Morgan *et al.* 2013, Mann & Diprete 2013, Michelmores & Sassler 2016). This chapter starts by discussing occupational commitment and its increasing importance amid increasing organizational change and educational levels. Occupational commitment is discussed in relation to women in STEM and the current issue of the leaky pipeline. The second part of the chapter includes an in-depth presentation of the theoretical framework. It also contains detailed explanations on each variable; namely, coping self-efficacy, mentoring, and occupational commitment, as presented in Meyer's three-dimensional model.

Finally, a summary is included at the end of the chapter recapping the research gap and the main aim of the study, as well as presenting the conceptual model.

2.1 Occupational Commitment:

Research on occupational commitment has been deemed crucial for many years. With rising educational levels, work is becoming more specialized, and organizational change is intensifying (Weng & McElroy 2012, Blau 2009). Uncertainties resulting from organizational change, such as layoffs and mergers and acquisitions, have led many to increase their focus on and commit to an occupation in which they feel more in control. Occupational commitment is also significant due to its possible connection to occupational and organizational engagement where both will have crucial human resource management ramifications (Colarelli 1998, Ballout 2009). Therefore, many researchers are arguing that attention is shifting from organizational commitment to occupational commitment (Johnson 1996, Savickas & Porfeli 2012).

Occupational commitment has been considered an important aspect in career progress since it involves an anticipated series of independent but relevant positions that an individual will occupy over time. Occupational commitment is also central to the advancement of ability since it aids an individual to persist for a long period of time in order to establish technical skills (Savickas 2012). Previous studies of accomplished people reveal that training occurs over a considerable amount of years, progression and exposure essential to obtain high degrees of know-how (Vuolo, Staff, & Mortimer, 2012). Occupational commitment is also crucial in bolstering business and professional relations leading to information sources (Vuolo, Staff, & Mortimer, 2012) and networking ties with decision makers. Occupational commitment is also crucial to occupational survival in an era where commitment to an organization is becoming more flexible and less secure in terms of employability

(Colarelli & Bishop 1990, Di Fabio & Palazzeschi 2012). While other studies investigating women in STEM have examined different career outcomes, this study is interested in understanding the factors related to and strengthening occupational commitment not least due to their importance and potentially diverse and dynamic roles in technical domains such as STEM. Occupational commitment is also considered an important variable requiring more research investigation taking into consideration the leaky pipeline that STEM industries are suffering in terms of attaining and retaining female employees.

Women in STEM and Occupational Commitment:

Despite the increase in the number of females joining the workforce, women in STEM fields still make up around 10% of full-time jobs and 7.7% of managerial positions (BLS 2011). The job demand for these professions is on the rise where job demands in the IT sector are expected to increase by 12% from 2014 to 2024 in the USA, for example (Munoz-Boudet 2017). Many studies investigated how to encourage school girls to study Engineering, for example, while others have concentrated on how to keep women in academic programs (Cech *et al.* 2011). These attempts have succeeded in increasing the number of female graduates from US STEM programs where the number jumped from 5% in 1980 to 22% in 2008 (NSF 2008). However, with the vast 83% majoring STEM graduates working in industry or business (NSF 2011), only a small number of studies have directed their attention to researching non-academic females working in STEM domains (Buse *et al.* 2013). Among these, the vast majority of research investigations have attempted to answer the question of why females exit these professions (Hewlett *et al.* 2008). Statistics show that more than two thirds of females give up their STEM careers within 15 years from graduating, that is double the number of men who quit (Frehill 2008) compared to 10% in other industries (Livingston 2014). To be able to remain in

and be committed to STEM occupations, research has recommended enhancing culture and organizational practices. This may include establishing a culture inside the organization that will appreciate the contribution of women by supplying clear routes towards growth, facilitating mentoring opportunities, and promoting work-life balance (Foud & Singh 2011). Such recommendations, despite their importance, have resulted in only a slight increase in the participation of women in these occupations. Therefore, this study focuses on the concept of occupational commitment for only those females who persist and succeed rather than further investigating the numerous, complex challenges covering the whole population of women with STEM qualifications.

Since occupational commitment is the concept that reveals attachment and motivation, it is used in this research to examine the persistence of females pursuing STEM careers. Occupational commitment is used as an outcome variable that aids in establishing the motivations and intentions of females working in these domains (Blau 1988). Intention is a significant notion within STEM fields since a vast number of females end up either quitting their jobs or even leaving the occupation for good, after a certain amount of time. Occupational commitment is also used in this research as a work-related behaviour or an attitude. It influences actions, performance, future career decisions (Brown & Lent 1996), and affects consequent job behaviours (Darden *et al.* 1989). In addition, career success, satisfaction, and involvement are all interlinked with the discussion of occupational commitment (Baker *et al.* 2002). Occupational commitment was found to be a major indicator of the intention to remain in the profession (Blau & Lunz 1998) and an antecedent of intention to change occupations (Carless & Bernath 2007).

Definition of Occupational Commitment:

Becker was among the early researchers who started studying commitment in the 1960s and 1970s. He considered commitment as a kind of loyalty towards organizations and examined the effect of previous decisions and options on an employee's behaviour. Later, a rather attitude-oriented prospect on commitment emerged. The concept of commitment has evolved into a more intricate and versatile construct where scholars are utilizing the concept in many ways. Blau (1985) considered commitment to be a single dimension indicating affectional connection. Meyer *et al.* (1993), on the other hand, proposed a multidimensional three-component framework. Commitment has also been studied in different domains whereas the early searches focused on organizational commitment of the employee (Mowday *et al.* 1979). One trend in the research has been to analyse employees in different work domains, such as occupations, unions, and jobs (Meyer & Allen 1991). Commitment targets represent the entities that a person is committed to. Scholars have studied various commitment targets, such as occupation, organization, career, and goals (Vandenberghe 2009). Further studies dealt with the dimensions of commitment initially identifying three dimensions pertaining to loyalty, involvement, and identification (Oreily & Chatman 1986). In later studies, Meyer and Allen put forward the three-component model of commitment (1990, 1991, 1993) detailing three distinct mind-sets related to three features of motivation: desire to affect, cost to cognition, and obligation to social influence.

Occupational commitment can be defined as a verifiable and particular line of work a person enrolls in at a certain point in time to earn a living (Lee *et al.* 2000). It comprises a variety of required skillset, knowledge, and different duties according to each occupation and is interchangeable across settings (Meyer *et al.* 1993). Despite the fact that the terms career, occupations, and professions have been used

conversely in the literature, to some extent, occupation best fits the concept under examination in this study. Occupation is preferred over profession because it tends to be broader (Weng & McElroy 2012). It includes both professionals and non-professionals. This agrees with the notion that both professionals and non-professionals can be committed to their line of work (Meyer *et al.* 1993). Occupation is chosen over the term career, as well, in an attempt to avoid any possible confusion where many authors have defined career as a set of jobs, vocational choices, and other activities related to work throughout a person's lifetime (Arthur e1989). This definition does not agree with the notion discussed in this paper. Various interpretations of the term career may yield different responses as well, thus a narrower work concept, like occupation, is being used (Blau *et al.* 2009). Occupational commitment has been defined also as an individual's belief in and recognition of the values of the line of work followed, and eagerness to maintain association with that occupation (Vandenberg & Scapello 1994, Okuram 2012). Blau *et al.* (1993) explain that occupational commitment is a person's stance towards her profession or vocation. It has also been perceived as a psychological tie between an individual and his occupation that is due to an emotional response to that occupation (Lee *et al.* 2000).

Although the topic of occupational commitment has received a considerable amount of attention in the literature across various domains (Cohen 2007, Blau & Lunz 1998, Weng & McElroy, 2012), major gaps still exist in terms of understanding the factors behind occupational commitment, especially for women operating in male dominated industries. Most of the research done on this topic so far has tackled environmental antecedents of occupational commitment. The intention of this study is to attempt to contribute to the research on dispositional aspects where less focus has been offered (Erdheim *et al.* 2006).

2.2 Meyer's Three-Dimensional Model:

Drawing from their research on the organizational commitment model, Meyer *et al.* (1993), defined occupational commitment as a commitment to a specific line of work. The model of organizational commitment distinguishes three aspects of commitment. Commitment can be affective indicating attachment to an occupation. Affective commitment is based on value. In such cases, employees stay with the organization because they want to or wish to do so. Affective occupational commitment (AOC) is when an individual continues with her occupation because she wants to. The person has a favourable identification with her occupation and desirable psychological accomplishments (Meyer *et al.* 1993).

Normative commitment pertains to being obliged to continue in a certain line of work. Normative occupational commitment (NOC) is based on obligation. People stay in the occupation because they feel obliged to remain there (Meyer & Allen 1984). The person in this situation has strong feelings of loyalty and a high degree of responsibility not to exit the profession.

Continuance commitment pertains to the perceived cost of exiting the occupation. Continuance commitment is based on a costs and benefits assessment (Meyer & Allen 1997). Continuance occupational commitment (COC) implies a person keeping to their occupation due to the difficulties entailed if they want to leave for another, or it may be due to financial constraints. Continuance commitment is explained in details through the Carson *et al.* (1995) measurement of “career entrenchment”. The individual considers the compiled investment in his occupation that would become useless and meaningless if he quits. In this situation, the individual might also think about the emotions of loss by abandoning his occupation and may also perceive the options are limited, in some situations, for taking on a new occupation.

The three dimensions are viewed as independent elements of commitment (Meyer *et al.* 1993) but also can be experienced by an employee simultaneously in varying degrees as the multidimensional nature of the model implies. The three dimensions are significant in the sense that each one has distinct causal factors that may result in totally diverse results (Irving *et al.* 1997). The advancement of affective commitment has been linked with personal attributes such as gender, age, work experience, and the structure of the organization. The latter has been reported to have the strongest link to occupation. Individuals whose work experiences fall in line with their expectations will show high satisfaction in terms of their occupation. They tend to have deeper affective commitment when compared to unsatisfied employees.

Continuance commitment forms as a result of an individual having minimal alternatives, compiled endowments, or side bets. Thus, any factor that may heighten perceived cost is considered a pre-existing factor. Normative commitment is formed via socialization attempts that accentuate loyalty. In situations where the organization offers the employee rewards, trainings, or financial incentives, normative commitment develops. Normative occupational commitment is related to acts of professional advancement serving as support to the occupation (Snape & Redman 2003). Many researchers have explained that normative commitment can be excluded as a third component of the model due to its recurring association with affective commitment. Meyer *et al.* (1993) noted that the analogous antecedents and consequences could explain the strong association between the two components. The formation of continuance commitment constitutes side bets, endowments, and options (Meyer and Allen 1997). Side bets are the compilation of investments individuals might be wasting if they decide to leave the occupation. Meyer and Allen build on Becker's (1960) side bet theory that states that commitment increases as these investments grow. A female engineer, who has sacrificed and invested ample

effort, time, and money on her college education, would be less prone to quit her occupation and lose all of these investments.

As a result of testing the generalizability of commitment to occupation on a sample of Canadian nurses, Meyer *et al.* (1993) concluded that the measures of affective, normative and continuous domains of commitment are reliable; that the antecedents and consequences of organizational commitment can be used on other aspects, such as occupation, and that organization and occupational commitment both add separately to organizational outcomes. Further studies were made to assess the three-component model of commitment. Irving *et al.* (1997) attempted to study the validity of the constructs on a sample of Canadian government employees across various occupations in an organization. Their findings are consistent with those of Meyer *et al.* confirming the generalizability of the model. They also found a positive relation between gender and continuance commitment. In 2003, Snape and Redman attempted to replicate the study on a sample of British human resource employees. Their general overall findings were the same. Their study also proved the generalizability of the model to different type of occupations. Another recent study investigated the quality of mentoring relationships and its impact on the occupational commitment of nursing faculty using four magnitudes of occupational commitment (Gwyn 2011). The findings revealed no difference in normative and affective commitment between faculty members. There existed, however, a positive association between affective commitment and the quality of the mentoring relation. While research is still ongoing to test new variables to the model and study occupational commitment as a predictor of work behaviour, little research has been done on the relation between mentoring and occupational commitment.

2.3 The Social Cognitive Career Theory/Career Self-Management Model:

Social Cognitive Career Theory (SCCT) was introduced about 20 years ago and contained three segmented models focusing on choice making, advancement of interest and persistence and achievement in educational and occupational settings (Lent *et al.* 1994). This model is adopted as the main theoretical framework informing the research for this thesis since it aids in understanding several process aspects of career behaviour of women working STEM fields. This includes, for example, how females would manage normative tasks and handle barriers related to working in these fields, such as career adjustments, advancements and so on. Such a process focus can augment and considerably aid us in exploring a wider range of dependent variables that would assist us to comprehend the persistence and occupational commitment of females in STEM related fields.

Drawing from Bandura's cognitive work (1986, 2006), the theory is an effort to test and enhance understandings of links between prior theoretical domains to career development. It attempts to expand Holland's theory (1997) by stressing the antecedents related and unrelated to interests such as self-efficacy and beliefs (Lent & Brown 2013). The theory also has aided in expanding the range of existing theoretical concepts by including culture, gender, and human diversity elements within the frame of career development (Betz and Hackett 1981). Many scholars have attempted to apply or expand it. For instance, in 2000, Lent *et al.* attempted to further explain the roles and the nature of environmental forces inside the theory. The theory was extended to recognize its practical implications (Lent & Brown 2013, Lent & Fouad 2011) and to study ethnically diversified students (Byras-Winston *et al.* 2010) and individuals with disabilities (Fabian 2000). Another SCCT model investigated satisfaction and welfare in educational and career settings (Lent & Brown 2008). Vast changes happening in the workplace such as international

competition, economic ambiguity, diminishing job security, and technological progress, all call for new ways and models to help employees administer their careers (Blustein 2006). The new emerging model of career self-management is the result of a research approach to understand these changes. It attempts to concentrate on the micro-level mechanisms, such as how individuals handle normal developmental duties and also cope with less anticipated incidents. The career self-management model stresses the adaptive behaviours, environmental factors, and person-based aspects that promote their use, unlike other existing models that render career behaviour as a group of personal-difference characteristics (Rottinghaus *et al.* 2005). The Career Self-Management Model is considered an expansion of previous SCCT models by focusing on a broader range of vocational adaptability behaviours, reacting to existing career-related challenges, and attempting to integrate vast channels of vocational and psychological research that are still at times discussed as separate entities (Lent & Brown 2013). The model aided this research by enabling further investigations about the lived experiences of females in terms of the challenges they have faced as an under-represented group of employees. It assists understanding of the vocational behaviour and adaptability of the participants given that STEM fields are fast-moving industries where rapid, technological changes are taking place. The model is based on the assumption that individuals are usually able to claim a certain measure of individual control in some parts of their career development. The focus is, therefore, on those processes where individuals are partially able to control their actions to achieve individual and corporate results (Lent & Brown 2013). Agency is achieved by people's ability to participate in deliberation, self-reflection, intentional activity, and self-reaction (Bandura 2006). Such capabilities allow humans to engage to some extent in their vocational advancement and choices. They also offer fundamentals for supporting career services, such as searching, establishing and planning actions. However, these personal capabilities

don't imply that individuals have full control over their occupational lives. Humans do not function as independent actors nor are their actions fully driven by environmental factors. Humans' operations are a result of complex interactions of individual, behavioural, and contextual determinants (Bandura 2006). Thus, SCCT considers peoples' operations within a social frame, with constantly existing chances to be affected by, as well as to affect, others. Therefore, the model has allowed deeper understanding in terms of how the participants view the occupational challenges and barriers. It also helped in understanding how they were able to deal with these challenges and not resort to quitting the industry like the majority of women.

Since it is an expansion of the SCCT choice content model, the career self-management model utilizes many of the same basic dimensions but defines and conceptualizes them in a novel way. The model presents three deeply linked variables that guide people through their career development: Self-efficacy expectations, outcome expectations, and personal goals (Brown & Lent 1996).

Variables of SCCT:

Outcome expectations are presumptions related to ramifications of performing an action. They can be neutral, undesired, or admired. There are three kinds of expected outcome expectations: social, which may favour one's family, material, such as financial gain, and self-evaluative, such as approving one's self (Bandura 1986). Social Cognitive Theory proposes that humans are likely do a certain action and sustain it if they believe that they possess the needed competencies to perform the action and that the endeavour will result in a pleasant outcome. In case of questioning her capabilities or expecting unpleasant or neutral consequences, a person may evade or put off doing a certain behaviour, invest little effort, or even give up rather quickly when faced by challenges (Bandura 1986). Self-efficacy and outcome expectations

advance vocational behaviours both directly and indirectly via the mediating effects on individual goals. According to many theories, to a certain extent, behaviour is instigated by goals. However, specific quality of or kinds of goals particularly facilitate an action. In other words, individuals are motivated to change their goals to actions in cases where goals are definite, unambiguous, and in line with their values (Ajzen 1988). Self-efficacy can also have a direct relation with outcomes, which in our case is occupational commitment, due to the effect it has on assisting the individual to organize actions and persist in the face of obstacles (Lent & Brown 2013).

These personal cognitive factors function along with contextual influences such as social support from managers, peers, or family members. They may facilitate or constrain career behaviour. Contextual supporters and barriers function through many paths. They can directly affect goals and actions or moderate the relations between the two (Lent *et al.* 2000). They can indirectly affect goals through their relations with self-efficacy and outcome expectations (Sheu *et al.* 2010). Thus, the existence of supporters may enhance self-efficacy and outcome expectations. Contextual influences can affect occupational commitment directly and indirectly through the pathway from actions. This is discussed in more details in the section on role models.

2.4 Self-Efficacy:

Self-efficacy pertains to an individual's convictions about his or her capability to perform certain actions or behaviours. Self-efficacy can be measured in many ways (Brown and Lent 2006). Within SCCT models, it is commonly assigned as content or task-specific self-efficacy or process-efficacy. Coping self-efficacy is another form that refers to convictions about the person's capability to surmount certain barriers. It is considered a central form within the model and is supposedly linked to

the idea of self-regulatory efficacy, that is the perceived capability to direct and motivate oneself to carry out self-improving actions such as studying, for example, despite difficult surrounding situations (Bandura 2006). Individuals possessing a high degree of coping efficacy are expected to persist towards their goals when faced with unfavourable environmental surroundings compared to individuals who believe they are incapable of facing expected obstructions. It is through his studies that Bandura (2006) stresses the significance of individuals' belief about their capabilities in managing certain obstructions and barriers.

Researchers distinguish between coping efficacy and content-specific or task-efficacy. The latter has been defined as perceived ability to behave in a certain way necessary for success within a specific activity realm, under ideal, normal or undefined performance situations. Coping efficacy, however, depicts a person's perceived ability to handle certain situational factors hindering or obscuring behaviour. For example, a student might believe she possesses substantial abilities in Science and Mathematics, however, she doubts her capabilities at enduring gender bias or unfriendly peer pressure related to STEM domains, both academically and in terms of career. The example displays the possibly complementing part of coping-efficacy compared to task-efficacy in facilitating behaviour and persistence at intricate skills in challenging settings. Several studies have investigated the mathematical and scientific aptitude of females and tried to establish a link between this aptitude and the under-representation of females in STEM. Recent studies indicate that both men and women tend to have similar learning aptitudes. However, the self-confidence of females during the early stages of schooling begins to influence their future career decisions (Morgan *et al.* 2013). The male-dominated environment of STEM occupations further intimidates them into refraining from working in these domains. Being able to cope under stressful situations is a crucial

aspect concerning the occupational commitment of women in STEM. Females operating in male-dominated industries such as STEM have to cope with several challenging circumstances such as harassment, discrimination, unequal pay, gender biased promotion decisions, work assessment and inequitable allocation of work assignments that might lead to promotion, and finally the challenge of balancing work and life responsibilities due to long working hours. In a relatively recent study, Pinnington and Sandberg (2013) explain similar challenges that female lawyers in high ranking positions have to face as a numerically employed minority and under-represented group working in professional services firms.

Self-efficacy has been identified as the most crucial aspect of social cognitive theory (Bandura 1997). It has been defined as an individual's confidence in her capabilities to perform certain acts or execute several related behaviours successfully. This aspect of SCCT is a high predictor of whether an individual will perform a certain act, persist at it, and finally succeed (Bandura 1997). There exist four sources of self-efficacy; namely, previous experiences; vicarious learning or observations; degrees of emotional arousal experiences, and persuasive messages. Individuals use these sources from their lived experiences to acquire information to appraise their self-efficacy (Bandura 2006). This indicates that self-efficacy does not function solely but rather interacts with environmental factors as well.

Sources of Self-efficacy:

Bandura's self-efficacy theory attempts to clarify personal agency under a uniform conceptual framework, which depicts the sources of beliefs of human efficacy, the operations and formation of these beliefs, their operating mechanism, and their various effects (Bandura 1997). Perceived self-efficacy is defined in terms of convictions about one's abilities to organize and execute required actions in specific situations (Bandura in press). These beliefs affect individuals' cognitive, emotional,

and behavioural processing. This explains why self-efficacy is considered to be the primary and most prevalent aspect of personal agency.

Mastery experiences are deemed to have the strongest influence on self-efficacy where they provide the most accurate proof of whether an individual is able to successfully achieve a certain task (Gist 1989). Successful performances or actions help build a stronger self-efficacy, while unsuccessful ones weaken it. Mastery experience is a developmental process involving how the individual acquires the right tools to aid her direct her feelings, thinking, and motivation to develop and carry out necessary behaviour to handle her life circumstances. It is through barriers and challenges that the stamina of self-efficacy grows. Individuals achieving a quick and easy success will anticipate quick results, thus, they are easily demotivated when they fail. Facing difficulties and obstacles develops perseverance and teaches the individual that successful achievements do need effort (Bandura 2001). Such individuals learn to persist in the face of challenging situations and recover fast from failures.

Vicarious learning also aids in developing and increasing the sense of self-efficacy through social models (Bandura 1986). Being exposed to other similar individuals who can achieve success by facing an adverse environment heightens the viewer's belief that she too can succeed (Schunk 1987). Similarly, seeing individuals fail although they put in strong efforts will diminish the observer's self-efficacy and impair her motivation (Brown & Inouye 1978). The impact of role models on a person's self-efficacy is related to the degree of similarity between the two perceived by the latter. The higher the perceived similarity, the stronger is the influence of the role model on the person's self-efficacy. Role models are considered a social or occupational standard to which an employee benchmarks her own skills and capabilities. However, role models do more than that. They teach their protégé

efficient skills and strategies to be able to administer contextual demands via their attitudes, actions, and verbal communication. Possessing such skills heightens the sense of strong self-efficacy. Observing role models persist amid obstacles and challenges is even more empowering for others than acquiring certain skills.

Social persuasion is a third way to influence and strengthen self-efficacy. When individuals are verbally convinced that they have the skills and competencies to perform a certain act, they feel more motivated towards achieving that task in comparison to a situation where they have doubts about their competencies and focus solely on their own deficiencies (Schunk 1987). Bandura (1997) notes that a successful efficacy facilitator not only discloses constructive evaluations but also attempts to construct situations for individuals so that they prompt their success. They guide people to measure the success in terms of self-enhancement instead of victories over others.

While individuals depend on their sentimental and physiological states to assess their abilities, this aspect is considered the fourth source of self-efficacy. For example, when undergoing activities that need strength and endurance, individuals tend to assess their abilities by looking for signs of pain and weariness they are experiencing (Ewart 1992). Mood also plays a part in how individuals judge their capabilities where positive mood improves perceived self-efficacy (Kavanagh & Bower 1985).

Self-efficacy and Gender:

Due to the alarming under-representation of women in Science and Technology, Hacket & Bezt (1981) were pioneers in extending self-efficacy theory to vocational development, stressing occupational interests, and choices across genders. They propose that the under-representation of females in STEM fields may be due to low self-efficacy. After publication of their study, a string of research followed where

some studies found that gender differences in career self-efficacy existed among university students in a diversified sample. These gender differences were also manifested across male and female dominated jobs at the level of specified occupations (Church *et al.* 1992). The vast body of literature reveals specific moderators in terms of gender differences in self-efficacy, probably among gender-stereotypical jobs where females struggle to achieve and develop their efficacy further or in which gender-role stressors negatively affect perceived efficacy (Betz & Hackett 1983). On the other hand, a more neutral attitude towards gender-role and a considerable number of role models may improve occupational efficacy beliefs and widen the options of non-traditional jobs that females can choose from. The vast amount of research on self-efficacy and women in STEM explains that lack of confidence rather than academic or talent deficiency is the main reason why women are quitting STEM (Dawson *et.al* 2015). These problems further highlight the need to further investigate this cognitive variable in an attempt to understand its implications on females employed in male-dominated industries.

Self-Efficacy and Career Decision:

Career decision self-efficacy (CDSE) was proposed through the studies of Taylor & Betz (1983) due to the apparent influence of self-efficacy on vocational performance, interests, and persistence. Many aspects of efficient occupational decision-making have been identified, such as job exploration, problem-solving abilities, goal setting, organizing abilities and representative self-assessment skills (Crites 1981). Some research verified that the CDSE scale differentiates among university students at three levels of career decidedness: those who affirmed their majors, those uncertain about them, and those who have not chosen yet (Taylor & Popma 1990). Other prominent findings suggest that a low CDSE is related to apprehension over the choice making process (Matsui & Onglatco 1992); that liberal

gender-role self-perception enhances strong self-efficacy for vocational decision processes, and more decisive women possessing stronger CDSE are more eager to participate in non-traditional occupations (Nevill & Schlecker 1988).

Some researchers have studied the relation between self-efficacy and career decision-making skills. Results show that career decision self-efficacy is negatively related to career indecision, positively correlated to peer support and career outcome expectations, and negatively correlated to career obstructions (Choi *et al.* 2011). Others have researched self-efficacy and work search competences where self-efficacy positively correlates with job search activities and number of job offers obtained (Kanfer *et al.* 2001). A number of researchers also investigated the relation between self-efficacy and desire to attend college (Ali *et al.* 2005), work-family conflict (Cinamon 2006), training motivation (Colquitt *et al.* 2000), and organizational citizenship behaviour (Todd & Kent 2006). Results fall in line with previous research indicating a positive relation between self-efficacy and desire to attend college, training motivation and organizational citizenship behaviour.

2.5 Mentors as Contextual Supporters:

Contextual Supporters in SCCT

Social Cognitive Career Theory (SCCT) can be viewed as having two sections. The first pertains to personal cognitive aspects of self-efficacy, outcome expectations, and personal goals. These variables help individuals have control over their own actions and career choices. The second section analyses the relations between other sets of variables such as personal input, learning experience, and environmental factors. (Lent *et al.* 1994). In this part of the study, the focus is on the environmental factors, specifically the impact of mentoring as a contextual factor on career development. As discussed earlier, both objective and perceived contextual elements

have an impact on career advancement. Nonetheless, the influence of a certain objective factor usually rests on the approach the person assesses and to which they react. In other words, individuals are seen as proactive influencers in the environment to a certain extent. They are no doubt influenced by uncontrollable occurrences, events, either negatively or positively. Individuals differ in the ways they construe the environment and themselves, as reflected in their behaviour and choices (Lent *et al.* 2000). The concept of environmental influences has been borrowed by SCCT from Astin's (1984) concept of perceived "opportunity structure" and "contextual affordance". The two notions explain that environmental factors such as resources, obstacles, or prospects, are dependent on a person's analysis. They stress the significance of exploring the phenomenological duty of an individual to process environmental impactors. Lent *et al.* (1994) divided these factors into two groups based on their degree of closeness to the vocational choice-making process. Focusing on contextual factors will aid us in understanding how these relations take place. When faced with certain barriers or unsupportive environment, a person will most likely be more intimidated to shape her interests into goals and then actions. The opposite scenario is also true. Contextual factors can also have a direct effect on career development. This may be very clear in collectivist cultures where the desires of influential others, such as family members, for example, may have an impact on the person's career choices (Lent *et al.* 2000). In line with this notion are the findings of Tang *et al.* (1999) where they studied a sample of Asian American university students and two contextual variables: adjustment to culture and the influence of family along with self-efficacy. The three variables were powerful interpreters of an index of career preference compared to personal interests. Many recent researchers have studied the influence of perceived support aspects in relation to several educational and vocational outcomes (Stockard *et al.*, 2010). The impact of parental support on adolescents seeking jobs in specific

fields revealed a relation between the latter and other variables such as self-efficacy and interests, in light of Holland's theory (Lapan *et al.* 1999). Academic plans and occupational expectations among Mexican American high school girls related to perceived fathers' support (Ali *et al.* 2005). Faculty assistance and support were related to academic achievement of Engineering students (Hackett *et al.* 1992) and persistence (Schaefers *et al.* 1997). Other qualitative studies investigated vocational support aspects in employees (Richie *et al.* 1997). It is, however, noticeable that support factors and mechanisms are under-researched compared to barriers (Lent *et al.* 2000). Much of the attention that was directed to studying contextual barriers was due to the need to understand the reasons hindering females' career advancement. Since the general picture was depicted in terms of obstacles and challenges, naturally, the attention was turned toward researching barriers. However, focusing on one aspect of effects and neglecting the other may result in confining research on contextual influences in a general term. By focusing on career supports, this research seeks to complement the existing research on contextual factors in terms of career development. Attempting to answer questions such as how and why mentors influence occupational commitment may result in valuable implications for organizational leaders, career counsellors, and group minorities. While the research on barriers offers the possibility of designing coping strategies (Brown & Lent 1996), the focus on supporters might propose improving efforts to make use of the contextual resources available, for example, mentors, or adjust and modify their environment in an attempt to gain previously inaccessible resources, such as a supportive peer structure.

Definition of Mentoring:

Among the large amount of literature discussing the topic of mentoring, there exist many variations of the definition presented by researchers, resulting in different implications in the use of the term (Kram 1985). The literature indicates that the term mentor can mean diverse things to different individuals. While studying the topic of mentoring, it is crucial to provide a clear presentation of what the term mentor means. In this study, distinct types of relationships and understandings are proposed. This prevents the participants from relying on their own comprehension of what a mentor is. Although attempting to define a construct, as researchers indicate, may be a challenging job, the significance of a clearly defined concept cannot be exaggerated (Netemeyer *et al.* 2003), especially when dealing with a topic such as mentoring where a large amount of variation exists. This research borrows from the definition of Day and Allen (2004) that states that a mentor is an accomplished employee who acts as a role model, offers sustenance, guidance, and feedback in relation to social advancement and vocational plans. S/he is also a person of senior position who provides a protégé with advice, looks out for him or her, and helps in advancing work achievements to the attention of senior and powerful individuals in the organization. Where there exist two types of mentoring, formal mentoring is created by the organization while informal is generally unplanned. This study agrees with the above definition of mentoring in terms of functions but does not necessarily agree with the concept of seniority. This will be explained in more detail when discussing types of mentoring. Tentoni (1995) noted that mentoring is made up of five segments. It is a supporting relation yielding career success for the protégé. It has three functions: psychological, career and role modelling. Although mentoring aims at advancing protégé success, it is also an interchangeable relation between the mentor and mentee. The relation is based on direct interactions between the mentor

and protégé. Finally, the mentor has more expertise, knowledge, or authority in the organization.

Functions of Mentoring:

In addition, this study also incorporates Kram's (1985) two-dimensional functions of mentoring in an attempt to reduce as much as possible any variability among the participants in order to aid data collection in terms of participants' understanding of a mentor and a mentoring relation.

The definition of mentoring differs across personal dimensions and structural relations (Merriam 1983). This is still the case in recent literature while additional mentoring functions and roles are being included (Gibson 2004). The classical mentorship has been defined as a hierarchical relation where a senior provides advice to a junior employee. This kind of relation would stretch over long periods of time, it is one-on-one, and involves career-oriented developments (Whitely *et al.* 1992). Another viewpoint came from Levinson *et al.* (1978) where they highlighted the functions of mentoring. Kram (1983,1985) drew from this line of thought and proposed her conceptual model of mentoring based on both career and psychological functions. Mentoring has been viewed as an enriching relationship between an experienced person who offers technical and psychological assistance and a less experienced person benefiting from this support.

The technical support provided is related to career developmental aspects, such as promoting intellectual growth, balancing workloads and teaching informal rules within the organization. The career development activities also include helping and assisting, training, safeguarding, providing challenging assignments and broadening exposure. These functions rely on the mentor's authority and power within the organization. Kram (1986) identified five activities pertaining to the career

functions. The first, sponsorship, includes aiding, preserving, and promoting the protégé's career advancement, such as allowing her access to important social networks (Tentoni 1995). The second activity is coaching, which entails the mentor to act as a teacher and to supply the protégé with beneficial instructions and constructive performance feedback (Kram 1986). The third activity is protection, where the mentor plays the role of a buffer, granting help in tough conditions and sharing responsibility for the protégé's mistakes. The fourth activity is exposure where the mentor facilitates chances for the protégé to showcase her proficiency in front of executives and decision-makers in the organization. The last activity is challenging work where the mentor provides the mentee with job duties and assignments that would enrich her skillset and knowledge resulting in career prosperity and promotion (Kram 1986).

The psychological functions stress the quality of the relation and the emotional link underling it. They may include support on issues of work-life balance, how to respond to discrimination, and how to cope with disappointments. The mentoring relationship could lead to career success where it includes modelling and vicarious support. Mentors can help protégés establish a sense of professional self in terms of recognition and confirmation, provide sound counselling, share a mutual supportive friendship, and offer identification and role modelling. The relation between the two may also improve a protégé's feelings of competency, self-efficacy, and personal and work-related advancements. The psychological functions of mentoring discussed by Kram (1985) are expected to influence career outcomes through their effect on the learning process (Bandura 1977).

The psychological functions include reinforcing the protégé's self-confidence via caring and praise (Lyons & Scroggins 1990, Hewlett, 2013). Kram (1986) explained that the psychological functions relate to four activities. The first function, role

modelling, pertains to the protégé having an outstanding role model to mimic (Brinson and Kottler 1993). The second is the counselling activity, which involves the mentor in supporting behaviours and helping the mentee in tough employment and life situations (Tentoni 1995, Ibarra, Carter, & Silva, 2010). This activity aids the protégé through professional and interpersonal crisis (Kram 1986). The third activity is acceptance and confirmation where the mentor supplies continuous help, appreciation, and respect that will result in stronger self-efficacy and self-image for the protégé (Kram 1986). The friendship function, the fourth activity, pertains to the mentor devoting time for the protégé and accepting the protégé as she is (Tentoni 1995). This function also involves a caring relation between the two that goes beyond work duties (Kram 1986).

Some scholars focused on the influence of mentoring on the job (Johnson & Scandura 1994). They tested for specific types of mentoring. Others tested traditional one-to-one mentoring in relation to a network of mentors assigned to a protégé. Other scholars researched aspects relating to lack of mentorship provided to females as opposed to males. When it comes to women's mentorship, several explanations have been put forward as to why women are not well integrated into the system. Some scholars explain that some mentors do not usually welcome women as protégés, based on their assumption that they lack the drive and commitment needed for a professional career. In addition, factors such as prevalent developmental occurrences, perceived value congruence, and memberships in special social networks do promote a strong relation between both male mentors and protégés rendering the strength and quality of the relation between them greater as opposed to female protégés (Betz & Fitzgerald 1987). The literature reveals the substantial amount of research done on traditional mentoring relations (Gibson 2004); however, not much research has been employed to investigate the process by

which employees recognize, build, and preserve career advancement through mentoring relations and role modelling.

Most of the existing research on women in male-dominated jobs focused on the influence of role models during different stage of education rather than career progress. Although women are attempting to match men for qualifications and experience, they are still drastically under-represented in STEM fields (Hill *et al.* 2010). A crucial factor that would encourage more women to pursue careers in a STEM field would be to anticipate their success in these fields (Bandura 1977). However, according to research, women tend to under-rate their capabilities to succeed in such industries (Ehrlinger *et al.* 2003). One proposed solution has been to supply women in STEM fields with mentors.

Types of Mentoring:

In addition to formal and informal mentoring, peer mentoring is an important substitute, specifically when other forms of mentoring are less accessible for female employees (Hite 1998, Sorcinelli & Yun 2007) or when women are faced with a shortage of female mentors (Hunt & Michael 1993). Thus, due to its relevance and impact on females working in STEM fields, this study incorporates peer mentoring as a contextual supporter as well as one-one one mentoring as discussed earlier. Peer mentoring offers beneficial support on both the personal and professional level (Daniell, 2006). In their studies, Kram and Isabella (1985) identified three kinds of peer relations. The first is the informational peers, those supporting one another with useful information. The second type is the collegial peer, which resembles informational peers but enjoy a higher degree of trust and exposure that results in stronger emotional backing up. The third are the special peers, comparable to “best friends”. They offer a broadened scope of psychological and career aid. Other studies reported similar findings of women having multiple support relations they identified

as group mentoring (Hansman & Garofolo 1995, Sorcinelli & Yun, 2011). Other types of mentoring relations include primary, secondary, and tertiary (Johnson 2002). Primary pertains to the relation between one mentor and a protégé and it is described as bonded and lasting (Russel and Adams 1997). Secondary relations tend to be less broad and last for a shorter time frame. Tertiary is when a mentor provides few mentoring duties during a bounded time frame (Johnson 2002). Thus, scholars indicate that in such cases employees can have several mentors at a time each fulfilling a different function and role (Casto *et al.* 2005). By including various types of mentoring within the definition of mentoring functions examined in this chapter it is anticipated that readers' understanding of the experiences of participants reported in the empirical investigation will be enhanced. Each participant would discuss a mentoring relationship from her perspective, whether formal or informal, and according to the ramifications that the mentoring functions had on her occupational commitment.

Mentoring and Career Development:

Various researchers have indicated that mentoring has a positive impact on successful career advancement and development (Roche 1979, Griffin *et al.* 2010). It is frequently considered a form of career development (Wallace 2001, Alston *et al.* 2017). Mentoring has been linked to positive career outcomes such as reduced turnover intentions, increased career expectations, and reduced on-the-job stress (Kram & Hall 1995). Studies of employees with mentors have noted that they experienced increases in income and promotions (Dreher and Ash 1990, Brooks and Clunis 2007), heightened job satisfaction (Scandura 1997), acknowledgement (Fagenson 1989), improved career opportunities (Corzine *et al.* 1994), declining work estrangement (Koberg *et al.* 1994, Alfred 2001), and increased socialization and organizational commitment (Donaldson *et al.* 2000). Protégés are more exposed

to training opportunities, challenging assignments, and encouragement and sponsorship, all of which foster career development (Scandura & Williams 2001). Increased job satisfaction and career success have also been related to women who have mentors (Riley & Wrench 1985, Bell & Goldsmith, 2013). Studies also show that mentoring plays a role in advancing the quality of organizational life for females and reduces stress by enhancing self-esteem (Nelson & Quick 1985). Females who have mentors in powerful senior positions may be aided in gaining access to beneficial social networks and obtaining significant managerial competence by observing efficient senior management (Dreher & Ash 1990, Bagilhole & White 2011, Davidson and Burke 2011). Females working in non-traditional careers as well as undergraduates explain that female role models have a great influence on their accomplishment and ambitions, because they depict the feasibility of beating gender-related challenges to success (Quimby 2006). In line with this notion, Stout *et al.* (2011) point out that female Engineering students who were familiar with biographies of female engineers were more likely to follow an Engineering career. Recent research has signalled the importance of providing women in STEM with role models and a support networks that would help decrease the marginalization they endure in these industries. Recommendations as to how to enhance these two aspects through mentoring is still an area of policy and practice that requires further research. Therefore, this study considers mentoring as a contextual support and attempts to investigate how and why certain mentoring functions, whether psychological or career-related, would aid females in this respect.

Mentoring and Self-Efficacy:

According to Social Cognitive Career Theory, mentors can be considered contextual supports and influence career choices directly and indirectly (Lent & Brown 2013). Current studies indicate that mentoring has a favourable effect on new employees in

terms of increasing their self-confidence and ability and decreasing their intentions to quit (Hudson & Sempowicz 2011, Baldauf & Nguyen 2010). Mentoring functions have not been only recognized as a crucial aspect in the development of minorities and females both professionally and academically, but also as a significant component fostering women's progress in STEM fields (Dawson *et al.* 2015). The staggering under-representation of females in these industries is an indicator that mentoring as a contextual supporter should be given more consideration. Recent studies have indicated that the occupational commitment of females in STEM is positively related to the women's exposure to a mentor (Preston 2004). Through their studies, Scherer *et al.* (1991) found that students who were exposed to a role model in specific career domains tended to choose pursuing that career or to believe that they will be able to succeed in that occupational domain. Similar results were reported when the exposure to role models was made through video or any other written media (Savenye 1992). Other studies have shown that females are quitting STEM industries due to lack of self-confidence as a result of negative experiences while attaining their degrees or working in these fields rather than lack of talent or academic aptitude (Sonnert & Holton 1995). Such negative experiences can be the result of the varied work environment sometimes involving exclusionary and discriminatory attitudes and practices that females have to endure in STEM fields. This includes the lack of mentors, isolation, and intimidation as a minority (Smith & Bernstein 2011). In their research, Farbert & Bernstein (2009) explained that women stopped pursuing their doctoral studies in STEM due to lack of confidence because their social network and academic professors either didn't offer them encouragement or at other times discouraged them from committing. Despite the attempts that have been taking place to enhance the STEM climate for women, lack of support and its impact on self-efficacy remain a pressing issue that needs further investigation in order to help attain and retain more women in these industries.

2.6 Protean Attitude:

The area of career dynamics has been attracting the attention of researchers for quite some time (Tlais 2014). Career theory defines the traditional career as an organizationally set up career (Arthur 1994) that builds on the assumptions of secure and long run employment (Hall 1976) and views the careers of both women and men as unidimensional (Rosenbaum 1979). This traditional stance views career as a vertical progress in one or two organizations (Orser and Leck 2010) with the organizations setting the goals and rewards (Hall and Mirvis 1995). Organizational careers, in this respect, are characterized by being linear, foreseen and secure (Baruch 2006). Career advancement is viewed as upward promotions to managerial posts (Orser & Leck 2010). Several changes taking place in the mid-1990s, such as economic developments, globalization, the restructuring of organizations, increase in workforce diversity, and extensive flattening of hierarchies (Sullivan & Baruch 2009) have caused the traditional organization to break its prolonged and secure employment contract (Vinkenburg & Weber 2012) and start to advance employability instead (Baruch 2006). This resulted in the end of the organizational career as some scholars have indicated where it was considered no longer significant (Clarke 2013, Hall 1996). This has paved the way for the emergence of the contemporary careers that stress multi-directionality, resourcefulness, marketability, and adaptability (Baruch 2009). The new careers brought forward a novel perspective on viewing and defining careers (Clarke 2013). Scholars have labelled this concept in several ways such as boundary-less career (Arthur & Rousseau 1996), kaleidoscope career (Mainiero and Sullivan 2006), intelligent career (Arthur 2005), and protean career (Hall 1996). The protean career describes a self-directed appeal to career management (Briscoe & Hall 2006) by stressing that the individual instead of the organization is in control of his or her career (Hall 1996). It is guided by

personally identified goals throughout one's life, personal values, and subjective rather than objective success (Briscoe & Hall 2006). Therefore, the protean career tends to have a rather holistic approach to careers by considering work in the context of one's whole life and entailing learning and remodelling one's career aspirations through stepping out of organizational bounds (Clarke 2013). It has also been defined as an attitude toward a career that shows freedom, self-directedness, and decision making on the bases of personal values. Protean career stresses adaptability as a result of changing situations and also in terms of learning needs and achievements (Briscoe & Hall 2006). A protean individual is characterized by her ability to adapt to changing work conditions, manage employability, and focus on intrinsic rewards and continual learning goals (Sullivan & Baruch 2009). Career development under the protean career management is defined by the person's desire to grow, have autonomy, and keep learning (Hall 1996). The contemporary career has been highly received by advocates who have long argued that one of the pitfalls of traditional career is that it considers careers from a gender-neutral stance. With female's increasing workplace participation worldwide, contemporary career theories seem to address the experiences of females directly. Although a large amount of literature discusses females' careers, the focus has been on the barriers they face in the workplace (Kottke & Agars 2005, Gregory 2001), or how to balance work and life responsibilities (Mainiero & Sullivan 2006). Females' life experiences, values, contexts, and attitudes have not been fully integrated into the career literature as they should (Lamas & Hiillos 2008) due to the dominance of the traditional male career model which continues to be the normative standard for assessing career progress (Omair 2010). If females in STEM view their career advancements and occupational commitment on a vertical or multi-dimensional rather than a linear scale, this could provide more depth in understanding their lived experiences. I have added several questions in the interview protocol as well as the survey questionnaire

where I am addressing the protean attitude in light of the protean career theory. This has the potential to further knowledge and understanding of the experiences of females in STEM from a different perspective, a more dynamic and vertical one.

2.7 STEM and Women in the MENA Region:

In this section I discuss gender in the MENA region since the majority of the qualitative sample for this study were of Arab origins working or have worked at some point in the MENA region. Discussion about the current situations of women in this region, the challenges they are facing, and the major improvements that have been taking place in terms of gender equality can give further insight about the participants and inform the results of this study.

One can hardly analyse Arab women's working status without touching on the subject of culture. Although many theories have been put forward explaining that Islamic religion is to be blamed for Arab females' lagging position in education and the workplace, others have stressed that this is not the case (Sidani 2005). This group of scholars presented examples from early Muslim societies where females were vibrant, effective and influential community members. According to them, as time went by, various cultural aspects started forming that gradually hindered women's educational, economical, and political participation (Al-Faruqi 1987). Influenced in part by the strong movement that can be called Islamic Feminism commencing at the beginning of the 20th century, a strong endeavour to change the status quo of Arab women started to emerge (Sidani 2016). The number of females enrolling in educational institutions and joining the workforce, in general, began to slowly increase. However, a huge gap in females' work participation, employment opportunities, and equal pay still exists in comparison with countries worldwide. Recent statistics published by the World Economic Forum in 2012 show that Arab countries lagged behind in terms of gender equality thus maintaining a significant

gender gap. Discrepancies among the Arab countries exist with Yemen scoring as low as 135 on the Global Gender Gap Index compared, for example, to 109 in Kuwait.

Arab Women in Education:

The new wave of change had a constrained but positive impact on Arab females' educational attainments. Statistics indicate that the percentage of females who are aged 25 and above and with a minimum of secondary education, in Bahrain is 74.4% compared to 80.4% for males of the same age. In Kuwait, females outnumber males with 53.7% compared to 46.6%. A similar situation exists in the UAE where females score 73% compared to 61.3% for males (Sidani 2016). When it comes to females enrolling in STEM majors the numbers look very promising. Statistics indicate that the enrolment and graduation of Arab women from STEM majors is considerably higher when compared to most other countries worldwide. In some majors the number of females is higher than that of males for enrolment and graduation such as in the Natural Sciences, Mathematics, and Statistics, in countries like Bahrain, Jordan and UAE (UNESCO 2017). Additional details are included in Figure 1 below. However, the main question remains whether Arab females graduating from STEM fields enjoy a fair degree of participation in the workplace?

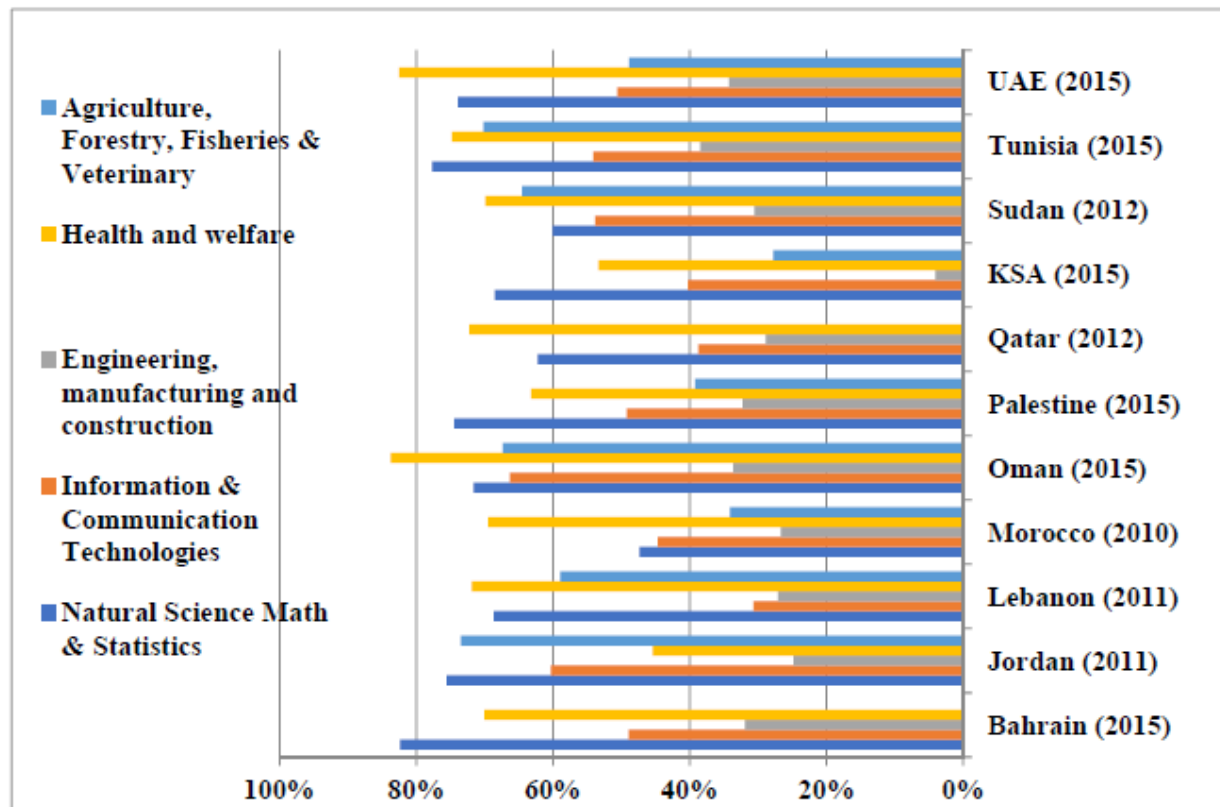


Figure 1. Percentage of Arab Women Who Graduated from STEM Majors in Some Arab Universities (UNESCO 2017).

Arab Women in the Workplace:

Women's employment has also been on the increase in Arab countries. In Egypt, for example, female labour participation witnessed a huge boost in the 1960s due to the large industrialization movement that the country went through (Sidani 2016). In other Arab countries women's entrepreneurial initiatives were also increasing (Itani *et al.* 2011). The emergence of nationalization policies in several Gulf Cooperation Council countries such as Saudization and Emiratization contributed in favour of increasing female work participation especially in the government sectors (Sharp 2005). Research indicates that the modernizing movements across the Middle East in the 20th century have highlighted the importance of education in the technical and

scientific domains. This change was highly received particularly by women (Al-Mughni and Tetreault 2000). 59% of women in Saudi Arabia were enrolled in computer science majors as opposed to 16% in the UK and 14% in the USA in 2014 (World Bank 2014). Al-Mughni & Tetreault (2000) also indicate that female enrolment in STEM fields in Kuwait outnumbers that in some western countries. Young Arab women committed to STEM fields do not view their commitment as something uncommon (Abu-Lughod 1998). When discussing the reasons behind their choice of a STEM career, many Arab women do not consider it to be a result of their parents' wishes but rather articulate more individualistic reasons pertaining to their own personal aspirations and beliefs (Kandiyoti 1991).

The educational and work progression of Arab women can be due to several factors. The legislative framework in many Arab countries have witnessed favourable changes that have further advanced women's quality of life. The change in institutional context would ultimately alter how society views female roles. Morocco, for example, started implementing a gender-responsive budgeting mechanism in an effort to balance the country's gender equality (Momani 2016). The importance of the Arabic family as the main element in society has also been changing. Having both partners in a family employed is not considered anymore to be something unusual (Haj-Yahia 2000).

Religion which plays a significant role in Muslim people's lives is also taking on a different perspective. Recent studies indicate that the power of religious institutions is decreasing and there is a shift towards a more individualized form of religionism among the new Arab generation (AUB-UNICEF 2010). This new generation perceives religion as an individualistic experience where the interventions of Islamic institutions as to what is deemed right or correct is not considered a necessity anymore. As a result, a novel perception, as opposed to the classical viewpoint on

Islam, is being formed that grants females a wider portion of freedom in terms of work participation and societal rights. In addition, a portion of the new generation believe that the economic situation in the region rather than the religion seems to negatively affect women's rights and work opportunities (Mogahed 2012). The wide spread impacts of globalization have also captured the attention of researchers on gender where many have argued in the literature that globalization is playing a vital role in gender relations. Arab females are becoming increasingly knowledgeable about global gender practices and is attempting to copy these practices in an effort to decrease the gender gap in their countries (Metcalf 2008, Doumato & Posusney 2003).

Despite these positive changes and social movements that have been taking place across almost all Arab countries, women are still struggling in terms of gender equality in the workforce. The World Bank (2011) indicates that the participation of women in the workplace in the MENA region has increased by only 0.17% on an annual basis during the past 30 years. The statistics show that only 25.2% of females in this region are either working or actively seeking to be employed as opposed to almost 50% in other developing countries. The under-representation of Arab women working in STEM occupations is not very different from other countries despite their high enrolment in STEM majors at universities. As Table 1 indicates, the percentage of women researchers in the field of Health and Medical in the UAE was 6.02% in 2015 and 11.57% in Iraq according to UNICEF (2017). Various other studies indicate similarly low representation of women across STEM fields in the Middle East and countries worldwide (Hill *et al.*, 2010; Buse, 2011; Mills, 2011; Hunt, 2010).

<i>Field</i>	<i>COUNTY</i>	<i>YEAR</i>	<i>%</i>
<i>Natural Sciences and Engineering</i>	Bahrain	2015	41.1
	Egypt		40.03
	Iraq		39.03
<i>Agriculture, Fisheries, and Veterinary</i>	Egypt	2014	31.96
	Iraq		29.76
<i>Health and Medical</i>	Bahrain	2014	14.60
	Egypt	2015	27.96
	Iraq		11.57
	Oman		4.26
	UAE		6.02

Table 1: Female Researchers as a Percentage of Total Researchers in STEM Industries in Some Arab Countries.

The literature indicates various barriers that are still impeding Arab women from joining the workforce and committing to their occupations. The socio-cultural barriers include a host of reasons that still hinder Arab women. Despite the fact that the number of Arab females attaining education has been on the rise, several countries such as Yemen still lag behind (Momani 2016). In Yemen, for example, the percentage of females above the age of 25 who have completed at least secondary education is 7.6% compared to 24.4% for males (Sidani 2016). Males are favoured over females in such cases due to financial constraints. A girl's education is deemed unnecessary or worthless since she is expected to stay at home and raise a family at some point (Jalbout 2015). Males, on the other hand, are considered to be the breadwinners of their families. Also, due to cultural role expectations, married women are prone to quit their jobs in order to fulfil the majority of responsibilities of raising children.

Despite some social changes taking place, as discussed earlier, in terms of altering duties within the family, the Arab context still considers family and childcare

responsibilities to be a woman's duty. This partially explains why single Arab women enjoy a higher rate of work participation (Fargues 2005). While the challenge of balancing work and life responsibilities is apparent worldwide, research indicates that it is more pressing in Arab societies due to such socio-cultural expectations (Brooks 1995). This barrier is accentuated further for women who work in STEM whenever these fields are characterized by a high degree of competition, strenuous deadlines and long working hours, and the need for continuous learning to keep pace with the fast-moving nature of these fields.

The gender role norms also direct females into certain educational or work domains such as nursing, teaching, and certain administrative posts that are deemed socially acceptable or respectable (Hewlett & Rashid 2011). These gender role expectations tend to drastically impact women's participation in STEM occupations that are considered untraditional occupations for Arab females. Discrimination in terms of the gender wage gap is also another barrier. The economic participation and opportunity metric put forward by the World Economic Forum indicates that the MENA region had the largest gender wage gap in the world in 2012 (Hausmann *et al.* 2012). This metric consists of participation, development and benefits rates.

Many research studies discuss the cultural stereotypes and discrimination that negatively affects Arab women's participation and progress in the workplace. Lebanese women in leadership roles have been found to endure selection bias because of gender stereotypical perceptions (Jamali *et al.* 2005). In addition, females in the region face double the rates of unemployment at 43.9% compared to 22.9% for males due to stereotypes and gender discrimination (Jalbout 2015). This is a major barrier for females in STEM occupations where negative attitudes are still present towards females who work in jobs that are considered socially incompatible (Al-Lamky 2007). Research also indicates that women in Arab societies are faced

with various types of work pressures that greatly influence their career choices and advancement. Perceptions of being a female negatively impacts on a woman's self-confidence to fill certain leadership roles or succeed in certain work domains (Koeing *et al.* 2011). This places pressure on her specifically if she is operating in a non-traditional or male-dominated industry (Sidani 2016). As a result, she might suffer from others under-rating the quality of her work or attributing her success to mere luck (Hoyt & Burnette 2013). Due to perceived lack of fit, Arab women end up in positions that fit their expected roles rather than their qualifications with limited access to important networks. According to a study by Gharaibeh (2007) over a period of two years, 34 million Arab females experienced some form of sexual harassment at work. This is another challenge that women suffer from in many employment contexts. Although this topic is neither widely discussed nor appropriately addressed in Arab societies compared to western ones, the limited amount of research on the topic indicates that it is a severe problem that needs further consideration. Accounts of the chilly climate have been identified by researchers as one of the factors behind the under-representation of females in STEM fields. Females are discouraged from joining such industries because of the notorious unfriendly work environments they will have to operate in as an under-represented group.

In addition to the socio-cultural barriers, females in the Arab world are faced with legislative challenges that further hinder their work participation. The current labour laws fall short in offering support to working women especially mothers in terms of flexible hours of work and maternity benefits that would increase the motivation of women to stay in the workplace (Momani 2016). The retirement age is also another barrier for Arab women. In some countries it is mandatory at the age of 55. Such laws discourage women from joining the workforce specifically after having to raise

their children. It tends to decrease their end of service pensions and negatively influences their overall work expectations (Karsshenas *et al.* 2016).

While most of the discussed barriers may not be unique to the Arab world, they definitely tend to have a more enduring impact on female rates of employment participation due to cultural, social and legislative contexts that they live and work in. One therefore can reasonably expect these barriers to impact negatively even more on females in Arab countries who work in non-traditional or male-dominated industries such as STEM, as the numbers indicate.

2.8 Statement of Hypotheses:

The initial conceptual framework is included under Figure 2 below. Based on the results of phase one of the study, the qualitative design, additional concepts were included. Figures 3 and 4 show the amended and final conceptual models for this study. Explanation on how and why these new constructs were added are included in the coming sections of the results and findings of the phase one. Model A tests the hypotheses asserted in the initial framework in addition to a new construct which is the quality of the mentoring relationship. In model B, quantitative research is conducted to further enhance the understanding resulting from of the qualitative study which demonstrates the importance of coping self-efficacy on the occupational commitment of females in STEM fields. This section discusses the hypotheses presented in models A and B of this research. The following paragraphs discuss the literature relating to the hypotheses in model A.

Research indicates that mentoring functions act as antecedents of an individual's career advancement and commitment (Kidd & Smewing 2001, Wickramasinghe & Jayaweera, 2010). The technical support provided by the mentor to the mentee is related to career developmental aspects, such as promoting intellectual growth,

balancing work loads, and teaching the informal rules within the organization (Hamman *et al.* 2006). The career development activities include helping and assisting, training, safeguarding, providing challenging assignments, and broadening exposure. By carrying out the career mentoring function, the mentor helps the protégé learn the skills and inaugurate her own professional act that will lead to professional success and advancement (Elliott *et al.* 2010). The psychological functions of mentoring, for example, can enhance occupational commitment by promoting career success, effective attitudes towards occupation and self-directedness, through the function of friendship and counselling mentoring activities. (Kram 1986, Colarelli & Bishop 1990, Underhill 2006).

The mentor, through career-related and psychological functions, is always available to provide needed support for the protégé. The protégé, in return, as suggested by social exchange theory, acts in the same way by showing loyalty and commitment to his or her mentor and occupation (Bhawuk 2008, Tymon *et al.* 2011). The mentoring functions also yield greater employee commitment and career success (Tymon *et al.* 2001, Okurame 2012). This will intensify the bond between the mentor and mentee into a more mature relation. As a result, the protégé will benefit further from the mentoring activities that will further promote socialization processes through the organization. In turn, this enhances the protégé's professional advancement and career commitment (Mezias & Scandura 2005, Okurame 2012).

Previous research on mentoring indicates the positive impact of the latter on promotions, turnover intentions, and career advancements (Kaplan *et al.* 2001, Allen *et al.* 2004) all of which may also positively influence occupational commitment. Career related mentoring functions enable a stronger occupational commitment where mentees benefit from learning about the traditions of their occupations. Such mentoring functions provide the mentee with a high degree of

clarity about her roles in certain STEM occupations. It will help the mentee, as a result, to relate better to her professional goals. Females operating in STEM are expected to face various challenges as discussed earlier. Several studies indicate the positive influence that psychological related mentoring functions have on career satisfaction and intention to stay (Allen *et al.* 2004, Viator 2001). The psychological related mentoring functions can result in a favourable impression of the occupation, in general, for the mentee (McManus & Subramaniam 2014). Mentors who are viewed as role models act as exemplars and allow the mentee to reflect on her professional identity (Alexander 2011). Some of the challenges that females working in STEM industries face are lack of exposure to proper training or difficulty in accessing networks that would enhance their knowledge in the fields. Mentoring functions, both career-related and psychological, are expected to enhance women's skill set, professional advancement, and ultimately occupational commitment in these fields. Therefore, the following hypothesis is asserted:

H1: Mentoring has a positive effect on occupational commitment.

Mentoring can enhance self-efficacy through social persuasion where the mentor attends to the protégé's career via different types of functions such as sponsoring, protecting, coaching, and providing challenging work assignments (Kram 1986, Yarger & Kasten 2001). Social persuasion is one of the sources of self-efficacy discussed earlier. When individuals are verbally convinced that they have the skills and competencies to perform a certain act, they feel more motivated towards achieving that task unlike if they have certain doubts about their competencies and focus solely on their own deficiencies (Schunk 1987). Bandura (1995) notes that a successful efficacy facilitator not only discloses constructive evaluations, but also attempts to construct situations for individuals so that they prompt their success. Through the exposure activity, the mentor facilitates chances for the protégé to

showcase her proficiency in front of executives and decision makers in the organization (Elliott *et al.* 2010). The coaching activity in the career-related functions of mentoring entails the mentor to act as a teacher and supply the protégé with beneficial instructions (Castro *et al.* 2005) and constructive feedback (Kram 1986). Through the protection function, the mentor plays the role of a buffer granting help in tough conditions and sharing responsibility for the protégé's mistakes. Among the career-related functions of mentoring, the mentor provides the mentee with job duties and assignments that would enrich her skillset and knowledge resulting in increase in the mentee's self-esteem and confidence that might ultimately lead to promotions and career prosperity (Kram 1986).

Vicarious learning aids in developing and increasing the sense of self-efficacy through social models (Bandura 1986, DeFreitas & Bravo 2012). Being exposed to other similar individuals who achieve success by facing an adverse environment heightens the viewer's belief that she has the mastery of experiences required and that she, too, can succeed (Schunk 1987, Lankau & Scandura 2002). Similarly, seeing individuals fail, although they make strong efforts, will diminish the observer's self-efficacy and impair her motivation (Bandura & Inouye 1978, Santos & Reigados 2002). When the mentor acts as a role model, a feature of the mentoring psychological functions, he or she will be providing the protégé with vicarious learning chances for her to model specific manners and conducts. This enables the protégé to expand her beliefs concerning her abilities to perform certain tasks (Wood & Bandura 1989).

The activities of friendship and psychological reinforcement of mentoring (Kram 1986) also aid in strengthening self-efficacy (Day & Allen 2004). While individuals depend on their sentimental and physiological states to assess their abilities, this aspect is considered the fourth source of self-efficacy. For example, when

undergoing activities that need strength and endurance, individuals tend to assess their abilities by looking at the signs of pains and weariness they are experiencing (Ewart 1992). Mood also plays a part in how individuals judge their capabilities where positive mood improves perceived self-efficacy (Kavanagh & Bower 1985). The psychological buffering, emotional support, and the trusting relation, all help in reinforcing one's self-efficacy. As Kram (1986) indicated, the relation between mentor and protégé is also a personal one where it incorporates the wants and aspirations of both parties. Self-efficacy is enhanced through the various psychological functions that include the counselling activity of mentoring, which involves the mentor in supporting behaviours and helping the mentee in tough employment and life situations (Tentoni 1995). Another activity is acceptance and confirmation where the mentor supplies continuous help, appreciation, and respect that will result in a stronger self-efficacy and self-image for the protégé (Kram 1986). The friendship activity also pertains to the mentor devoting time for the protégé and accepting her as she is (Tentoni 1995). Where various studies have discussed the challenges of the unsupportive climate that the females working in STEM fields have to endure due to being under-represented, the mentoring functions discussed above will help to strengthen women's coping self-efficacy in these industries. Therefore, the following hypothesis is formulated:

H2: Mentoring has a positive effect on coping self-efficacy.

The quality of the mentoring relation has received considerable attention in the literature due to its importance in understanding the mentoring relation. However, little is known about how the characteristics of the two players in this relation, the mentor and mentee, influence the outcome of the relation (Mitchell *et al.* 2015). In her research, Booth (1996) discussed that a mentor shows commitment to a long-term developmental relation with the mentee. They both share their values, beliefs,

and goals. Therefore, the mentor would be aware of the mentee's career needs and aspirations and takes the responsibility to assist him or her in the career development process (Kram 1985). The constant interaction enhances the relation further so the two could become friends where trust and commitment bond the relation (Tepper 1995). Positive outcomes have been recorded from mentoring relations where the mentee sees himself as similar to his mentor compared to others who don't believe so (Eby *et al.* 2013). Although researchers agree that perceived similarity is a predictor of the quality of the mentoring relation, little is known about what constitutes perceived similarity. Scholars explain that attachment orientation and self-construal play significant parts in shaping individual perceptions and expectations in a mentoring relation (Ragins & Verbos 2007). According to the attachment theory, people shape internal perceptions of attachment drawn from their early life experiences with their caregivers. When it comes to mentoring relations, the most popular kind of attachments discussed in the literature is secure attachment. It is when individuals form positive internal perceptions of oneself with others (Scharfe & Bartholomew 1994). Similar people will be attracted to others sharing their internal working model characteristics. This increases the chances of further interaction that will result in additional discovery of similar ideas, values, and aspirations. Relational self-construal explains one's inclination to construe oneself in terms of close relations (Cross *et al.* 2002). Individuals with high relational self-construal see their friends as having comparable abilities and traits to themselves. This fosters a sense of belonging to the relation and confirm positive aspects to oneself (Gore *et al.* 2006). The theory of relational identification can also be applied to explain the role modelling relation. The theory explains that individuals identify with a certain role in a relation (Sluss & Ashforth 2007). In role modelling, the protégé identifies with the mentor and she embodies valued features of the mentor into her self-concept (Kram 1985). Perceived similarity is precedent to relational

identification. Similarities between the mentee and mentor unfold to further foster a closer identification.

The mentor can influence the protégé's self-efficacy through verbal persuasion. If she is verbally convinced that she can perform the job or task at hand, then she is likely to do the job (Bandura 1986). However, the influence of this message from the mentor will have a stronger impact on the mentee's self-efficacy taken into consideration the quality of the relation between the two. In other words, the persuasion might not have a strong impact if the mentee does not view the mentor as proficient, trustworthy, attractive, and conceivable. Kram (1985) explains that respect is a major aspect of the mentoring relation because the mentee has to perceive the mentor as a proficient career advisor. Therefore, a mentor's trustworthy communication and the way he or she is perceived by the mentee plays an important part in explaining how the mentor would influence the self-efficacy of the protégé. Thus, the following hypothesis is claimed:

H3: The quality of the mentoring relation mediates the relation between mentoring and self-efficacy.

Several studies have discussed the effect of self-efficacy on occupational commitment. In a study conducted in Singapore, Chan *et al.* (2008) found a positive relation between self-efficacy and occupational commitment among 2130 primary school teachers and 1587 secondary school teachers. Self-efficacy also plays a role in strengthening affective commitment via social persuasion. According to Meyer and Allen (1997), affective commitment is refined through retroactive rationale. A female who has chosen an occupation in a STEM field and made her decision known among her social network finds it very difficult to change her decision especially when she might expect a high degree of disagreement with her decision. This disagreement can be presented in the form of verbal persuasion. Such persuasions

might communicate to her all of the sacrifices she made and all the challenges she had to overcome to reach where she is now in terms of her career. This retroactive reasoning impacts her self-efficacy and ultimately her commitment. She becomes accustomed to justifying her behaviour retroactively and building affective commitment for her occupation (Somers 1995).

Research indicates that perceived self-efficacy administers how individuals deal with work-related stress and preserve interest in their occupations (Klassen & Chiu 2010). Klassen and Chiu (2010) discuss how self-efficacy affects job satisfaction and mediates job stress. Teachers with low self-efficacy regarding class management found it difficult to manage the classroom stress which affected their commitment negatively and were likely to leave the occupation. Similar results were found as well by Jepson and Forrest (2006). Work stress, defined as an individual's emotional and psychological reaction to recognized imbalance between job requirements and potential, resources and needs (Hakanem *et al.* 2006), may cause low morale, weaker occupational commitment, and decreased effectiveness (Rots *et al.* 2007). Studies on this topic indicate that stress can cause professionals to quit their occupations (Klassen *et al.* 2012, Chaplain 2008). Females who are confident enough in their skills and capabilities to achieve work objectives and cope under stressful situations are expected to have higher levels of occupational commitment (Tschannen-Moran & Woolfolk Hoy 2001).

Drawing from the career motivation theory, career resilience has been defined as being able to adapt to changing situations even when these situations are challenging and hard (Day & Allen 2004). Career resilience can be demonstrated when an individual is shifting industries, adapting to new organizational life, having to leave her job, or to balance work and family responsibilities all of which demand a high degree of coping self-efficacy. Career resilience includes believing in oneself, being

a risk taker, and being always on the lookout for new achievements (London 1983). Such characteristics are also visible among individuals with high self-efficacy. Individuals with high self-efficacy tend to persist in the face of obstacles drawing on positive past experiences and believing that they have the skills and capabilities to perform the job. The leaky pipeline is a major concern in STEM industries, where, for example, women make up more than 20% of Engineering university graduates, however only 11% of these women end up working in the field of Engineering (Marcus 2014, Munoz-Boudet 2017). One possible way to try to retain females in these industries is by strengthening their coping self-efficacy. In order to commit to their occupations, women need to believe that they can cope with stressful situations, such as long working hours, deadlines, the challenge of balancing life and work responsibilities, and in some contexts the unfriendly work environment they might be operating in. Therefore, hypothesis three suggest that:

H4: Coping self-efficacy enhances occupational commitment.

The following paragraphs explain the hypotheses presented in Model B. Studies indicate that self-efficacy has a favourable influence on task performance and motivation. Employees with high self-efficacy tend to set high career goals and persist to achieve these goals (King 2004). Such individuals are able to self-manage their careers that will ultimately lead them to achieve their desired goals and reach career success (King 2004).

The stronger is the commitment to the goals, the bigger is the effort done over time to commit and attain that goal (Brown *et al.* 2005). Individuals tend to evaluate their performance and alter their efficacies accordingly with every accomplishment (Chen *et al.* 1998). If the outcome is favourable, this motivates them to set even higher goals and put in more effort to attain them (Wood & Bandura 1989). Thus, setting goals impacts an individual's occupational commitment by motivating him or her to

persist and make more effort. The higher the goal set by the person, the more she will have to make effort and endure to achieve it. Therefore, the following hypothesis is stated:

H2: Goal setting mediates the relation between self-efficacy and occupational commitment.

The protean attitude has been defined as consisting of two aspects, the first being the values-driven where an individual's internal desires, goals, and beliefs guide her through career decisions and ways to measure her career success (Volmer & Spurk 2011). As discussed earlier, the literature on SCT stresses the importance of setting goals in terms of career regulation and self-efficacy behaviour (Lent *et al.* 2013). Therefore, individuals with high protean attitude tend to be more values-driven. They focus on their goal, desires, and aspirations. When this happens, they are able to better direct their efforts to motivate themselves to achieve career success. On the contrary, when individuals have a low protean attitude, they tend to have less motivation in terms of career regulation and self-efficacy behaviour. Their efforts to motivate themselves to achieve career success are less.

Scholars indicate that protean attitude has a positive impact on career development in terms of improving the feeling of proficiency and autonomy of an individual since it is related to increasing the level of employability (De Vos & Soens 2008), enhancing job performance, and adaptability (Briscoe *et al.* 2012). In addition, people with a protean attitude are values-driven and self-directed meaning that they are capable of creating more successful opportunities in their careers compared to others, they feel competent, and are able to enhance their job satisfaction (Hall *et al.* 1996). Such individuals tend to have a high degree of control and autonomy over their careers. This causes them to attribute any career success achieved to their own efforts, increasing their self-efficacy as a result and therefore strengthening their

occupational commitment (Bandura 2001). Therefore, the following hypothesis is claimed:

H3: Protean attitude moderates the relation between coping self-efficacy and occupational commitment.

Personal learning development acts as a moderator where it plays a significant role in the relation between self-efficacy and occupational commitment. According to Kram (1996), personal learning pertains to acquiring knowledge, proficiency, and skills that aid an individual in career development. It includes personal skills development and rational job learning. The latter refers to the individual learning about the work environment and attempting to view and understand oneself in relation to others (Kagan 1994). This process of learning heightens a person's awareness to her job with regards to others (W.Pan *et al.* 2011). Personal skill development relates to interpersonal skills such as having good communication skills, problem solving skills, and socialization skills (Kram 1996). Scholars indicate that learning in the workplace is becoming of increasing importance because of the added knowledge and skillset it offers an employee (Khandakar & Pangil 2017). Two main factors have been identified to influence an individual's learning both on the personal and organizational level (Mclean 2008). Personal factors can include motivation, communication, attitudes towards learning, and a person's skillset (Salarian *et al.* 2015).

Lankau and Scandura (2002) explain that personal learning causes changes in an individual's behaviour and consider personal learning an important requirement for performance (Hunter 1986). Individuals who undergo personal learning perform better since they possess more skills. Employees who have been able to enhance their communication and problem-solving skills feel more competent at work (Lankau & Scandura 2002). Personal learning results in change in attitude where an

individual feels more confident towards performing the job, thus, personal learning plays a part in enhancing one's self-efficacy.

Deciding on a particular occupation and working on developing a specific career within that occupation usually entails making big investments and personal dedication to the occupation (Carson *et al.* 1995). Therefore, to quit an occupation seems more costly than just to leave a certain job. This includes wasting emotional and monetary investments such as time, effort, and money (Blaue 2003). In recent years, the focus on occupational commitment has increased due to various economic and career reasons such as globalization and decreased employment security (Lee *et al.* 2000). Researchers explain that occupational commitment is a significant antecedent of occupational turnover (Meyer *et al.* 1993). Several recent studies attempted to understand the impact of work dissatisfaction on individuals' intention to quit their occupations (Blau 2007). Job satisfaction is defined as a positive attitude towards a person's job situation (Weiss & Cropanzano 1996). Researchers concluded that aspects of the work environment might positively or negatively influence job satisfaction. These aspects include role conflict, autonomy, and routinization (Irvine & Evans 1995). The STEM industry is characterized as a fast-moving industry with new technologies. Individuals working in these industries are expected to keep updating their skills and knowledge to meet the new technological innovations. They are expected to be proficient in dealing with the new technologies or changes taking place in these industries. The routinization in terms of lack of exposure to new learning opportunities or the lack of learning opportunities that would aid employees in improving their skills might negatively impact on their job satisfaction. This may increase their intention to leave the STEM domain (Blau 2007). Job satisfaction is deemed a major work outcome for both the organization and the individual (Hart & Cooper 2001). It is also a significant factor that impacts

the success of the individual (Gould-Williams & Davies 2005). A vast amount of research indicates that learning and development positively influence work outcomes such as job satisfaction (Dirani 2009). Individuals benefitting from learning and development tend to be motivated and enjoy favourable outcomes like enhanced work satisfaction and commitment (Dekoulou & Rivellas 2015). Therefore, when an individual is exposed to learning opportunities, she feels more knowledgeable about her occupation. This learning opportunity enhances her attitude towards her occupational commitment. She may feel more equipped with knowledge and capable of further committing to her occupation. Contrary to the situation where the individual is not exposed to personal learning and development, this might decrease her coping self-efficacy especially given that STEM fields, as was discussed earlier, are fast moving industries that require continuous learning. Her commitment level would be negatively impacted by the lack of challenge and learning opportunities. This leads to the following hypothesis:

H4: Personal learning development moderates the relationship between coping self-efficacy and occupational commitment.

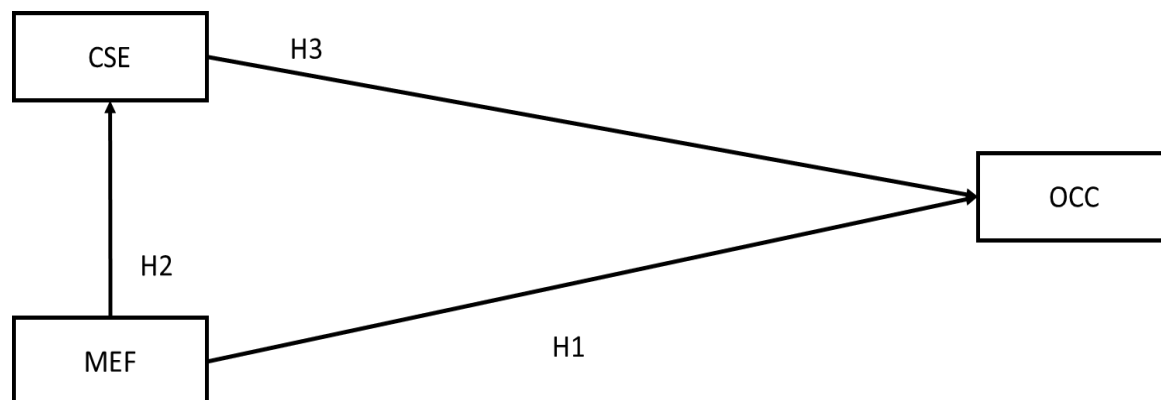


Figure 2. Initial Conceptual Framework

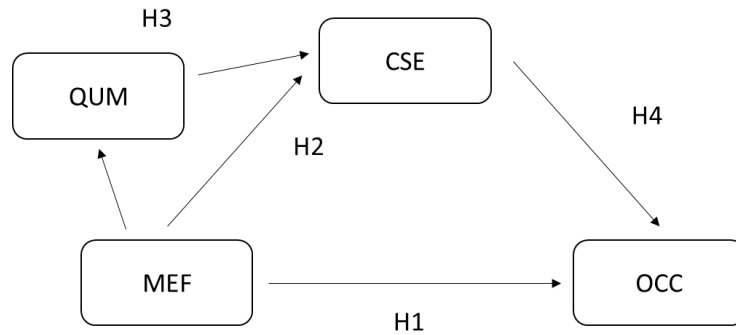


Figure 3. Revised and Final Conceptual Framework Model A

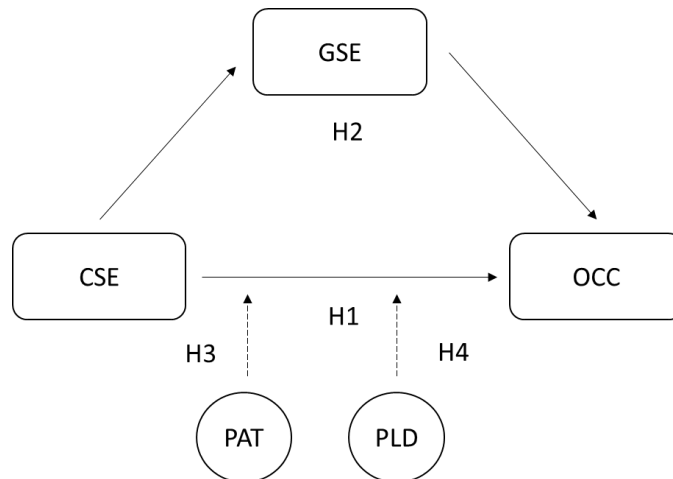


Figure 4. Revised and Final Conceptual Framework Model B

A summary of relevant literature that asserts or has identified relationships between the hypothesized constructs presented in Figure 3 and 4 is given in Table 2 below.

Table (2): Summary of Relevant Literature

Hypothesized Relationships	Relevant Literature Discussed
MEF is related to OCC	Colarelli & Bishop 1990, Kram 1986, Okurame 2012, McManus & Subramaniam 2014, Underhill 2006

GSE mediates MEF-OCC	Greenhaus et al. 1995, Lent & Brown 2013, Lent et al. 1994
MEF is related to CSE	Bandura 1986, Day & Allen 2004, DeFreitas & Bravo 2012, Kram 1986, Lankau & Scandura 2002
QUM mediates MEF-CSE	
MEF is related to QUM	Booth 1996, Eby et al. 2013, Gore et al. 2006, Kram 1985, Mitchell et al. 2015
QUM is related to CSE	Bandura 1986, Chemers et al. 2011, Kram 1985, Lejonberg & Tiplic 2016, Santos & Reigados 2002
PLD moderates CSE-OCC	Hunter 1986, Kagan 1994, Lahkua & Scandura 2002, W. Pan et al. 2011
CSE is related to OCC	Chan et al. 2008, Jepson and Forrest 2006, Klassen & Chiu 2010, Meyer and Allen 1997, Tschannen-Moran & Woolfolk Hoy 2001
GSE mediates CSE-OCC	Brown et al. 2005, Chen et al. 1998, King 2004, Wood and Bandura 1989
PAT moderates CSE-OCC	Bandura 2001, Briscoe et al. 2012, Hall et al. 1996, Lent et al. 2013, Volmer & Spurk 2011

Summary of Chapter:

The under-representation of women in STEM has been widely researched in the academic setting, however, research on this area in the occupational setting is still limited. Even in the occupational setting, the focus has been on the females who are not succeeding and the factors pertaining to this. This study tackles the issue of female under-representation from a different perspective. The focus is on that small portion of women who actually succeed in persisting and committing to their occupations. The aim is to try to understand how and why they are able to do so. Another gap that can be identified in the literature investigating women in STEM, is that the focus has been mainly on the outcome rather than the process. That is what majors do female students end up choosing at universities or what career fields do they end up selecting, rather than how do females manage to succeed and commit in STEM fields and why? The aim of this study is to heighten the attention on the process elements of commitment.

Through this research we propose that mentoring functions enhance an individual's self-confidence by providing needed training and coaching to elevate their skillset, as well as trust and support to boost their psychological morale. Females with high coping self-efficacy are more likely to cope under stressful situations than those with lower coping self-efficacy. Drawing from goal-setting theory, people with high self-efficacy tend to designate more challenging goals for themselves compared to those with lower self-efficacy (McKee *et al.* 2006). Thus, individuals with high self-efficacy have higher outcome expectations that might cause them to put in more effort and better performance (DiRenzo *et al.* 2010).

They are more likely to feel more comfortable and relaxed and benefit from their mentoring experiences, which enhances and strengthens their occupational commitment because they see themselves as more capable and more confident in

surmounting the challenges faced (Pan *et al.* 2011). Therefore, these females are also more likely to exert effort to surmount challenges or to take initiatives to find a way around the obstacles rather than give up too easily (Gist & Mitchell 1992, Drenzo *et al.* 2010). Thus, we also anticipate that coping self-efficacy and mentoring will have a positive impact on occupational commitment.

CHAPTER THREE

Methodology and Methods

3.1 Mixed Methods Research Design:

This chapter discusses the philosophy and approach of the research design. It explains the overall methodology and provides details on the methods employed including the sampling techniques, data collection and procedures, data analysis, and interpretation. The qualitative and quantitative methods used in this empirical research study are discussed in the context of the research questions of the thesis. The research questions are considered appropriate for the application of an exploratory sequential mixed methods design.

Rationale for Mixed Method Design:

This study uses mixed methods for data collection and analysis. This method is considered appropriate due to the research questions and the nature of the topic under research which is deemed under-researched. The purpose of using mixed methods is to acquire knowledge about the under-representation of females working and committing to their careers in STEM fields that is more extensive than a single approach may provide. Mixed methods design has been receiving increasing attention in recent years. It is a type of research where the researcher incorporates both qualitative and quantitative methods, approaches or conceptions into one study (Johnson & Onwuegbuzie 2004). In such research, the methods serve as means to answer the same research questions, to gather data and administer equivalent data analysis (Yin 2009). Thus, mixed methods can allow the researcher to undertake more complex and broader questions, collect deeper evidence, and provide more vigorous proof than can be acquired by a single method (Yin 2014). One of the

strengths of using mixed method design is that it assumes that both types of data will yield distinct forms of information for the research study. Mixed methods design has been deemed appropriate for this empirical investigation since existing literature has not evidently explained the proposed research questions regarding mentoring of females, their coping self-efficacy, and occupational commitment in STEM industries. Mixed methods research has been discussed in various ways. This study adopts Creswell's (2016) definition on mixed methods where it is considered as a method rather than, for instance, an ideology or language. Creswell defines mixed methods as a way of conducting research in several fields of study, such as behavioural and social where the researcher utilizes open and closed-ended questions in reference to quantitative and qualitative data, combines both and finally draws conclusions established according to the incorporated end results in order to reach an understanding of specified research questions. Creswell and Plano Clark (2007) introduced four main mixed design types that differ according to the timing whether sequential or concurrent, the weighing whether dominance or priority/equal or unequal, and the mixing that identifies at which phase and how the data are combined. Through this study, exploratory sequential design will be utilized where the first phase is qualitative followed by quantitative design (Creswell 2003, Patton 2002, Miles & Huberman 1994, Flick 2010). In an attempt to provide more integration to the process, further studies introduced a three-dimensional typology (Onwuegbuzie 2003). The variation in the level of mixing is one dimension which will be a partial variation in this study. The time orientation which will be sequential, and finally the emphasis which will be the dominance of the qualitative design. Therefore, in this study a partially-mixed sequential dominant status design, referred to as QUAL→quan will be implemented. Recent studies have discussed several complex typologies of mixed methods. In this study a synergistic approach will be implemented where the resulting synergism of mixing both research designs will

take place at the analysis and interpretation stages were conclusions drawn from both qualitative and quantitative designs are integrated at the final meta-inference stage (Teddlie & Tashakkori 2009). Hall and Howard (2008) put forward four main principles for synergetic approaches that will be followed through this research:

- 1.The notion that combining both qualitative and quantitative will result in a research process and findings that are far better than that created by using one of the approaches only.

- 2.The significant presence of multiple ideologies or viewpoints concerning mixing the two methods. This will result in efforts to accommodate opposing viewpoints that might appear at different stages of the research process.

- 3.Although there is a clear allocation of different weighing for each approach, where qualitative is the dominant approach in the case of this study, equal value will be attributed to both.

- 4.The significance of a contemplative viewpoint in balancing the possibly conflicting views that I might have in relation to data interpretation, for example.

I am hereby including a detailed diagram that would better explain the synergetic process of the mixed methods design adopted. It is borrowed from Tashakkori and Teddlie (2010) and will act as a roadmap for this section's methodology. It clearly identifies the main method adopted (qualitative), the supplemental component (quantitative), the sequential organization of the two designs, and the point of interface in the results section. The sequential mixed design is conducted as follows: phase one comprises the qualitative core component. After identifying the research questions and the theoretical framework (SCCT), the qualitative core method is selected, which is the multiple individual case studies. Then the sample is identified using purposive criterion sampling and the sample size is 28 participants. The data

was collected using semi-structured interviews that assisted in exploring in more depth women's accounts of their experiences of mentoring, coping self-efficacy, and occupational commitment. These steps are discussed in more details in the coming sections of the study. The next step was to analyse the data using Nvivo software resulting in the research findings of the QUAL. These were used to partially design the survey questionnaire. The survey helped in identifying whether relationships exists between the variables in these three areas: coping self-efficacy and mentoring, coping self-efficacy and occupational commitment, and mentoring and occupational commitment. The potential advantages of the survey are the large sample size and the advancing numerical analysis that helps with finding trends in the data (Patton 2002). Data collection for the quantitative part was done through an administered survey. The sample was made up of female alumni from universities across UAE and Lebanon who graduated with STEM majors. Data is analysed using structural equation modelling in Stata.

The fact that the researcher conducting mixed methods has to be efficient in a range of both qualitative and quantitative analysis techniques is not an easy task. The researcher has also to be competent at generating findings from both research techniques to come up with substantial meta-inferences (Tashakkori & Teddlie 1998). These factors make data analysis of mixed methods a challenging task. Due to these reasons, researchers have advocated a wide range of inclusive frameworks for data analysis in mixed methods research designs. These frameworks can have practical advantages of uniting the field they represent whether it is predominantly qualitative or quantitative. They present a flexible system that other researchers can benefit from. A comprehensive research framework also offers a clear format and provides guidance for researchers on how to analyse the data and ultimately answer their research questions. An inclusive framework also enhances rigour in the analysis

which aids in legitimizing the field of mixed methods research design. Finally, an inclusive framework supports creation of a common language for classifying and explaining the analysis process. Future research can then benefit from such consistency by expanding, modifying, or further developing existing frameworks into more advanced ones. The advantages of an integrated framework and its importance in legitimizing an accountable field has triggered a string of research (e.g. Onwuegbuzie *et al.* 2009, Onwuegbuzie *et al.* 2007, Newman and Ramlo 2010).

Despite the fact that a large amount of published work is now emerging related to mixed methods research, there still does not exist a generally acceptable framework for analysing mixed methods (Greene 2008). Many recent typologies, however, classifying mixed analysis strategies (e.g. Bazeley 2010, Creswell & Plano Clark 2007) have been highly received by scholars. Tashakkori and Teddlie's (2010) content analysis of these typologies explains that the authors used thirteen distinct criteria to come up with these typologies. This research adopts six of these criteria to further explain and classify the mixed analysis strategy that has been used based on the mixed research design typology that was discussed earlier in this chapter. These criteria are listed below and further discussed in the coming paragraphs.

1-The reason for conducting the mixed methods analysis.

2-Number of data types that were analysed.

3-Number of data analysis types that were used.

4-Time sequence of the mixed analysis.

5-Link to other design elements.

6- Degree of analysis interaction between the two research designs, qualitative and quantitative.

The rationale for performing a mixed research design further aids in advancing the decision for a mixed analysis strategy. While Onwuegbuzie and Sutton (2006) assert five reasons, this research builds on one of these, namely expansion. The reason this study uses mixed methods is to expand the magnitude and dimension of the research by applying two analytical strands, one qualitative and the other quantitative, each in a different phase. The second criterion that is considered is the number of data types that will be used in the meta-inference phase when combining both results. In this study one data type is used. This type is qualitative because it is the core component of the research design. The first phase of the data analysis is qualitative, the second phase is quantitative. Then, the quantitative data, after being analysed using structural equation modelling, is qualified by changing it into narrative data that is analysed qualitatively to facilitate comparison with the findings from the qualitative study (Onwuegbuziet et al. 2007). This is presented in the Discussion Chapter which constitutes the meta-inference phase. The third criterion that this study applies to develop a mixed analysis strategy is the number of data analysis types used in each separate research study. This research involves one principal method of analysis for each design. The Gioia methodology is used for the qualitative design and structural equation modelling is used in the quantitative design. The sequence of the analysis is the fourth criterion that is considered. Since this is a sequential mixed methods design, qualitative analysis is conducted in the first phase, which then informs the quantitative design in the second phase (Teddle & Tashakkori 2009). The fourth criterion is the priority of a certain analytical strand. In this research, priority is given to the core component which is the qualitative design. Therefore, complex and extensive analytical methods have been used to

ensure in-depth investigation and understanding of the research questions as opposed to the quantitative design in the second phase. The quantitative design (which is considered supplemental) is used to further enhance the explanation resulting from the first phase. This brings us to the fifth criterion which is the link to other design elements. In summary, the mixed analysis design of this study is defined as a partially-mixed sequential dominant status design.

The last criterion considered is the level of interaction between the analysis of the two designs. This dimension is important and explains the point at which the analysis of both designs interact. The most common technique of mixed analysis is the parallel mixed analysis that has been extensively discussed in the works of Tashakkori and Teddlie (1998), Onwuegbuzie and Leech (2004), and Teddlie and Tashakkori (2009). The authors define parallel mixed analysis where, for example, both qualitative and quantitative analyses are conducted independently. However, both designs offer explanations about the phenomenon being studied. The findings of both are then joined and integrated into a meta-inference phase. This simple form of parallel mixed analysis is known as parallel tracks analysis in contrast to a more complicated form known as a cross-over tracks analysis (Li *et. al* 2000). The cross-over tracks form has been adopted in this study to extensively analyse the data. The findings from the two designs interlace and enhance one another throughout the research (Datta 2001). Teddlie and Tashakkori (2009) explain certain characteristics relating to these complex forms of mixed analysis strategies. In sequences of such forms, as is the case in this research, the analysis of one design informs the other before the stage of meta-inference. Based on the findings of the qualitative design, additional hypotheses were added. The conceptual framework was amended to reflect these changes in terms of additional constructs included and new relations that needed to be tested. The survey was also expanded and redesigned accordingly.

After analysing each set of data from the two designs separately, both results are integrated and further interpreted in the Discussion Chapter of this study. The third and final characterization of cross-over tracks analysis is combining this form of analysis with other types of mixed analysis strategies. In the case of this research and as has been discussed earlier, the analysis is informed by the fact that the research design is qualitatively dominant and also sequential in nature.

As indicated by Kelle and Erzberger (2004), one of the advantages of combining both methods is that findings from both designs will focus on distinct elements of the study, yet simultaneously will also complement each other and contribute to a bigger picture. Combining both methods will lead to valid results and their limitations (Flick 2010).

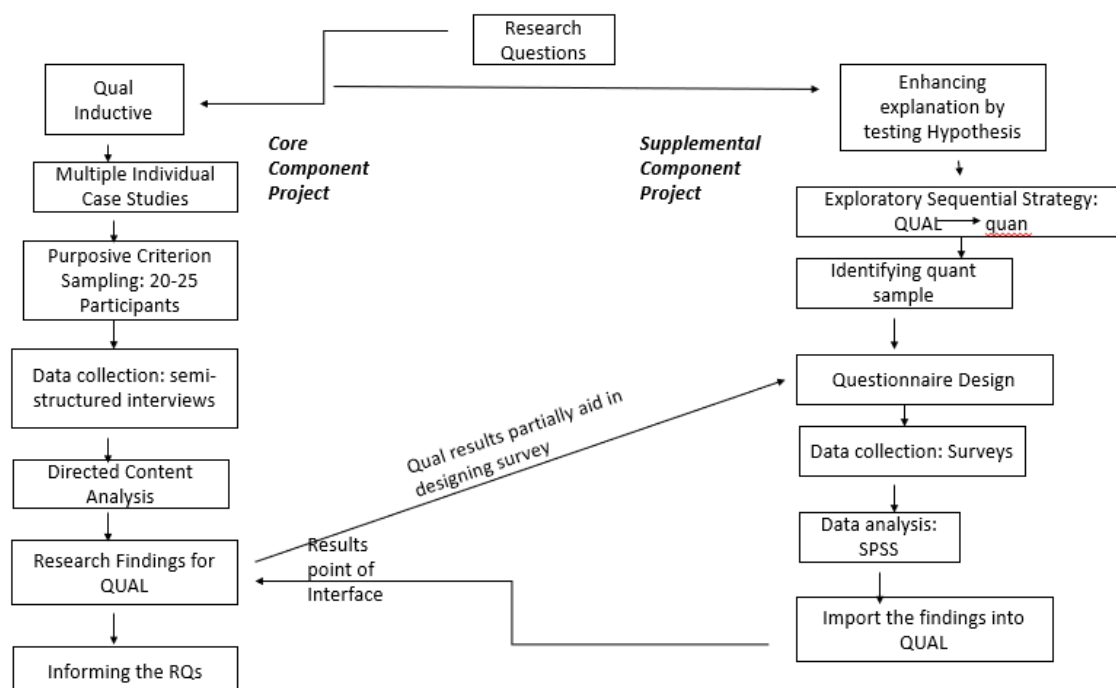


Figure 5. Mixed Methods Map

3.2 Qualitative Study Design – Phase 1:

Qualitative research is commonly used where variables are undiscovered, complicated, and need further investigation (Creswell 2005). The intent, in such a situation is not to create an experimental model for collecting data but rather is to acquire valuable in-depth comprehension of participants' life experiences. In a qualitative approach, the methods utilized usually generate a great amount of thorough data from a small sample size. The research consists of people and cases and is characterized by explicit citation and precise depiction of events, circumstances, observed actions, and situations (Labuschagne 2003). Qualitative researchers will be more attentive to comprehending the meaning behind the lived experiences and acted behaviours from the participants' perspectives. The researcher is interested in exploring and understanding how women working in STEM domains make sense of their experience, how they construct their worlds, and what are the meanings they ascribe to their lived experiences. A major characteristic of such research design is that people are able to make sense of their reality while interacting with their worlds. Thus, this type of research seems to serve the purpose of comprehending the meaning of the limited experiences of women working in STEM fields.

Most of the current literature is focused on providing reasons why females are not choosing to enter the STEM fields. However, the focus of this research is on those females who are working in STEM fields, persisting and committing to their occupations. The under-representation of females in STEM occupations has been a major concern for organizations, career counsellors, and educators amidst a significant increase in jobs in these fields of work. Whereas many studies have

attempted to explore choices and decisions made by females in their academic stages of life, a small research section focused on women in occupational domains.

a. Multiple Case Study Design:

While various types of qualitative research methodologies share several aspects, such as researching meaning, researchers being considered the main tool of data collection, and interpretation to be an inductive investigative method, the result of which is largely descriptive, case study methodologies favour a thorough comprehensive analysis and description of a bounded system. Yin (2014) defines case study research as an empirical examination that studies a recent phenomenon in its real-world framework, particularly when the borders between the context and the phenomenon are vague. The case study design is specifically appropriate in instances where it is not possible to isolate the phenomenon's elements from its context (Yin 2014).

This study attempts to construct the meaning of perseverance and success of women working in STEM fields who sustain their commitment to their occupation in a labour market where many females resign from their jobs due to several contextual and organizational barriers. The study is mainly focused on understanding the effect of the contextual supporters that have an impact on the decisions and perceptions of these females in their daily occupational work lives. The main research questions this study is seeking to answer are why and how certain females in STEM fields persist and commit to their occupation while others fail to maintain careers in their chosen fields.

Yin (2104) introduced a two-fold definition of case study, one that further explains why we are using it as the framework for the qualitative phase of this study. The first part of the definition discusses the scope of the case that extensively investigates a

new incident in its natural context, specifically when the borders between the case and its context are not definite. The second part of the definition explains the features of the case. The case study permits analysis of several variables, depends on diverse collective sources, and finally draws on previous theory development and research to guide data collection and interpretation (Yin 2014). According to Stake (2010), the determining feature of case study research exists in bounding the object of study, that is the case, since most qualitative research designs focus on comprehending one single thing well: in our situation it is the commitment of females in STEM. Therefore, case study tends to be less of a methodological option and more of a preference for what is to be investigated (Stake 2010, Smith 1990).

This study uses multiple individual case studies where data collection and analysis are derived from several cases in an attempt to provide answers relating to the research questions of this study. Each case is defined with a bounded system that will be discussed in more detail in the coming sections. The advantages of multiple case studies include a larger diversity across cases thus yielding more constraining interpretations (Miles *et al.* 2014). Multiple case study design can also strengthen the external validity and generalizability of the findings. The multiple case study design generates more in-depth understanding of a research topic by simultaneously researching several cases in one complete study (Johnson & Christensen 2004). Through multiple case study design, this research seeks to explore and apprehend the experiences of women in STEM fields and tries to understand why and how they manage to overcome the challenges of working in male-dominated industries and commit to their occupations. This study advances a major assumption stating there are detectable traits and strategies adding to the persistence and commitment of women in STEM domains. The multiple case study technique aids with generalizing across cases. This method can be used to compare between cases, which makes

generalization more effective. In such a situation, there is a greater certainty that analogous findings would be present in another case, compared to a single case study method (Johnson & Christensen 2004). Multiple case study design is chosen since the issue of women's mentoring, coping self-efficacy, and occupational commitment in STEM fields is under-researched. Therefore, it is more suitable to introduce a fundamental research initiative using multiple case studies for developing a clearer understanding of the perceptions and experiences of the group of women who persist with their careers in STEM fields. Yin (2003) indicates that the use of multiple case studies yields a more persuasive and effective evidence base.

b. Sample Selection:

The exploratory sequential mixed methods approach includes two phases of data collection. The first refers to the qualitative method where semi-structured interviews will be done. Non-probability sampling has been the most commonly used method by qualitative social researchers (Merriam & Tisdell 2015). For the researcher to be able to conduct a thorough investigation concerning a selected phenomenon, purposeful sampling is mandatory. Purposeful sampling aids the researcher in gathering rich insights about the phenomenon from people's experience (Suri 2011). This study uses a purposeful or purposive non-probability sampling technique which starts from the assumption that the researcher wishes to explore and comprehend insights relating to a specific phenomenon; therefore, one must choose a sample from which one can learn the most. Known also as judgmental or purposive sampling, this technique entails choosing suitable candidates according to specific criteria (Creswell 2005). The researcher can identify settings, events, or individuals who can aid the latter in comprehending a phenomenon. It also assists in establishing in-depth understanding that may result in valuable information so that people can learn more and understand this phenomenon (Creswell 2005). The

rationale and strength of qualitative purposeful sampling comes from the focus on the extensive understandings of each specific case that Patton (2015) refers to as information-rich cases. Purposive sampling or criterion-based selection according to Schensal and Lecompte (2010) entails the criteria and attributes of the sample. Participants will be asked to further highlight their achievement and success to explain their experiences as an under-represented group in STEM fields.

The data collection for phase one has the following criteria for the participants:

- 1- To be a female.
- 2- To hold a STEM degree
- 3- To work in a STEM domain where she is considered to be a minority.
- 4- Has or had a mentor at some point in her career.

I started looking for these participants initially within my social network. I asked people I knew who work in STEM if they would know any females with the above mentioned criteria. Snowball sampling was used also where I asked some participants after the interviews to refer any of their female colleagues. I also searched several social and professional networks that were specialised in empowering females in STEM. I checked the profiles of members of several STEM societies online and got in touch with them to explain the purpose of my study and the criteria I am looking for in the participants. I also emailed 14 professional companies and organizations that offer professional mentoring. Two of these organizations offered formal mentoring specifically to females in STEM fields. I only received a reply back from one of those organizations but unfortunately, I couldn't move forward with it because as it turned out they only offer formal mentoring to STEM undergraduate females who don't have any work experience in most cases. I checked also the profiles of many female professionals who work in STEM online across several professional networking platforms and emailed those

who fit the criteria for my search. The recruitment email is included in Appendix (D) of the study. I emailed 300 females and obtained responses from 30, most of them declined participating in the study. I faced several challenges while identifying the participants. The first challenge is the small number of females who actually work in these industries. The second challenge is that most of the females I contacted would end up not having a mentor, so lack of mentorship seemed prevalent. The third challenge was the availability of the females. Even if they fit the criteria some declined to participate because they were too busy and had no time to attend for an interview. Some of the participants who also fit the profile and agreed to participate in an interview either lost touch with their mentors or their mentors refused to participate in the study. After being able to identify a female participant who holds a STEM degree and works in the industry, I would give her a call and have a short chat with her. I would introduce myself, what I do, the topic of my research and its purpose. I would also explain clearly the criteria I am looking for in the participants and ask her whether she has or had a mentor at some point in her career. If she said that she does have a mentor, I would further explain generally the nature of the questions I am interested in asking and the expected length of the interview to be held. Once the participant agreed, I would have to wait for her to contact her mentor, explain briefly to him/her the research, and initially get his verbal consent on participating in the research as well. Then I would get in touch with the mentor, reaffirm the nature of my study, explain generally the type of questions I will be asking and the expected length of the interview. Finally, I would schedule an interview with each at their convenience. 10 mentee participants out of 28 were Lebanese and this may be due to the snowball sampling technique. As discussed earlier in this section, I started by contacting my social network for referrals. In addition, I would also ask the mentees after the interview if they can refer any of their co-workers or friends due to the difficulties in finding females who work in STEM fields and fit the criteria

of this research. In addition, as will be discussed in the coming section on reflexivity, my nationality and Arab origin as the researcher might have played a role in terms of recruiting Lebanese participants specifically and Arab participants generally since they might have viewed me as an insider and were encouraged to sit for interviews despite the fact that I emailed 300 participants from various nationalities. Another reason for having around 30% of the mentee participant pool Lebanese might pertain to the abundance of Lebanese women in STEM fields in general. This has been explained as a result of the country's secular society, the impact of the French education curriculum across many Lebanese schools, the efforts made by the government in the past years to increase the number of females who enroll in STEM majors, and the country's weak and unstable economy that offers little professional job opportunities in these fields, thus, dispiriting men to join (Koblitz 2016).

The mentees' interview would start by an opening question about their educational background and work experience. The interview would run for around an hour and is concluded by asking the participant to say what advice she would give to new females who are about to graduate and join the industry. I was able to interview 28 participants and 22 mentors. Five mentors changed their minds during the process and didn't want to be interviewed. Demographic information about the female mentees are included in Table 3.

Table 3: Mentee's Demographic Information

Participant	Nationality	Age	Marital Status	Degree	Years of Experience	Occupation
P1	Lebanese	24	Engaged	BSc Telecom and Networking Engineering	3	Network Support Engineer
P2	Lebanese	30	Engaged	BSc Computer and Communication Engineering	5	IT Administrator

P3	Lebanese	31	Single	BSc Computer Communication Engineering	9	IT Manager
P4	Lebanese	29	Married-1 child	BSc Architectural Engineering	6	Engineer
P5	Lebanese	38	Married-3 children	BSc Telecom and Networking Engineering	15	Senior Network Engineer
P6	Lebanese	38	Married-2 children	BSc Telecom Engineering	15	Solutions Architect
P7	Jordanian	31	Married-3 children	BSc Computer Engineering	8	Solutions Architect
P8	Tunisian	30	Single	BSc Architectural Engineering MSc Urban Planning	5	Senior Architect
P9	Jordanian	29	Married-2 children	BSc Civil Engineering MSc Building Services Engineering	7	Project Manager
P10	Palestinian	34	Single	BSc Architectural Engineering	10	Architect
P11	Omani	35	Single	BSc Electrical Engineering MSc Mechanical Engineering	11	Manager-Energy Services
P12	Emirati	29	Single	BSc Architectural Engineering MSc Building Services Engineering	6	Architectural and Review Engineer
P13	Lebanese	32	Single	BSc and MSc Computer Science	10	Systems Analyst and Project Manager
P14	Jordanian	29	Single	BSc Telecommunication Engineering MBA	6	Presales and Solutions Enterprise Consultant
P15	Emirati	39	Married-7 children	BSc Electrical Engineering	10	Quality Head
P16	Palestinian		Single	BSc Biomedical Engineering	2	Sales Engineer
P17	Lebanese-French	31	Married-1 child	BSc Telecommunication Engineering BSc Computer Science MSc Telecommunication Engineering	9	Research Engineer, Data Scientist

				PhD Telecommunication Engineering		
P18	Egyptian	27	Single	BSc Civil Engineering MSc Engineering Management	6	Lead Traffic Engineer
P19	Egyptian	31	Single	BSc Architectural Engineering MSc Sustainable Design	10	Senior Sustainability Engineer
P20	Pakistani	29	Single	BSc Chemical Engineering	3	Chemical Engineer
P21	Emirati		Married	BSc Biological Science	11	R&D and Quality Manager
P22	Lebanese		Single	BSc Electrical Engineering	6	Electrical Design Engineer
P23	Egyptian	23	Single	BSc Chemical Engineering	3	Chemical Engineer
P24	Syrian	29	Single	BSc Architectural Engineering	7	Architect
P25	Lebanese	28	Single	BSc Telecommunication Engineering	5	Sales Engineer
P26	Lebanese	28	Single	BSc Electrical and Computer Engineering MSc Engineering Management PhD Industrial Engineering	6	Researcher
P27	Emirati	26	Single	BSc Architectural Engineering	4	Senior Engineer
P28	Palestinian	25	Single	BSc Architectural Engineering	2.5	Architect

The participants came from different STEM backgrounds such as biomedical, electrical, structural, chemical, and computing domains. Their ages range between 22 and 42 years old. Although most of them work in the Levant area, they come from different nationalities and backgrounds.

All of the interviews were conducted in English as was the choice of the interviewees except for three, one mentee and two mentors. The latter preferred the interviews to be conducted in Arabic. Most of the interviews were conducted over the phone,

based on the wish of the participants, due to their busy schedules or because some were located in different countries such as Jordan, Lebanon, France, Canada, and the USA. The interviews with the mentees ran on average for one hour and for 20 minutes with the mentors. All interviews were audio recorded except for one which the mentor requested not to be recorded. During the interview, detailed notes were taken pertaining to each question. The interviews were transcribed orthographically in most cases to include all spoken words, sounds and expression indicated by different exclamation marks, pauses indicated by (...), and laughs indicated by (laugh) at the end of the phrase. Some of the transcripts have been edited for conciseness removing phrases that are not crucial to understanding the general meaning of the passage. After transcription, the files were imported into NVivo software for analysis. Details relating to the demographic information of the mentors are included in Table 4.

Table 4: Mentors

Name	Gender	Domain of Work	Reference to the Mentee	Duration of Mentoring
M1	Male	Team Leader/Support Manager	Direct Manager	2.5 years
M2	Male	Senior Engineer/Assistant Head of Department	Fiancé	3 years
M3	Male	Managing Director and CEO	Direct Manager	10 years
M5	Male	Managing Director	Direct Manager	12 years
M6	Male	Telecom Manager	Husband	10 years
M7	Female	Solutions Architect	Co-worker/friend	9 years
M8	Male	Senior Architect/Line Manager	Direct Manager	2 years
M9	Female	Civil Engineer/Managing Director	Mom	8 years
M10	Female	Renewable Energy Engineer	Co-worker/Friend	9 years
M11	Female	Architect	Co-worker/Friend	9 years
M13	Female	Senior QA Software Consultant	Formal Mentor	5 years
M1314	Female	Technical Program Manager	Formal Mentor	4 years

M15	Female	Health and Safety Manager	Co-worker/Friend	4 years
M16	Female	Recruitment Manager	Mom	8 years
M17	Male	Optical Engineer/Researcher	Husband	5 years
M18	Male	Managing Director/Transportation Engineer	Direct Manager	5 years
M19	Male	Managing Director/Prof of Architecture and sustainable design	Direct Manager/ University Professor	18 years
M20	Male	Project Manager/Industrial and Mechanical Engineer	Direct Manager	2 years
M26	Female	Professor of Industrial Engineering Management	Academic Advisor	2 years
M27	Female	Director of Design	Direct Manager	3 years
M24	Male	Project Manager	Direct Manager	3 years
M23	Male	Chemical Engineer	Co-worker/Friend	1.5 years

c. Methods and Data Collection:

Semi-Structured Interviews:

Interviews are considered to be the most common method of data collection in qualitative research (Merriam & Tisdell 2015). A research interview can be defined as a method where an interviewer and an interviewee interact in a focused conversation discussing questions related to a specific research topic. It is a conversation with a research aim to acquire special information (Dexter 1970) where the researcher intends to discover what goes on in “someone else’s mind” (Patton 2015). Interviews are deemed appropriate when the issue being studied relates to aspects of human experience and when the research questions posed revolve around how rather than how much (Brinkmann & Kvale 2015). This study uses interviews as the main method of qualitative data collection. Interviews are appropriate and essential to this research since it was not possible in a practical sense (e.g. geographical and financial constraints) for the researcher to observe the the

behaviours and feelings of the selected sample of participants when located in their places of work. Interviews contribute to understanding how the participants analyse and perceive the world around them. This study includes participants' recall of past events that might have present and future ramifications for their decisions and behaviours yet are impossible to reproduce and can only be investigated through interview processes or other methods of obtaining first-hand accounts about the past. It is assumed that an appropriately designed set of interviews have the potential to acquire high quality data about the interplay of cognitive aspects and contextual supporters of females persisting in STEM fields.

As for the type of interviews used in this research study, they were semi-structured with open-ended questions in order to give room for the female participants to express their lived experiences in their own words without any limitations (Creswell 2005). This type of interview structure is considered to be in a mid-way position between the highly structured interview type and the unstructured or informal type. A high structured interview is frequently used to gather socio-demographic data and is deemed more appropriate when discussing a relatively straightforward and defined concept (Merriam & Tisdell 2015). It is composed of a rigid structure, thus, hindering the researcher from having access to participants' viewpoints and conceptions of the phenomenon. In comparison, understandings and viewpoints can be gathered through the informal interview structure, although there is the risk that the researcher might become confused by the large amount of diverse insights and scattered pieces of information. An unstructured interview tends to be held more like a conversation and is used when the researcher's knowledge about the phenomenon is limited. Thus, unstructured interviews are not easy for novice researchers to use on their own as a method of data collection. The mid-way alternative is the semi-structured interview that helps with obtaining precise information from the

participants. Although it did not contain a predetermined wording or precise order of questions, the major part of the interview is guided by a list of the main issues to be investigated and common questions to be asked. Semi-structured interviews enable the researcher to investigate unforeseen themes via probing questions, prompts, redirects, and follow-ups (Yin 2003). Even though the main questions are set prior to conducting the interview, the semi-structured interview style encompasses flexibility in the wording of questions that enables participants to freely articulate their views and share their experiences clearly and thoroughly (Algozzine & Hancock 2006).

Interview Protocol and Procedure:

An interview protocol is crucial to improve the reliability of the design and guide the researcher through the data collection phase (Yin 2009). Interviews are managed by the protocol derived from the main research questions, and in this case the literature on women in STEM industries and the theoretical principles of the Social Cognitive Career Theory through which data were interpreted. This protocol is considered as a guide to ensure adequate and appropriate data are being acquired (Yin 2003). The interview questions are designed to bring about detailed information related to the participants' occupational experiences and investigate meaningful occurrences or themes that have an impact on their commitment in STEM domains.

Two interview guides have been constructed for this study, the first contains fourteen semi-structured questions in addition to demographic questions and probing questions (Appendix A) addressed to the female participants working in STEM occupations. The second interview guide is composed of fourteen interview questions addressed towards the participants' mentors (Appendix B). The interviews with the mentors were recorded, transcribed and studied for the sole purpose of corroborating the mentees' answers in some cases. Thus, they were not included in

the analysis. In his studies, Yin (2003) discusses the importance of interviews consisting of conversational questions administered in an unbiased fashion and guided by the case study protocol. The interview questions are derived from the main research questions, the theoretical understanding of SCCT, and the literature review of women in STEM industries.

d. Methods of Data Analysis:

A parallel mixed analysis technique will be followed where two separate processes will take place. The result of each will offer an understanding to the research questions. The findings of both designs will then be integrated into the meta inference stage which is described by Tashakkori and Teddlie (2010) as a mixed paradigm where the combination of qualitative and quantitative research contexts is applied to the final results. The qualitative data analysis includes methodical inspection for meaning among interview answers provided by each participant to develop themes. Every interview was transcribed, and a formal coding and analysis procedure was implemented using Nvivo 11. The interviews were audio recorded in order to make sure that everything discussed by the participants was saved for the analysis. After every interview, the data was transcribed by the researcher.

Qualitative content analysis was used to analyse the data generated from the semi-structured interviews. It is one of the most popular and classical methods to analyse data as text resulting from interviews (Bauer 2000). The aim of this approach is to reduce the material at hand by assigning categories that are derived from the theory. There are three types of qualitative content analysis: conventional, directed, and summative. Through this study, directed content analysis was used for reasons relating to the theoretical framework and research questions (Weber 1990) that will be discussed in more detail in the coming sections of this study proposal. Through the use of qualitative content analysis, the focus is on the characteristics of language

as a means of communication with special consideration to the contextual meaning of the interview transcripts (Tesch 1990). The goal is to contribute to knowledge about the lived experiences of females in STEM industries. This study borrows the definition of qualitative content analysis put forward by Hsieh and Shannon (2005) where they consider qualitative content analysis a research design for the subjective explanation of the meaning and essence of the data generated from the interviews through the orderly categorization mechanism of coding and recognizing themes or patterns. Directed content analysis is usually used in situations where a certain phenomenon, like the one at hand, is under-researched and could be better understood by further analysis and investigation. The aim of this approach is to conceptually ascertain or expand knowledge about theory. Existing literature or theory aids in clarifying the research questions. It can also supplement predictions about the variables or the relation among the variables which will aid in identifying the primary codes and relation between the codes (Mayring 2000). Compared to the conventional approach of content analysis, the directed approach is more structured (Hickey & Kipping 1996). Drawing from the SCCT and the research questions of this study, I start by identifying the main conceptions or variables as primary coding categories. An inductive coding is applied whereby I studied the data, look for meaning units and assign codes. This includes first reading the interview transcripts several times in order to identify patterns. The coding process involves reading the data and noting the main themes. The next step is to identify operational definitions for each category using the theory. Coding starts first by reading the interview transcripts and underlining all text that seems to represent connection to occupational commitment, self-efficacy, and mentoring. The next step is to code the underlined texts using the initial codes. In case a text is not categorized using the predetermined codes, it is assigned a new code. The interview data is analysed by dividing the text into smaller parts or units of content and subjecting these units to

content analysis. Finally, I evaluate the relations and links between the themes and subthemes. My discussion of the findings is guided by the SCCT and the research questions. The main advantage of directed qualitative content analysis is that it aids in expanding the current theory, SCCT. Within-case analysis is conducted whereby each individual case is analysed as a comprehensive and individual case in itself. This facilitates our understanding of the contextual variables affecting the case. Despite the fact that some details differ from one case to the other, I attempt to construct a general explanation that fits all of the individual cases. The cross-case analysis helps in obtaining a consolidated description of all cases (Yin 2014).

The first step in analysing the data was to conduct a literature review thematic analysis. Thematic analysis initially was unsatisfactory as defined in the literature despite its common use in analysing qualitative data (Howitte & Cramer 2008). Braun and Clarke (2006) present a detailed explanation of the process of conducting thematic analysis in an advanced and systemic way. Thematic analysis is becoming a broadly acknowledged method of research analysis and is characterized by flexibility and approachability. Thus, it has been defined as an approach for methodically identifying, arranging, and offering understandings into patterns of meaning throughout a data set (Braun & Clarke, 2012). Thematic analysis enables the researcher to identify and understand shared meaning and lived experiences by focusing on the meaning present in a data set. By using this method, the purpose is to attempt to figure out the commonalities being discussed about a certain subject area and to try and understand the insights that these commonalities offer. It is important to note, however, that while using thematic analysis such commonalities do not have to have a meaning or importance in themselves. It is the patterns of meaning identified with regard to the topic of research that are of significance to the researcher. This is what the usage of thematic analysis facilitates for the researcher.

A large number of patterns might be identified by the researcher, however, the main aim of thematic analysis is to identify and select those patterns that are relevant to the research questions of the study. Thematic analysis is used as the method to analyse the literature data sets and empirical study throughout this thesis due to the convenience and the flexibility that the method offers. While other analysis methods may seem unclear and complicated, thematic analysis paves the way for an inclusive and systematic process of coding and analysing data where the results can be associated with aspects from both theory and concepts. The exploratory topic of the study, the research questions, and the data collection method all indicated the appropriateness of using thematic analysis. While using thematic analysis, the researcher assumes that a plausible account of elements of reality can be obtained through language although the lived experiences of the participants inevitably is socially mediated (Madill, Jordan, & Shirley, 2000). A deductive lens is used while analysing the literature and empirical study data sets where I infer themes based on broadly theoretical concepts from SCCT, mentoring, OC, PA, and the literature on women in STEM. Throughout the analysis I adopt Braun and Clarke's (2006) six phases approach to thematic analysis:

- 1- Get familiar with the data.
- 2- Initial coding.
- 3- Start to construct themes from codes.
- 4- Review potential themes.
- 5- Define and name themes.
- 6- Produce the report.

I researched the literature for the main concepts I have in my research: occupational commitment, self-efficacy, mentoring, protean attitude, and women in STEM. The ABI-Inform/Proquest was searched for journal articles published between 2011 and

2018. I excluded materials available in abstract forms only, editorials, commentaries, review articles, books, and excerpts of books. There is a huge amount of literature on self-efficacy and mentoring in the educational sector, I excluded that. I also did not include studies completed on school or university students. I focused on research studies executed in vocational settings. Taking into consideration the SCCT theory and the research questions, I refined the search down to 20 journals. Appendix (E) contains the list of the journals included as data sets in the analysis. The journal articles were read several times with notes being taken along the way highlighting sections or phrases that are of importance. The journal articles have been read analytically in an effort to make sense of the content and were actively analysed in light of the research topic and the research questions. The next step was to systematically analyse the data by coding it. The codes were used to identify certain parts of the data that were relevant to the research questions. Descriptive codes were used to depict the content of a data section. In some cases, the coding reflected an interpretation of a particular concept. The main aim was to ensure that the coding was performed in a comprehensive, accurate and systematic way. To that end, each journal was read several times, the initial attempts to become familiar with the data, the later readings were to make sure that all relevant data sets within each journal have been clearly coded and nothing was left out. At the end of the process, 100 codes were identified. Appendix (F) contains all the coding sets identified. The next step was to start searching for themes. If codes are considered the building blocks of an analysis process, themes are the walls constructed from these building blocks (Braun & Clarke 2012). I started by grouping similar codes that seem to share the same meanings with each other. In doing so, I was able to identify four themes that are familiar to my research topic that are self-efficacy, mentoring, protean attitude, and occupational commitment. A large amount of codes also clustered around four different themes that are considered newly identified themes to the topic and

research questions. These derived themes are: The quality of the mentoring relation, professional identity, goal setting, and personal learning development. A detailed table of all the themes is presented in Appendix (F).

Another major step at this point was to also identify any possible relations existing between the themes and try to understand how the interaction between the identified themes further explain the phenomenon at hand. The quality of the mentoring relation indicated the reasons or factors that would lead the mentee to identify a specific person as her mentor. This can be based on similarity aspects between the two, much as the attraction paradigm indicates (Eby *et al.* 2013). These could include similar characteristics, desires, attitudes, etc. The quality of the relation also indicated trust between both parties, or a sense of need where the mentor is considered an experienced and highly knowledgeable person sharing needed information with the mentee (Pan *et al.* 2011). The second new theme was goal setting where the person discusses future plans or goals and provides detailed descriptions of how she is endeavouring to achieve them. Self-efficacy motivates the individual to commit to her goals (Ballout 2009). The literature also indicates the importance of goal setting in strengthening the occupational commitment of employees (Jiang 2016). The third theme identified was professional identity where the employee would have a strong sense of identity with her occupation. Mentoring plays an important part in strengthening a person's professional identity via different functions such as role modelling and coaching. The last derived theme identified is personal learning development where the latter is enhanced when exposed to several mentoring functions (Pan *et al.* 2011). Individuals who experience learning developments enhance their skills which may lead to better performance and ultimately a stronger sense of self-efficacy (Pan *et al.* 2011). After identifying several relations between the themes, the next step was to review the themes against the entire data sets and the coded data to refine and assess the quality. Several codes

were revised, and the coding phrases were adjusted to give clearer and more concise depiction of the data set that is coded. Some wordings of the themes were also amended for the same purpose. The data in the journals was read all over again to double-check whether the final generated themes depict the meaning of the data. When checking the themes, several aspects were taken into consideration. Each theme was focused on a single idea or concept, there are relations between the themes, yet there are no redundancies among them. And finally, they attend to the research questions in a direct way. Table 5 includes an excerpt of the codes and the themes identified.

Table 5: A Sample of Codes and Themes Derived from the Literature

Literature	Codes	Themes
Two recent meta-analyses find that protégé perceptions of similarity to mentors are consistently related to positive mentoring outcomes. Eby et al. (2013) found that meta-analytic correlations between deep-level similarity (i.e., protégés' perceptions of similarity to their mentors in terms of attitudes, values, beliefs, or personality) and protégé perceptions of mentoring were consistently large, ranging from .38 for instrumental support to .59 for relationship quality. Similarly, Ghosh (2014) found mean meta-analytic correlations of .42 between perceived similarity and career mentoring and .60 between perceived similarity and psychosocial mentoring. These results support the similarity-attraction paradigm (Byrne, 1971), which posits that we are attracted to those who are similar to ourselves because they reinforce and validate our beliefs, attitudes, and behaviour (Mitchel et al., 2015, p. 2).	Shared similarities – Attraction Paradigm. Communication unfolds the similarities	Quality of the Mentoring Relation
Petty and Cacioppo (1981) pointed out, however, that in spite of the encouragement received from a mentor, the influence of verbal persuasion may become negated if a protégé's perceived credibility of the mentor is negative in terms of the expertness, trustworthiness, and attractiveness (Bang & Reio, 2017, p.152).	The quality of the relation moderates the relation between mentoring and self-efficacy. The mentee has to perceive the communication from the mentor as credible.	Quality of the Mentoring Relation
The paradigm of social exchange theory suggests that employee's strong perception about supervisory work-related support influences employee's commitment, job satisfaction, and perceived career success (Arora & Rangnekar, 2015, p. 65).	Quality of the mentoring relation can be explained by the Social Exchange Theory.	Quality of the Mentoring Relation
Carson and Bedeian (1994) reported about OC on the basis of Hall's (1971) and London's (1983) career motivation theory as comprising three major dimensions-career identity, career resilience, and career planning. Career identity is the emotional linkage and association with	Career identity strengthens OC (Motivation Theory)	Predictors of OCC Professional Identity

one's line of work (Arora & Rangnekar, 2015, p. 65).		
Career resilience is the degree of willingness to persist in the face of adversities (Arora & Rangnekar, 2015, p. 65).	Career resilience increases OC	Predictors of OCC
And career planning is the active engagement of an individual with goal-setting and goal-determination activities (Okurame, 2012). (Arora & Rangnekar, 2015, p. 65).	Career planning enhances OC through goal setting.	Predictors of OCC Goal setting
Several studies from the literature have also identified perceived supervisory career support as a key factor affecting employee's career satisfaction and career development (Wickramasinghe and Jayaweera, 2010). (Arora and Rangnekar, 2015, p. 65).	Career-related functions of mentoring enhance career outcomes such as career satisfaction which ultimately increases OC.	Predictors of OCC
"Ballout's (2009) study revealed that, career commitment has a significant influence of career satisfaction through the moderation effect of self-efficacy." (based on: Karavardar, 2014, p. 100).	Goal setting Self-efficacy motivates the individual to commit to her goals. Self-efficacy motivates the individual to commit to her occupation.	Predictors of OCC Benefits of SE Goal setting
"Consequently, he or she is more likely to believe in his or her own ability to maintain a balance between work and non-work demands, thereby acquiring a strong sense of self-efficacy, and subsequently, achieving work-life balance" (Based on: Chan, Kalliath, Brough, Siu, O'kakDriscoll, & Timms, 2016, p.6).	A stronger sense of self-efficacy would enable females to work towards achieving work-life balance.	Benefits of SE
Mentors also provide protégés with verbal persuasion. Individuals who are verbally persuaded that they are capable of completing and mastering a given task are more likely to perform the task (Bandura, 1986). (Bang & Reio, 2017, p.152).	Mentoring enhances self-efficacy through verbal persuasion. The quality of the relation mediates this relation.	Mentoring (Common Norms)
Supervisors have been regarded as an important resource for personal learning. Individuals learn vicariously by observing the behaviour of others and the outcomes that result from this behaviour (Bandura, 1977). Through intensive interaction, sharing and exchanges, mentoring relationships provide a useful platform through which individuals can enhance personal learning (Kram, 1996). Lankau and Scandura (2002) investigated personal learning in mentoring relationships. Their findings have shown support for the impact of supervisory mentoring on subordinate personal learning. vocational support by supervisors enables subordinates to acquire new skills through direct coaching and challenging project assignments (Pan, Sun, and Chow, 2011, p. 266).	Mentors enhance mentee's personal learning development.	Mentoring (Common Norms) PLD
Employees who experience personal learning may have more positive reactions to their work because they have greater confidence and skill. Personal learning should thus be related to attitudes. Employees who have developed communication and problem-solving skills may feel more competent and may receive feedback about the value of their contributions (Pan <i>et al</i> , 2011, p. 266).	Personal learning enhances self-efficacy. Personal learning enhances mentee's communication skills.	Mentoring (Common Norms) PLD
For employees who have a strong protean career orientation, owing to their proactivity in career planning, they are likely to experience occupational success and have more accomplishments throughout their careers (Baruch, 2014), which then boost and sustain their self-efficacy. They are eager to interact and learn from their supervisor and colleagues as well as to seek positive feedback and encouragement from them (Gubler <i>et al.</i> , 2014). Earlier research has found that individuals with	Goal setting Facilitate learning Protean attitude strengthens occupational commitment via career success and accomplishments. Protean attitude enhances self-efficacy via mastery experience.	Protean Attitude PLD Goal setting

a strong protean career orientation obtain more instrumental and socioemotional support via their social networks (Gasteiger, 2007; Grimland, Vigoda-Gadot & Baruch, 2011). As they perceive more personal control and autonomy (Hall, 2002), they tend to experience positive affect and feel less anxious. Drenzo, Greenhaus & Weer (2015) reported that a protean career orientation enables individuals to develop more psychological capital (in which self-efficacy is one of its components). Taking the above arguments together, we expect employees with a strong protean career orientation will possess a high level of self-efficacy. Previous studies have provided evidence for a positive relationship between these two constructs (Baruch, 2014; Baruch, Bell & Gray, 2005). (Ngo and Hui, 2018, p. 429)	Protean attitude enhances the mentoring relation through the eagerness of the mentee to learn more.	
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The second part of the analysis was to analyse the data gathered from the interviews in light of the results of the thematic analysis derived from the review of the relevant literature, the theoretical framework for the study, and the research questions. The interview transcripts were exported to NVivo and were thematically analysed using the Gioia methodology. The Gioia method attempts to answer two major questions that are on every researcher's mind when embarking on analysing qualitative data. How is it possible to maintain qualitative rigour while sustaining the originality to be able to develop new ideas at the same time? And also how can a researcher apply orderly disciplines that yield trustworthy analysis of the data and simultaneously be able to convince the readers that the results are credible and defensible? The method rests on two assumptions, that the organizational world is socially constructed and people making sense of their realities are informed individuals (Gioia *et al.* 2012). This implies that the researcher in such a situation plays the role of the reporter whose major job is to present credible explanations and interpretations of the participants' experiences. The researcher has to make an exceptional effort to allow the participants in the initial phases of data collection and analysis to freely express themselves. The researcher can do so by simply not attempting to force her pre-existing understandings of certain concepts or theories as being the right interpretations for explaining the participants' experiences. Such an attempt allows

for more opportunities for new concepts to be detected rather than assert current ideas. Another assumption also is made concerning the research where Gioia *et al* (2012) explain that the researcher is considered to be knowledgeable as well and is capable of identifying certain concepts within the data that could lead to emergence of new themes and relations that might not have been noticed by the participants. The researcher is able to construct terms from the new concepts discovered that are relevant to the theory. One of the main reasons for using the Gioia method in this research is because it provides an evidence base for findings and conclusions. The method presents three systematic phases to analysing the data. In the first order analysis, the researcher adheres as much as possible to the participant's wordings and terms. At this stage, the number of codes seem to grow bigger while going through each transcript. The result is a total of 54 codes presented in Table 6. The bold font is indicative of the themes that emerged in the interview data sets while the italicized font is indicative of the themes that were derived from the literature review thematic analysis.

Table 6: First Order Concepts

First Order Concepts				
1.Acceptance and Confirmation	12.Exposure	23.Lack of Motivation	34. Values Driven	45.Self-assessment
2.Adaptive	13.Females privileged	24.Lack of Support	35.Positive Outlook	46.Self-doubt
3.Ambitious	14.Flexibility	25.Leadership	36.Proactive	47.Self-marketing
4.Barriers	15.Freedom	26.Learning	<i>37.This is Me</i>	48.Self-reliance
5.Challenging Stereotypes	16.Friends and Family Support	27.Looking for Challenge	38.Protection	49.Self-serving Bias
6.Challenging Work	17.Friendship	28.Motivation	39.Psychological Success	<i>50.Having Goals</i>
7.Coaching	18.Gender	29.Need for Advice	<i>40.Quality of the Mentoring Relation</i>	51.Sponsoring
8.Confidence	19.Interpersonal Skills	30.Obligation to Stay	41.Responsibility for Success	52.Taking Risks

9.Counseling	20.Job Dissatisfaction	31.Occupational Investment	42.Restricted Freedom	<i>53.Family Responsibilities</i>
10.Culture	21.Job Satisfaction	32.Desire to Stay	43.Role Model	54.Achievements
11.Dealing with Demotivators	22.Lack of Awareness	33.Persistence	44.Salary	

In the second step, differences and similarities among the concepts were identified which allow the researcher to regroup some of the concepts and reduce the number of the 1st order concepts from 54 to 15 order themes as shown in Table 7. For example, the 2nd order theme coping self-efficacy contains concepts from the 1st order concept like confidence, achievements, interpersonal skills, dealing with demotivators that were grouped together based on similarities.

Table 7: Second Order Themes

Second Order Themes	
1.Coping Self-Efficacy:	Achievements, Confidence, Dealing with demotivators, Inter-personal skills, Leadership , Motivation, Taking risks, Self-serving Bias, Self-Marketing, Female Privileged , Challenging Stereotypes
2. Normative Commitment:	Obligation to Stay
3. Affective Commitment	Desire to Stay
4. Continuance Commitment	Occupational Investment, Salary
5. Mentoring Functions (Norms)	Career-related: Challenging Work, Coaching, Exposure, Need for Advice , Protection, Sponsoring Psychological-related: Acceptance and Confirmation, Counseling, Friendship, Role Model
6. <i>Quality of the Mentoring Relation</i>	Quality of the Mentoring Relation
7.Peer Mentoring	Friends and Family Support
8.Protean Attitude	Personal Values: Psychological Success, Values Driven Self-Directedness: Adaptive, Ambitious, Flexibility, Freedom, Job Satisfaction , Looking for Challenge, Persistence, Positive Outlook, Responsibility for Success, Self-assessment, Self-reliance
9. <i>Goal Setting</i>	Having Goals
10. <i>Professional Identity</i>	This is me

11. Culture	Culture
12. Personal <i>Learning Development</i>	Learning
13. <i>Family Responsibilities</i>	Work-life Balance
14. Perceived Barriers	Barriers
15. Unperceived Contextual Barriers	Gender, Job Dissatisfaction , Self-doubt, Lack of Awareness , Lack of Motivation , Lack of Support , Restricted Freedom

In the 2nd order analysis, the main question is whether these emerging themes are indicative of ideas that might aid in answering the research questions. Keeping in mind the SCCT, since at this point, the researcher is analysing and interpreting the data in ways that attend to the theoretical realm (Gioia *et al.* 2012), I started looking further for emergent themes that might stand out within the data. Some of these themes fall in line with the four newly identified themes that were found in the literature review thematic analysis and others stood out from the interview data sets such as culture, job dissatisfaction, and lack of awareness. These 15 concepts were further distilled into four aggregate dimensions as shown in Table 8.

Table 8: Aggregate Dimensions

Aggregate Dimensions	
1. Internal Drivers	Coping Self-Efficacy, Protean Attitude, <i>Goal Setting, Professional Identity, Personal Learning Development.</i>
2. Occupational Commitment	Affective Commitment, Normative Commitment, Continuance Commitment
3. Contextual Supporters	Mentoring Functions, Peer Mentoring, <i>Quality of the Mentoring Relation.</i>
4. Barriers	Culture, Work-life Balance, Perceived Barriers, Unperceived Contextual Barriers.

The findings have been presented in a data structure Figure 6 that serves as a helpful visual aid and explains the reduction, refinement and development of the data into

concepts and ultimately themes. Drawing from the SCCT, the findings of the thematic analysis, and the aggregate dimensions, a dynamic relation among several emergent themes was identified which will be further explained when discussing the amended conceptual framework in the coming sections.

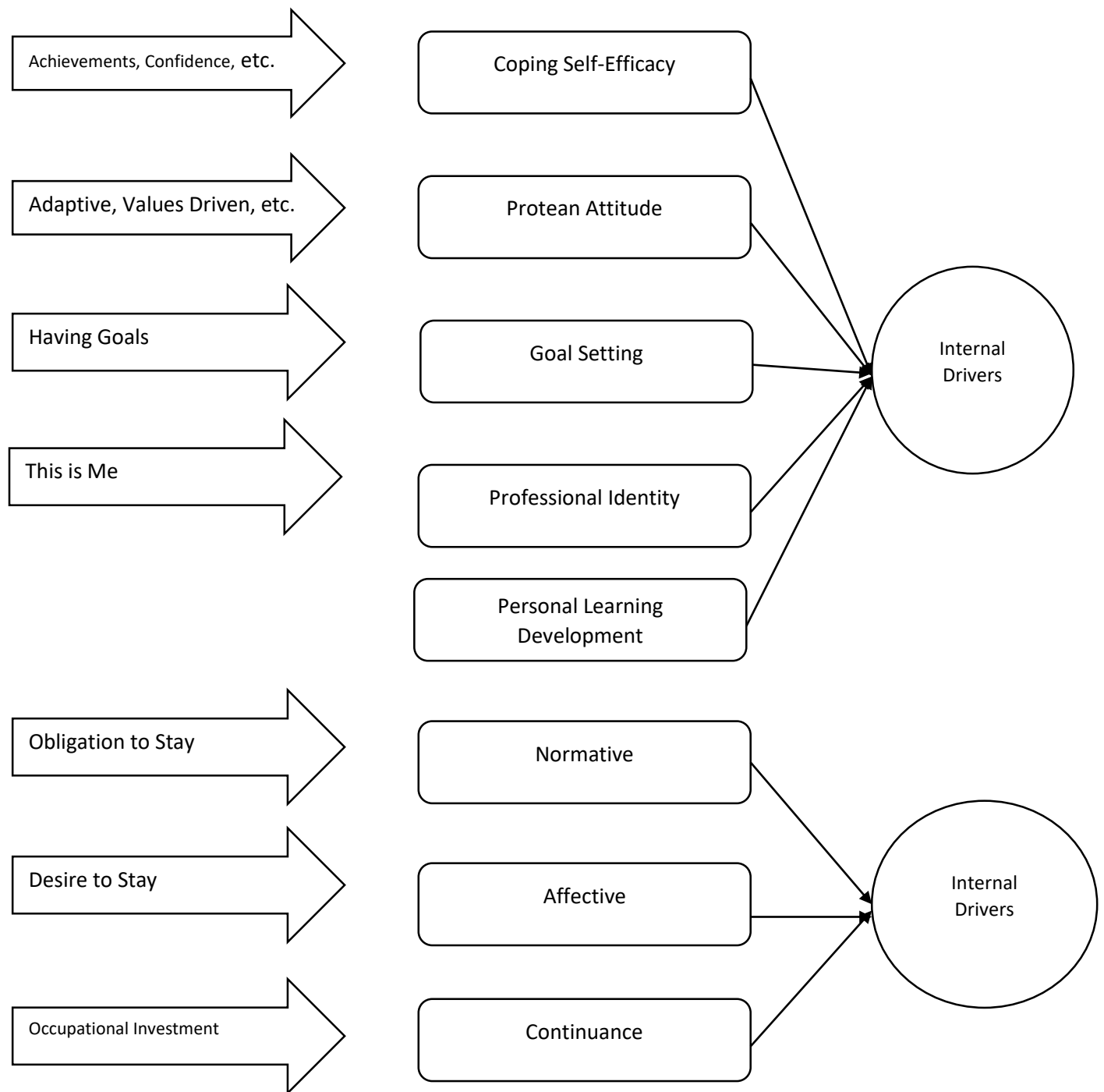


Figure 6. Data Structure

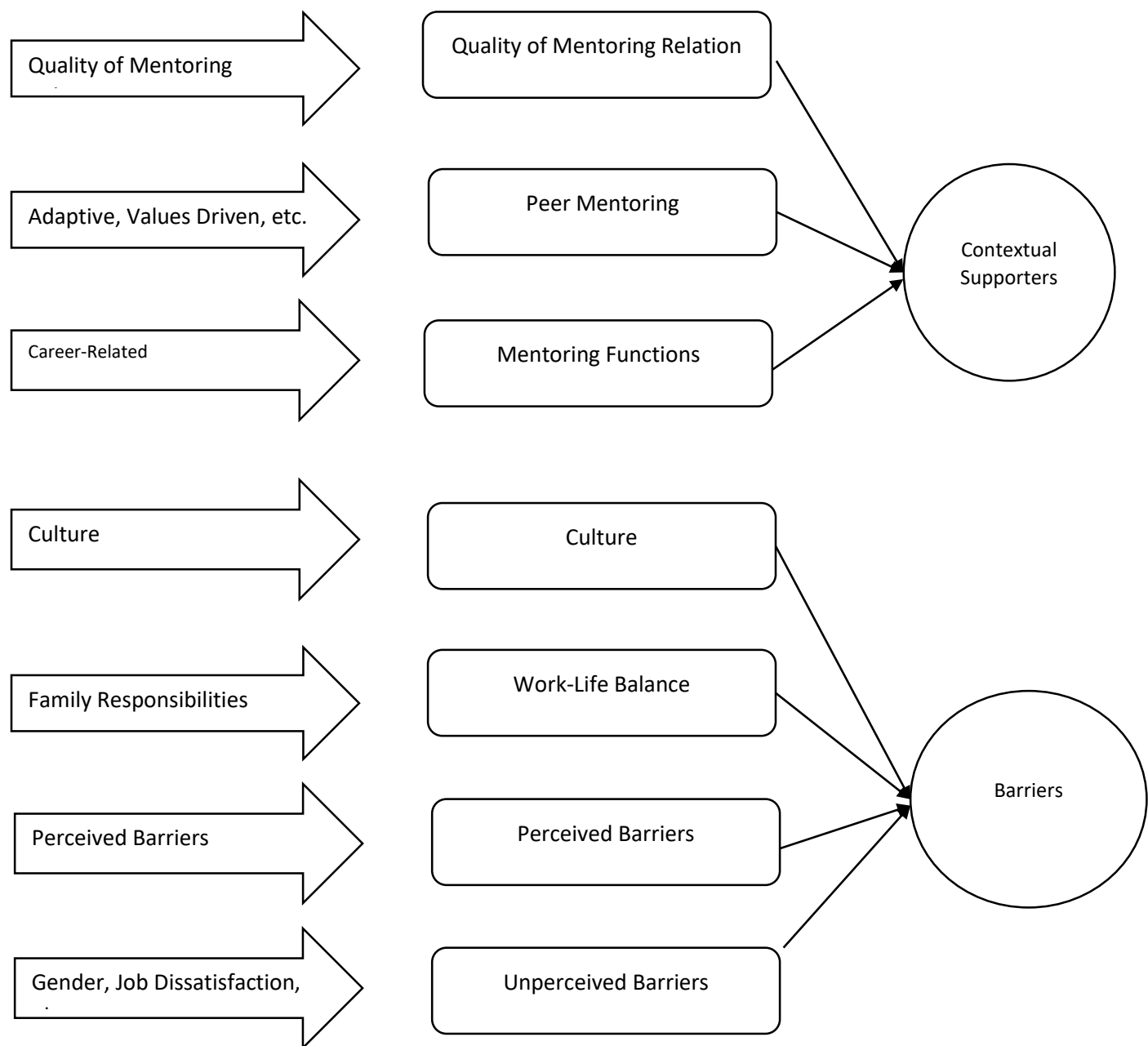


Figure 6. Data Structure- Continued

The second phase of the research design aids in further hypothesis testing of the results from phase one. Ultimately, three new concepts in addition to protean attitude have been included in the literature of this research, hypothesis testing, and the

survey. These constructs are quality of the mentoring relation, personal learning development, goal setting. This will be further discussed in the coming sections of this study.

Role of the Researcher and Reflexivity:

The role of the researcher is a highly debatable topic in qualitative research. A researcher must possess a variety of competencies and adopt a number of positions as part of the processes of data collection and analysis utilized when carrying out research (Creswell 2005, Merriam & Tisdell 2015, Yin 2003). In addition to the fact that researchers are expected to possess full understanding of the topic being researched, it is their responsibility to recognize any potential biases or preconceptions that might have an impact on the research findings (Creswell 2005, Yin 2003). Personal ideologies, presumptions and biases of the researcher can influence the process of data collection, analysis, and interpretation of results (Creswell 2005). Such conditions, however, may favour qualitative research designs where they tend to reinforce the researcher's awareness of the situation and setting of the study, resulting in better understandings of the themes that may arise from the data (Hatch 2002). As some scholars explain, the researcher is considered, to a certain extent, the research instrument of her own study (Lincoln and Guba 2000, (Merriam & Tisdell 2015). Therefore, as a researcher, I have included in the following paragraphs some information about my educational, career, and personal background that I consider crucial in highlighting my role as researcher and its impact on the degree of research reflexivity enacted within this study.

After graduating from the American University in Beirut with a Bachelor degree in Business Administration in 2003, I started my career as an internal auditor. It was not long before I realized that this is not what I really enjoy doing. However, reflecting back on those years, I admit that this line of work had a positive impact

on my personality and skills development. It has enhanced my attention to detail, which as a researcher and an academic now, I believe is an added value. After leaving the accounting domain I started work in the field of HRM. Initially, I filled the post of junior recruiter at a local recruitment firm in Lebanon. After a few years I became a senior recruiter and was studying for my MBA in HRM. I loved this new work domain, not only because it was research-oriented, but also because I had the chance to meet various people, whether potential clients or candidates, from various fields of work. I was also exposed to various practical aspects of HRM which helped me better understand and enjoy my MBA studies.

In 2008, I relocated to Dubai and there I started working as a head of research at an international recruitment firm. After one year, I decided to quit the whole industry and stay at home to raise my little boy. Reflecting on my years as a recruiter and researcher, I believe that these experiences have equipped me with the skills that I found very useful when I started pursuing my Ph.D. studies in terms of conducting research and interviews. Conducting interviews with the participants was something that felt natural and did not require much effort from my side because I was used to conducting interviews previously as part of my job. Yet, the purpose of conducting recruitment interviews was much different, of course, from conducting interviews for the purpose of research, but my experience as a recruiter still gave me an advantage. In 2012, I occupied the post of research assistant at the Lebanese American University in Beirut for two years. My academic research interests in the areas of HRM, organizational behaviour, career theories, and gender studies thus started to develop. I was able to co-publish three journal articles in these areas, one discussing gender inequality in the Lebanese workplace. This paved the way for me to start pursuing my Ph.D. studies. Merriam & Tisdell (2015) discuss three main aspects that should be considered in terms of the research-participant relation:

insider/outsider, positionality, and reflexivity. Lincoln (2010) refers to these three aspects as working the hyphen. The term refers to reviewing the inter-relation between the self, as the researcher, and the other, as the participant. The aim is to try to highlight how one affects the other and, ultimately, the research process. I consider myself as an outsider when attempting to research females working in STEM fields since, as discussed earlier in this section, I do not hold a STEM degree nor have I ever worked in a STEM field. I see this as an advantage since it helped me consider, analyse and interpret the lived experiences of the mentee participants from a rather objective viewpoint. When it comes to the issue of positionality as a female researcher, I think it has made it easier for me to develop trust with the mentee participants. Being a female who had experienced at some point various forms of gender discrimination in the workplace, this aided me to understand the depth of their experiences. It might have as well made it easier for them to discuss their experiences with me freely. I also consider myself as an insider due to the fact that I share with the majority of the mentee participants the same Arab/Middle Eastern culture. They felt at ease to discuss their experiences with me without the fear of being judged or stereotyped. I also shared with some of the mentee participants the common aspect of motherhood. As a mother of two boys, I decided to leave the workplace for a few years to raise my kids and it was a challenge for me to find a job opportunity again after being away. When issues of work-life balance were brought up by the mentee participants, the challenges they were discussing as working mothers seemed clear and obvious to me. Mentee participants who were single and do not have children also discussed their apprehensions about starting a family and described some of the challenges pertaining to that in substantial detail and with transparency since some of them at least knew that I am a mother and had to balance between my work as a research assistant in the past and more recently, the challenge of pursuing a full time Ph.D. So, in several ways, I was an insider when

it comes to gender, culture, motherhood and an outsider in terms of technical background relating to STEM. The fact that the researcher's positivity does not match that of the mentee participants is not necessarily an obstacle, neither for me as a researcher nor for my research because as a researcher, I am conducting research with the participants not on them (Merriam & Tisdell 2015, Johnson-Bailey 2004). Both as an insider and an outsider I was aware of the impact I had as a researcher on what was being discussed during the interviews. I was mindful of the positionality I had as a researcher and the advantages it offered me in the sense that the participants felt at ease discussing the challenges they faced as female minority and mothers or mothers-to-be.

As a female researcher, I have taken into consideration several measures to ensure that personal bias does not hinder the clarity of my understanding and interpretation of data; however, I kept in mind my own experiences when examining the literature and formulating the interview protocol questions, which I believe are of added value to this study.

According to Maxwell (2005), validity issues in qualitative research design usually include the researcher's bias and reactivity. Identifying and resolving aspects that might bias the researcher are important to address at the very beginning of the study so that the reader is able to understand the researcher's stance as well as any preconceptions or prejudices that may influence the study (Merriam 2009). Being a female researcher and having deep interest in this area of research might pose occasional concern. I have therefore tried to remain knowledgeable; therefore, it is of great significance that I do not focus on my own understandings of what is taking place in the career development of the female participants but listen and interact with the participants' understandings. I am also attentive as to how my personal values and predilections might influence the process and results of the research (Maxwell

2005). Through vigilant design of research questions and development of an interview protocol to serve the purpose of this study I endeavour to bracket these issues of research bias. Evidence collected from the interviews has been targeted towards collecting in-depth observations and ideas and eliciting accurate meanings in relation to the participants' experiences. This has been performed as much as possible and the research process has been carefully and thoroughly documented to produce as much clarity as possible on participants' own ideas and thoughts (Maxwell 2005).

Ethical approval for this research was granted by the research committee at the British University in Dubai. The steps listed below were taken to further reinforce the observance of ethical considerations and sensitivity towards the participants in this research:

Briefing the participants: The participants were briefed about the nature and aim of the study. They were also given a general idea about the questions to be discussed during the interview.

Voluntary Participation: All the participants were informed that their participation in the study is voluntary and that they can opt out of the study at any point with no penalties. Three mentors changed their minds at a certain point and chose to not participate in the interview study.

Informed Consent: Two versions of informed consent (Appendices G and H) were sent to the mentees and mentors respectively. All were satisfied with what was stated and signed acknowledging their agreement to the terms of the empirical study, except for one mentor who refused for the interview to be audio recorded. His choice was respected and implemented.

Confidentiality: The identity of all participants has been kept anonymous along with any personal details that were shared during the interviews.

Choice of Language: The participants had the right to choose the language of their preference for the interviews, therefore, 4 interviews were conducted in Arabic while the rest were in English language.

Translation: The data from the four interviews was thoroughly translated into English to depict a clear account of this group of participants' experiences.

Reliability and Validity:

Stake (2005) explains that knowledge acquired in a qualitative investigation is encountered by a dangerous traverse from writing to reading. The researcher looks for means of making this journey secure. Opponents of case study design point out that researchers often fail to establish an adequate functional set of measures and that data are collected through subjective awareness. Qualitative research design builds from the assumption that, unlike quantitative paradigms, the researcher doesn't have control over the context in which the phenomenon is being studied. In this mixed methods design adopted for this study, as a researcher, I had little or no control over the context of the phenomenon being studied. This study adopts Merriam's (1988) terms of consistency for reliability, truth value for internal validity, and transferability for external validity.

Several steps have been taken to generate fair and accurate information gathering, analysis, and results through qualitative design that are discussed in the following sections.

Validity:

Where validity refers to authenticity in qualitative designs (Neuman 1999), it signifies honesty, responsibility for results, and integrity of drawing conclusions from analysis. Yin (2003) points out that honesty in interpreting data is a crucial feature of validity in case study designs. Some validity risks that have been discussed by scholars are defective interview processes, an unsuited pool of participants, mistakes in coding and transcribing data, erroneous depictions, and researcher bias (Creswell 2005). Thus, counter measures addressing the issues of validity and reliability are included in this research.

Internal Validity (Truth Value):

Internal validity issues attempt to answer the question of how the study results reflect or are parallel to reality? Internal validity stresses the meaning of reality (Merriam & Tisdell 2015). It is important to note that an investigation could never actually capture reality. Validity in this sense is relative and should be judged in relation to the purpose of the study and the status of the research (Maxwell 2013). However, through several strategies, the research can increase the credibility of the research findings.

External Validity (Transferability):

External validity deals with the extent to which the results of the research can be generalized (Merriam & Tisdell 2015). While much debate has been taking place throughout the literature on the feasibility of generalizing from qualitative results, some scholars have pointed out that generalizability in qualitative research is best thought of in ways relevant to the philosophical underpinnings of the qualitative research (Eisner 1991). Lincoln and Guba (1985) were pioneers in promoting the concept of transferability where it is not the responsibility of the researcher to produce generalizable findings, but rather the reader attempts to apply the findings

to other places. However, the most popular understanding of generalizability in qualitative design is reader or user generalizability that entails the degree to which a research study's results can be persuasively and rationally argued to apply to other situations.

Reliability (Consistency):

Reliability or consistency refers to the degree to which the findings can be replicated. This definition is based on the idea that there exists a single reality and when studying it in a repeated form it will give similar results. In qualitative research, reality is rather constructed through the meanings of individuals' lived experiences. The researcher's duty is to try to narrate and disclose this reality according to how those experiencing it understand it. Thus, there often will exist several interpretations of even a single research phenomenon. This has led scholars to conclude that the more relevant question in qualitative research is whether the findings are consistent with the data gathered (Lincoln & Guba 1985).

Several steps have been taken throughout this study to assure reliability and validity of the results. Yin (2012) explains the importance of using multiple sources of evidence to deal with problems of validity and reliability of the study. One of the main advantages of using case study design is that it offers multiple opportunities to utilise various sources of evidence. This allows the researcher to tackle a wider range of behavioural aspects related to the phenomenon under investigation (Yin 2012). The first source of data was from the interviews conducted with the mentees, and the second from the interviews held with the mentors. This allowed for scrutinizing and reviewing data gathered from interviews from multiple participants, each with different viewpoints.

A second strategy is member checking or respondent validation, which Maxwell (2013) considers to be the most significant way of eliminating any mistaken interpretation of the meanings of words and behaviours of participants. In multiple case studies, internal validity can be achieved by applying checking techniques. Creswell (2008) points out the importance of member checking in validating the degree of precision in recording and documenting interview responses. After transcribing the interviews, the texts have been inspected multiple times to make sure that all relevant data are accurately transcribed. This process also includes checking statements for inclusion and precision. The internal validity of this research is expected to be high due to the fact that it is guided by participants' responses. The interviews have been conducted in a natural location or through telephone conferencing, thus, ample time was given to clarify declarations and double-check participants' answers. Another means of review, assessment and evaluation also arises from the research committee members (supervisory team) who have been reviewing and critiquing the progress of this study continuously (Patton 2002).

Another strategy employed to enhance the validity and reliability of the study results is using participatory modes of research. As discussed in the Gioia methodology adopted for the data analysis, during the early stages of data collection and analysis, the researcher acts as a reporter while the participant is considered to be a knowledgeable agent. In the first order realm, my aim was to give voice to the participants as much as possible. Codes were termed by the wordings of the participants.

A detailed interview protocol that clearly links the interview questions to the research questions (Appendix A) also aids in reliability and validity checks. It contains the exact wording and order of the main and probe questions asked of the participants. In addition, a case study database that is separate of all data generated

from the cases has been created using NVivo. It contains interview transcripts, demographic information about the participants, and a section showing all the related coding.

Maxwell (2013) explains that the researcher should give comprehensive description of the study's context that will facilitate readers' comparison of its fit with their own circumstances. The most common strategy to enhance external validity is through the application of rich, in-depth detailed description of the setting, participants, and the results of the study, that has been adopted in this study. The study includes a graph presenting the mixed methods road map (figure 5), a figure of the data structure detailing the advancement of the data analysis, 3 tables showing the different codes, concepts and themes that were identified and constructed, and a supporting data table that includes some participants' quotes and their relevance to the data analysis. The second strategy utilized in this study for external validity is the careful and purposeful selection of a modal sample where comparisons have been made across several participants to double-check and verify responses. The detailed accounts and rich descriptions of how the data were collected and analysed, and deep discussions about the results in the findings section will further aid the reader to understand how the researcher arrived logically at her conclusions. Finally, one of the aims of using a sequential mixed methods approach for this study is to facilitate corroboration of the findings.

3.3 Quantitative Design- Phase 2:

a. Sample Selection:

The aim of the quantitative design is to further enhance the explanations resulting from the qualitative design by testing the hypotheses presented earlier in Chapter 2. A survey was administered in the second phase of the study. The survey was partially created based on the results of the qualitative data analysis as discussed earlier. The survey targeted females who have been working in STEM industries for more than two years. Several universities were contacted for approval to administer the survey among their female alumni in UAE and Lebanon.

Table 9: List of Universities for Survey Approval

University Name	Location	Approval Status
1.Private University	Dubai- UAE	No reply received
2.Branch Campus University	Dubai- UAE	Access not given
3.Private University	Dubai- UAE	Access not given
4.Private University	Sharjah-UAE	Access not given
5.Private University	Dubai-UAE	<i>Approved</i>
6.Public University	Abu Dhabi - UAE	No reply received
7.Public University	Ras Al Khaimah-UAE	Access not given
8.Private University	Al Ain-UAE	Access not given
9.Private University	Beirut- Lebanon	No reply received
10. Private University	Beirut -Lebanon	Access not given
11.Private University	Beirut-Lebanon	<i>Approved</i>
12. Private University	Mishref-Lebanon	No reply received

An electronic email containing the link to the survey was emailed to female alumni at the British University in Dubai. The link to the survey was also shared on Lebanese American University official pages of Alumni Facebook and LinkedIn

with a brief statement explaining the purpose of the study and the target sample. The survey was also shared on several platforms that are of interest to women in computing, women entrepreneurs, and women in technology such as TechWomen Alumni Facebook page. It was also shared on one of the American University of Sharjah Alumni platforms on Facebook. I also shared the survey among 900 females on my connection list on LinkedIn. The first step was to check the profiles of each contact, make sure that each fits the criteria of the sample. A personalized email was then sent to each individually that briefly explains the nature of the research and the link to the survey. In some cases, and due to the low response rate and the difficulty in identifying females in these fields, especially with the criteria mentioned earlier, I occasionally asked some respondents if they happen to know other females who work in STEM and could also help by completing the survey but none were responsive. The data collection took place from mid April till mid June 2019. The sample size is 410. 375 respondents identified having a mentor, thus, were able to answer the last two sections of the survey that asked about the mentoring functions and the quality of the mentoring relation. Approximately 30% of the qualitative sample were Lebanese participants due to using snowball sampling technique as discussed earlier. It should be noted that such technique has its advantages in qualitative research by sustaining a research focus on accessing appropriate participants in relation to the research phenomenon. The quantitative sample that was based on non-convenience sampling, constituted of 375 respondents from 32 different nationalities.

b. Analysis Method- Structural Equation Modelling:

This study uses structural equation modelling (SEM) to analyze the data. The software Stata15 is utilized. SEM can be defined as combining both exploratory factory analysis and multiple regression (Ullman 2001). SEM is not solely a

confirmatory method, but can also aid in exploring data. This technique contains two parts the measurement model and the structural both of which help in possibly broadening the relationships between the latent variables (Schreiber *et al.* 2006). SEM has also been described as a set of statistical methods that enable analysis of relationships between at least one independent variable and one or several dependent variables. Scholars indicate several benefits of using SEM. Examining the relationships in SEM is error free since the error has been accounted for and taken out with only common variance remaining. The reliability of the measurement is also examined during analysis and measurement errors are removed. SEM is also used when the researcher is interested in measuring complicated and multidimensional models. It enables testing several relationships simultaneously. Another added value of SEM is that it facilitates testing construct-level hypotheses at the construct level. This is a crucial aspect in social science studies where usually hypotheses are proposed at the construct level but tested at the level of the measured variable (Ullman & Bentler 2013).

c. Research Instruments and Methods

Data generated from the quantitative part of the study was collected through an administered survey. The demographic part collects data on details such as the age and work experience of the participants. The second part contains measures of occupational commitment, with 18 items measuring the three dimensions of occupation. The third part measures coping self-efficacy, with 26 items while the last part is intended to measure mentoring through nine items. In addition to these parts, five more constructs were added to measure personal learning development, quality of the mentoring relation, professional identity, goal setting, and protean attitude based on the results of the qualitative research done in phase one. The survey is listed in Appendix (C).

Occupational Commitment Scale:

The occupational commitment survey developed by Meyer, Smith and Allen in 1993 is used in this study. It was created to measure the three occupational commitment dimensions normative, affective, and continuance. It contains 18 items, with six items to measure each dimension using a Likert scale with 1 being “strongly disagree” to 7 “strongly agree”. Meyer *et al.* (1993) conducted factor analysis to determine construct validity. The factor analysis confirmed that the three occupational commitment dimensional scale measured three different constructs. The data were collected from students in the nursing faculty and registered nurses showed that only the latter confirmed that the scale measured three distinctive constructs. The three-factor solution indicated the best fit. The statistical results showed chi-sq (df,132) =475.72, $p < .05$; (RNI)= 0.979; (PNFI)=0.845. The internal consistency among registered nurses for the three subsets of occupational commitment obtained a Cronbach’s alpha higher than 0.76 indicating an average to high internal consistency. Affective commitment scale Cronbach’s alpha was 0.82. Normative commitment scale was 0.8, and continuance commitment was 0.76. Gwyn (2011) replicated the study and reported an alpha value of 0.89 for a sample of 133 for affective commitment, and 0.94 for normative commitment. Irving *et al.* (1997) examined the occupational commitment scale using a composite occupational sample to test its generalizability. Confirmatory factor analysis revealed that the three-factor model is the best fit. No significant correlation between affective and continuance commitment existed but a positive correlation was found between affective and normative commitment, and also between continuance and normative. Thus, Irving *et al.* (1997) concluded that Meyer *et al.*’s (1993) three-component model of occupational commitment is valid for different occupational groups.

Coping Self-efficacy Scale:

To measure this construct, the study adopts the coping self-efficacy questionnaire (Chesney *et al.* 2006). This questionnaire was designed to measure the perceived capability and confidence to cope with difficult life circumstances. Respondents are requested to rate 26 items on a ten-point Likert scale (0=Cannot do at all, 10= Certain can do). The instrument aims to measure one's confidence in coping efficiently with a stressor rather than coping styles. The scale is adopted from the Lazarus stress and coping theory (Lazarus & Folkman 1984) and also draws from the ways of coping questionnaire (Folkman & Lazarus 1988). The scale was tested in two random clinical experiments among participants who received training in coping effectiveness in order to test the reliability and validity of the measure. Three coping domains were identified through exploratory and confirmatory factor analysis: stopping unpleasant thoughts or feelings with an alpha value of 0.91, problem focused coping with a Cronbach's alpha of 0.91, and getting support from friends and family with an alpha of 0.8. These three subscales can be used separately to measure self-efficacy as related to distinctive kinds of coping. Chesney *et al.* (2006) tested the internal consistency of each subscale and the figure ranged between 0.79 and 0.92. These alpha values are greater than those reported for scales measuring coping and self-efficacy separately (Chestney *et al.* 2006).

The Mentoring Scale:

The Mentoring Functions Questionnaire (MFQ-9) will be used in this study to measure the mentoring experiences of the participants. The questionnaire was developed further by Scandura and Castro (2004) to measure three aspects of support received by individuals who have or had a mentor, namely career-related,

psychological and role modelling. Derived from her definition of mentoring as having two functions Kram (1985) developed the MFQ-9 to measure career-related and psychological functions of mentoring. The first type is related to the mentor's behaviour as a coach, protector or sponsor. These kinds of relations will basically aid the protégé in enhancing her performance and be predisposed for future career advancements (Scandura & Castro 2004). The second function focuses on improving the protégé's sense of competence by offering social support and helping in defining the mentee's identity. The MFQ-9 contains nine items intended to measure the three subscales in a Likert format where 1= "Strongly disagree" and 5= "Strongly agree". The questionnaire has been revised from its original format where it initially constituted 15 items measuring the three subscales based on the finding of construct validity evaluation conducted by Scandura and Castro (2004). In doing so they employed three separate samples. Content validity was assessed from data gathered from sample A of 169 students. Sample B was made up of working MBA students (n= 256). The data gathered from this sample tested reliability and concurrent, convergent, and discriminant validities. Sample C comprised 795 CPAs and confirmatory factor analysis was administered. Findings support the three-factor format and show reliability figures of 0.78 and 0.91 across samples. Reliability measuring the subscales ranged between 0.67 and 0.85. Further reliability testing of the MFQ-9 has been conducted in numerous mentoring studies where results show a Cronbach's alpha range between 0.70 and 0.89 (Chun *et al.* 2012, Ensher & Murphy 2010, Kao *et al.* 2014).

The Protean Attitude Scale:

The protean attitude scale measures both values-driven and self-directedness and is adopted from Briscoe *et al.* (2006). It is 14 items measured on a five-point Likert scale with 1=to little or no extent and 5= to a great extent. An example of a values-

driven item is “What I think about what is right in my career is more important to me than what my company thinks”. An example of a self-directedness item is “Overall, I have a very independent, self-directed career”. Exploratory factor analysis was done on the scale using principal axis factory (CPA). The reliability coefficient was .81 for self-directedness career management sub-scale and .69 for the values-driven.

Personal Learning Development (PLD) Scale:

PLD was measured using the scale developed by Lankau and Scandura (2002) to measure 2 dimensions: personal skill development and relational job learning. The item are measured on an 11-point Likert scale with 1 indicating strongly disagree and 11 resembling strongly agree. An example of an item on the scale is “I have learned about others’ perceptions about me and my job”. The scale’s alpha reliability is .79. An acceptable fit was indicated when running confirmatory factor analysis (CFA) ($\chi^2=128.08$, $df=52$, $RMSEA=.08$, $CFI=.93$, $IFI=.93$).

Quality of the Mentoring Relation Scale:

The quality of the mentoring relation is measured using Allen and Eby’s (2003) scale. The scale includes five items and responses are measured on a 5-point Likert scale where 1 presents strongly disagree and 5 indicates strongly agree. The scale’s alpha reliability is .85. Examples of items on the scale include “Both my mentor and I benefited from the mentoring relationship” and “The mentoring relationship with my mentor was very effective”.

Goal Setting Scale:

The items measuring goal setting were combined from the career motivation measurement developed by Noe *et al.* (1990) and London (1993) to best represent the constructs discussed by London (1983) in his career motivation theory. The scale

is made up of 17 items stressing attitudes and feelings in relation to career and work. Noe *et al.*'s (1990) scale emphasizes behaviours. A reasonable high convergent validity has been identified between the two scales indicating that the two measure the same construct (London & Noe 1997). The items were added to career identity sub-scale by Day and Allen (2004). The revised scale was sent to Manuel London to review the items' suitability. These items are "I have volunteered for important assignments with the intent of helping to further my advancement possibilities" and "I have requested to be considered for promotions". Day and Allen (2004) support the content adequacy of the revised measures by a pilot study. Cronbach's alpha for the scale is .84.

CHAPTER FOUR

Qualitative Study Results

This section presents the details of the findings for each of the 15 2nd order themes identified in phase one of the research. Table 10 shows a brief representative supporting data of the 2nd order themes. The findings are reported in more details in this section and included are quotes from the informants in relation to each theme.

Table 10: Example quotations related to second order themes

Example quotations related to second order themes.	
2nd Order Themes	Examples from 1st Order Data
1.Coping Self-Efficacy	“And in 2014 when I was junior, it was my first year, I got the prize of best employee from the minister. So this gave me a really huge push to work and make more effort. And this year I got the prize from the minister for the most innovative employee.” “The experience, of course, and the way of communicating with people. I used to be shy and more afraid when I started working because it is a responsibility at the end of the day. Now I am more comfortable, I handle it very smoothly, I don’t panic. I used to panic before because it was something new to me. Now I know how to handle each case by itself.” “Even if I am stuck in architecture and I don't like it I am fighting to improve myself, to improve my work, so I can get a senior position later, I am not stuck.” “Well, I think I am kind of a calculation freak!” “Not too much, the mentor might be a support for you at a certain point in your career, but I don’t think that the mentor can be a support through your whole career life. For sure it is very important at the beginning of your career when you are new, but later on the mentor will not be that important you will be able to manage on your own.” “It was a challenge for me to be a female architect. Engineering is usually a male job so it was a bit challenging for me to be a female and in the engineering field. This was the main purpose actually.”
2.Normative Commitment	“No, because I made my decision, I am want to move but I couldn't find . I couldn't find less hours, you know, working. I couldn't find better atmosphere, this is what I found, you know, so this is my situation, I am trying to change, it's not easy, like ok I want to change so I will change, you know.”
3.Affective Commitment	“No, no no no at all (laughing). Never, never. You know I am really stuck at this point in my career, like should you go and do your own start up? should you leave the IT part and open

	your own business? I am like I cannot, I just cannot. Now that I have passed through all this I am like, oh my God am I going to spend all my time doing this technical stuff? I am really tired. You pass through this. But then I say this is my pleasure, this is my happy place.”
4.Continuaunce Commitment	“Mainly because I have studied for five years and it took me a lot of effort to graduate.” “At a certain point yes (laughs) but it is not always easy to make such a decision because as I said this is the experience that I have now. Your education and experience are your asset, so it is not good to switch. So even if I reached a point that I would leave, it would be a waste.”
5.Mentoring Functions	“Yes sure he has helped me and he plays a major role in the position I am now because he always sets me in charge of the projects and gives me his trust.” “Yes, he gave me a lot of confidence. He allowed me to go with him to meetings although I was young, 24 years old. Jean Nouvel, the architect who did the Louvre in Abu Dhabi, I attended some meetings with him. “ “I am, but no one is perfect, no one can be. In my opinion strength comes from taking advice when you need it so, no I would never be (capable on my own), I don’t believe I would ever be, I believe that I would never not need advice this is something that even CEOs who’s of the biggest industries in my opinion.” “He was keeping my back all the time.” “She was introducing me to their work in a very nice and good way so that I don’t feel like I am new there or alone.” “Yes by giving me more self-confidence: You are thinking in the right way, you should have more confidence, don’t be shy when you are talking about your rights, don’t be shy if you are talking about something you understand very well. So this way of motivation will make you feel more confident.”
6.Quality of the Mentoring Relation	“Because I was always fascinated with the knowledge that he has. And with the way he handles cases and how he deals with everyone. He is really good at what he is doing. So yes this is mainly why I have chosen X. He has very good knowledge in almost everything.” “You know your family and friends are like yes you can do it but they are my family they have to be telling me this, they think I am so smart (laughs). She actually made me believe it, ok yeah I am capable of doing these things.”
7.Peer Mentoring	“This success of committing to the industry is because of me and also my family, my spouse, even my managers. It is because of everyone.” “So of course, in order to grow in this career you would be able to handle the pressure and the stress and you will not be able to do that if your family is not supportive in this aspect. “
8.Protean Attitude	“But these challenges I turned them into strength points where I was insistent on continuing this career and mastering it. “ “So I loved it, honestly speaking I loved it. Every single challenge, task, project at work or at university I loved it. I felt like I am challenging myself to do it.”
9.Goal Setting	“Because I have some goals that I’m working on and I think that I should be capable to do them. Like I can take the decision by my own, because already I’m working on some stuff, I have some goals to reach. “ “I know my goal and I know where I am heading to.”
10. Professional Identity	“I have found myself in this field.” “Because this is what I want. This is me.”

11. Culture	“Maybe in our culture it is harder for a womn to pursue both things because there is more expected from you on the family side in terms of the household.” “Mainly when we submit the entrance exam at university to be a doctor or an engineer. These are the top high level selections.”
12. Learning	“I’m like for the experience, if I’m going to learn here whatever that I am going to learn here, it will serve me well in the future.” “What keeps me going is that I loved it because it is challenging because there are lots of things we need to study and be updated about it. I love it because it is not boring, there are always something new, it is not boring like something you studied it and you get stuck with it forever.” “In energy you need to do a lot of reading and research to update yourself all the time.”
13. Family Responsibilities	“I didn’t feel in most cases that there are such barriers in my career but mainly when I would be having a new baby I feel a conflict between my work and family. This is the main barrier especially when it is my new born baby.” “Other barriers I don’t know maybe after a while after I get married and have kids I don’t know.”
14. Perceived Barriers	“Barriers?... let us say ... it is the ever growing and all the updates we have in this industry. There are always something new and we need to be updated. This is challenging.” “Because as I said the university education is conceptual. You feel incompetent because you don’t know the laws and standards and rules and procedures and regulations that you haven’t been told at universities.” “I didn’t like to talk a lot to new people or to build relationships with everyone that was not easy for me. I was shy. It was easier for me to build a relation with customers than inside. “
15. Unperceived Contextual Barriers	“I frustrates to me. It is an issue I have with my current manager yes where he’s the evaluating my performance based on his idea of what I should be doing. For me it is about prioritizing my tasks based on what I know in the priority not only for me but also for adding value to the job itself.” “it is so difficult to improve yourself, you would face a lot of problems. People are not that helpful to encourage you, to improve yourself to, you know, those things.”

1- Coping Self-Efficacy:

This is the most prevalent theme in the data. It contains 11 concepts, two of which are emergent; leadership and female privileged. It also has concepts of achievements, confidence, dealing with demotivators, inter-personal skills, motivation, taking risks, self-serving bias, self-marketing, and challenging stereotypes. Participants were asked to talk about their achievements. They discussed with confidence the accomplishments they were able to make so far in

their careers. Their confidence was also apparent they described their feelings after overcoming a certain barrier in their careers. Participant 17 who has a Ph.D. in telecom engineering and works as a data scientist recalls an incident, she faced in her first job. It was a difficult situation where she and her supervisor had opposing views. However, she felt that she had two choices, either to escalate the issue to upper management and risk sabotaging the good relationship she had with her supervisor or accept the situation and consider it a lesson learned. She said she was very diplomatic about it and was able to control her anger and frustration. She described her feelings in the below quote after being able to resolve the issue she had with her research advisor:

“Strong, in control, knowing how to act with people, how to take what I want.”

In some situations, participants had to deal with demotivators whether within the organization they worked or outside from their social network. They were able to control the situation and not let it affect them and their career decisions:

P16: “Basically yes I’ve heard this, it used to affect me but now I am like I ignore. I lived a period of my life where I was surrounded by a lot of negative people. It which made me really down, I’m not that person anymore, I love to be around good motivated people. Some people were saying that, Oh maybe X is having difficulties in her job, she's going long distances, she’s a female blablabla I ignored these people.”

The self-confidence of P16 aided her in being selective by not allowing opposing views to affect what she wanted to do in her career and the decisions she took in that sense.

The mentee participants also showed a high feeling of motivation towards their occupation just like the case of participant 20:

“It always give me something to do like I wake up in the morning, then I’m excited to go to work like you know, I don’t think it’s not good work and I am thinking about taking leave, so if you’re not taking your vacations you’re doing okay (laugh).”

P20 was facing difficulties in communicating with her new manager. She was also notified that she won’t be receiving any promotion or salary pay in the short run. However, she still felt she loves her work and was motivated to wake up every morning and look forward to being part of the team.

In one of the interview questions, participants were asked to talk about the important factors that have helped them commit to their occupation and, in many cases, the participants would discuss their inter-personal skills:

P14: “The market that the telecom engineering build in my head, the critical thinking, the analytical skills that I have also building the masters in business with the engineering it was very beneficial because it let me see the things in another way so I think about it in a pure technical, sometimes I think about it in pure business sometimes. So it is the combination of the two fields that has given me a great advantage over my colleagues.”

P14 was one among many other mentee participants who invested in enhancing her personal skills and knowledge in the industry. She has a Bachelor’s in Telecommunication Engineering and then decided to have an MBA to diversify her experience. She proudly discusses how the

combination of both fields has given her an added value in the market and further boosted her self-efficacy.

Some participants discussed the importance of taking risks and having a leadership characteristic that have helped them survive in their careers so far.

P27: “O.K. I’m a part of the achievements, they are not all mine, it’s a teamwork. I could be a part of achieving them but I cannot give all the credit to myself because it’s a teamwork... It is a teamwork of all employees that work, for example, I told you that I’m a team leader, I will not achieve anything unless my team will work with me.”

The fact that P27 describes herself as a leader indicates the strong self-efficacy she has. Although at the beginning of her career as an architect she did not have a good relation with her old manager. She did not have the chance to work on a project and showcase her abilities.

Participant 21 who studied Biological Science decided to shift careers from a lab technician to quality assurance and R&D. She faced many criticisms when she first took this career decision:

“Yes and also Lama, I would have not gotten this if I didn't take risks and if I didn't decide to move on not just to stay in that corner. Many people blamed me at that time when I was in the lab. Oh X what are you doing, you transferred to the administrative work you will sit in an office, you will not feel any interest by testing analysis. Now those people Lama who said this to me, they are still in the same Lab in the same position.”

Two participants discussed the importance of self-marketing that females miss out

on doing and ultimately miss the exposure they need for the career advancements. P7 is a solutions architect and she explains that one of the important things she learned throughout her experience at an international IT company is that exposure is something very important for career advancement. She explained that it is not enough to do hard work but also to market it and make one's efforts visible for upper management:

P7: "That is the thing with us women, we do hundred percent and then we don't talk about it while others they do a little bit and talk about it and become known for it. "

Self-serving bias was also discussed by few participants especially when they were asked whether mentoring is important for females to succeed in committing to their occupations. The participants explained that it might be crucial at the early stages of the career where the female is still a fresh graduate but is not of importance at later stages. The reason behind this according to some participants is because after graduation, they tend to lack the technical experience. The university only provides them with the theoretical knowledge that is not enough, and in some cases even different from the knowledge needed in the workplace. This is why some participants found it very helpful to have a mentor at the early stages of their careers to coach and guide them through the companies' culture and work environment, as well as to connect them with colleagues or managers who could help advance their careers in the future.

P4: "Yes of course, I think it would help a lot especially in the first years of experience so you won't feel scared or you don't know or you don't belong to what you are doing. I think it is important to have it at an early stage especially for the women who are working in a man's field, it would be a bit tough on females."

Few participants explained they that they decided to pursue a career in STEM to challenge the stereotype. Despite the intimidation that they were aware of about STEM being a male dominated industry, these participants were confident that they can make it. They wanted to prove that they, too, can work in such fields.

“Why did you pursue a career in STEM?

P4: It was a challenge for me to be a female architect. Engineering is usually a male job so it was a bit challenging for me to be a female and in the engineering field. This was the main purpose actually.”

In some situations, the participants discussed that being a female in STEM industry is a privilege, and it did help them in their career. P28 who is an architect gives an example of such a situation where she was able to win over a project because she was a female. The initial architect working on the project, a male, was struggling to understand the client’s design needs. It was a residential villa and, according to the participant, the wife had the final say in the design. The initial architect didn’t seem to understand what the wife really expected from the design. At some point, P28 was given the lead on the project and she was able to connect with the wife and understand her vision, because, as she explained it, she was a female like her. To some extent, in effect, they both think the same way.

“In architecture for a female it is not as difficult as I expected it to be. It is becoming more progressive. In some cases, I got a project back from another architect because of communication problems with the client. Like a lot feedback from the wife on a villa for example. She decides everything if you are a female architect you will be able to understand her needs more, we are more in touch with everyday life.” “

2-Normative Commitment:

The analysis of the results indicated the existence of the three types of occupational commitment among the participants with affective being the most prevalent and Normative the least one discussed. Normative commitment pertains to being obliged to continue in a certain line of work. Normative occupational commitment (NOC) is based on obligation (Meyer & Allen 1984). One of the participants only discussed in several occasions the reasons that are making her want to stay in her occupation as an architect. P10, a Palestinian architect, explained her frustration from the work environment. She thinks she is undervalued and was expecting a promotion to senior architect after 9 years of work experience. She expressed her dissatisfaction with her job and that she was facing communication problems with some of her co-workers. The only reason that was making her stay at the company and in the domain was that she still didn't find a better opportunity:

“No, because I made my decision, I want to move but I couldn't find. I couldn't find less hours, you know, working. I couldn't find better atmosphere, this is what I found, you know, so this is my situation, I am trying to change, it's not easy, like ok I want to change so I will change, you know.... No, I am staying just because I couldn't find what I want, just that. I am still searching, like I told you I couldn't found. When I find I will directly move, even after 15 years. But still I can't find, this is my problem. I am staying and years are running.”

P10 explained her frustration from the organizational environment she was working in. Her co-workers were not friendly and the management was not appreciative of her efforts. She felt disappointed and unappreciated there after nine years of hard work. The only reason she was staying in her job

and occupation was because she was obliged to. She explained to me that she was actively looking for a better opportunity, a better work environment, better salary and a senior post but she was not finding anything. She decided to stay in her current job until she found something better. Otherwise she will be jobless and this was not an option for her.

3-Affective Commitment:

Participants expressed their desire to stay in their occupations based on several aspects relating to affective commitment. Some explained that importance of the domain plays in shaping the future. The importance that the participants attributed to the STEM industries they worked for made them feel important and this increased their desire to commit to their occupations:

P17: “I would say no, I’m not thinking about leaving the domain because it’s a boosting domain, it’s the coming, it’s the future.”

P6: “No not at all (don’t consider leaving the industry) because I believe in the future the technology will be everything in life. “

The desire to commit also was due to the continuous learning and exposure to new things that the participants experience in their work. They feel that it is exciting, interesting and not boring.

P1: “Right now I am interested in the job, I like what I am doing like learning new things and I hope to keep doing that I don’t think I would want to be in a different kind of job right now.”

P2 works as an IT administrator. During her university years while studying for a bachelor’s of Computer and Communication Engineer she started working in retail. After graduation she kept her job in retail because the

salary was very good and she was promoted. However, after a couple of years, she took the courageous decision to go back to the engineering field because it was her passion. One of the things that made her want to stay in this domain was the chance to continuously learn new things. She enjoys the fast pace that these industries operate at. She is always looking for new challenges. These aspects, although discouraging or intimidating to some, for her are the reason why she is still committed to her occupation.

P2: “There are always a lot of fields that you can experience and the technology in terms of engineering is changing rapidly so that’s why I don’t think at all (of leaving the industry). The rhythm of innovation and technology that is developing within the industry, it’s so rapid that if, so you never get bored of the new stuff being emergent in the market. I guess not in the near future, no not at all.”

The fact that some participants also found a certain aspect in their work that they felt they loved increased their commitment to their occupation. P4 is an architect who works at a development firm. She said that while she was good in the technical aspects of engineering, she enjoyed more the development side where she would meet clients and get to discuss the project from a management perspective rather than solely technical issues:

P4: “I used to think somehow to leave the industry for something different away from the engineering completely. But I think if I focus on the management part in the engineering I won’t leave it. If I am going to always find the management part in the engineering to work with, I would definitely stay. I love this part in the engineering.”

P11 is a Yemeni energy services manager who started her journey in STEM 11 years ago as an architect. She tried different engineering domains such as mechanical, electrical and finally energy where she felt it was the domain she was looking for.

“After all these years, do you consider leaving your occupation? Why? What are the factors behind your decision?”

P11: Today no, maybe last year I would have told you yes. It is not about the industry it is about finding the right fit place for you.”

The passion and the love for the specific industry they are working in was a key factor that helped some participants to commit more. For P13 who is a systems analyst and project manager even when she felt she was stuck and not progressing in her career the way she wanted, she tried to consider other options like consultancy, for example, but then she decided not to because she loves what she does in the technical aspects of IT:

P13: “No, no no no at all (laughing). Never, never. You know I am really stuck at this point in my career, like X should you go and do your own start up? should you leave the IT part and open your own business? I am like I cannot, I just cannot. Now that I have passed through all this I am like oh my God am I going to spend all my time doing this technical stuff? I am really tired. You pass through this. But then I say this is my pleasure, this is my happy place.”

4- Continuance Commitment:

Under occupational investment participants discussed reasons pertaining to continuance commitment that prevent them from leaving their domain of work. As discussed earlier in this research, continuance commitment pertains to the perceived

cost of exiting the occupation. Continuance commitment is based on a costs-and-benefits assessment (Meyer & Allen 1997). Some of the participants considered the effort and cost they had to put in their education in order to be able to join STEM industries and this was a main reason for them not to quit:

P1, a network support engineering, explains that the investment she put in her education in terms of effort and time are the main reason she would not think of quitting the industry. In other parts of the interview she also explains the continuous effort she put to stay up-to-date in the industry by attending workshops and studying for certain certificates.

P1: “Mainly because I have studied for five years and it took me a lot of effort to graduate.”

P26: “I am in a Phd program I don’t think I would want to quit (laugh).”

Just like the case of P18, some participants considered the years they spent in their domains of work as occupational investment that they don’t want to waste or throw away by simply quitting or moving into a totally different industry:

P18: “I don’t know if it is a joke or something, but at times I used to think I wish I did something simpler. I will basically be in a joking manner. Because I went to school to do this job, I don’t really want to waste all the effort that I have made and then move to another kind of career that is not really in my expertise.”

Some participants focused on the investment they made after working for some years in the industry in terms of building networks that will aid them in future entrepreneurial plans. P16 is a Palestinian biomedical engineer who has two years of experience. She explains in the interview that her first year was very difficult. She

had to learn how to deal with the clients' stereotypes as a female in this domain. She was able to persist in this domain. She successfully made a name for herself and has developed a considerable network of connections that she would end up losing if she quits the industry now:

P16: "I'm happy yes, why? Because this thing, after one year now, it gives me more connections with more people, it makes me really stronger in the market. I know how to finish a job. I know how to build connections really easy. A step forward and I will be reaching my goal, my private business as I told you.... so this makes me really happy and really recognize that no as long as you're working more in this field at least 2-3 years, you'll gain more people, more references, better future and you'll raise up quickly."

A few participants mentioned salary as an incentive as well for them to stay in the industry:

P5: "For sure money is one of the reasons when you have an extra income for the family it's better."

P5, a Pakistani chemical engineer, explained that she helped her parents financially. She requested a salary increase at her job but didn't get the approval. She didn't leave until she found another job also in STEM because salary is a major factor influencing her commitment. She explained that she moved from F&B as a procurement engineer and joined an oil and gas company as a chemical engineer because of salary considerations as well:

"So for engineering actually like in F&B they tend to pay less. But now I'm moving to oil and gas they are paying more, anywhere from 30-50% more. So I knew I'm not here to stay, because they

had told me that any increase will happen like after a period of time, maybe after a year.

This is why you're basically you're moving to (oil and gas)?

Yes.... I would continue, honestly I would continue but first of all the pay increase, it's not really happening.”

For working moms, the cost of leaving seems much higher where they believe that they had to put extra effort at some point in their careers to be able to balance both family and work responsibilities, and after succeeding in doing so, they think it is a waste to quit. P6 is a solutions architect who is married and has two children. She had to struggle to keep her job while taking care of her family by cutting her working hours and becoming a part-timer.

P6: “Right now no. Because I have worked hard most of my life to get my job. The hardest part of my life which is having babies I overcame it why do I have to leave now?! “

5- Mentoring Functions:

As mentioned previously, the mentoring functions discussed in this research draw from Kram's (1986) career-related and psychological functions. The career related concepts emerging from the data encompass challenging work, coaching, exposure, need for advice, protection, and sponsoring. Some participants explained that their mentors assigned for them challenging job duties that helped them further develop their skills and careers. P3 who works as an IT manager explains that when she joined the pharmaceutical firm she is currently working at, there was no IT department. She had to build the system up from scratch. Her manager, whom she identifies as her mentor, trusted her in doing so. He gave her the autonomy and even supported her financially to buy the necessary software despite the fact that she was

a fresh graduate.:

P3: “Yes sure because when he gives you trust and handles you a whole department with all its responsibilities. We are working with multinationals so we can’t make any mistakes concerning security and communication because you have like documents you sign on them when you have contracts with suppliers. He helps by making me feel in control of this department because of his trust.”

Participant 15 shares with me her experience with her mentor when she had to attend the first meeting with the senior management. She is an electrical engineer who shifted her work from the military to the marine sector because she was looking for more technical exposure. She was nervous in her new job because she was not familiar with the industry at all. She explains that the exposure she received from her mentor aided her in expanding her career responsibilities within the company. It helped her to quickly get involved and be familiar with the nature of the work:

P15: “It was like there was a new job and I remember in the first meeting we had with the management and I didn’t know what to do. We went together inside and she was like go ahead it is your floor to talk and I was like what? Talk about what? She said just explain your results. So I was like you know saying half of the things and she said remember we also did this and this and I would be like yes right we did this as well.”

Coaching was one of the most concepts that the participants talked about in terms of the support that they received from their mentors. Participant 20 explains how her mentor coached her in her first job when she was just a fresh graduate:

“And do you think that your mentor has helped you to develop these communication skills and management skills?

For sure, 100% like if I ever do something wrong like if I sent, like a weird email he would be this is not how you talk to management, this is how to talk maybe your colleagues or someone who's supporting to you. They were very small thing but he's always like show me another, something I didn't know basically, like he's always trying to teach me and show me outside the box not even work related like just how to interact people, outside of general engineering also behavioural and functional.”

The psychological related functions emerging from the data included acceptance and confirmation, counseling, friendship, and role model. Although role modeling was not discussed often among the participants, a few mentioned that they looked up to their mentors and identified them as their role models. This gave them motivation to further commit. P27 is an Emirati senior engineer who explained that her mentor was also her role model. She motivated her to work hard and commit to her occupation. Her mentor is her manager as well and fills the post of director of design. She was in-charge of several committees within the company, in addition to her senior post. P27 admired her dedication to her work. She explained that she was also very active in terms of participating in conferences. She also had her own family and children to look after but still she seemed on top of everything.

P27: “In addition, she's proactive, she's the one I really admire, it's like she is my role model, you know, I can say that.”

Acceptance and confirmation functions are defined as the mentor supplying continuous help, appreciation, and respect to the mentee which results in increasing her self-confidence (Kram 1986).

P19 is an Egyptian senior sustainability engineer with 10 years of experience who finished her master's in sustainable design in Egypt. She was working at a leading architecture firm and was a keynote speaker in the area of sustainability. She decided to move to Dubai because she was looking for new challenges and exposure to bigger projects. Her mentor for 18 years was her university professor and her manager at some point in her career. During the interview she explained how he helped her to direct her career to sustainability which was something totally new in Egypt back then. He also motivated her emotionally when she felt she was stuck while doing her master's thesis. Finally, he supported her decision to leave the country and do what was best for her career although it was difficult for him to see her leave her country.

“Even when I took the decision to leave, he (the mentor) supported me. He supported me with my career here (in UAE), he told me we will keep in contact and until now we are on very good terms. He was very sad that I am leaving but he supported me. He always advised me for what is best for me.... He made me proud of myself. He gave me a lot of self-confidence and a lot of positive feelings about myself. He was the main player in my career. “

The counselling function was also among the concepts discussed. Participant 10 is a Palestinian architect with 10 years of experience. She met her mentor at her first job. They were both fresh graduates. They became friends and over the years they also became each other's mentors. She discusses how her friend and mentor has been giving her advice on how to deal with the dissatisfaction she was feeling towards her work due to late promotion, unfriendly co-workers, and the under-appreciation of

senior management towards her work. She has been in this job for several years now and was hoping to be promoted to senior architect. However, the firm was not taking on big projects as before and work is becoming a bit slow. This has caused some unfriendly competition between P10 and other co-workers.

“(She – the mentor) always knows everything, she's the one who supports me. When they try to annoy me or do something bad to me, I am always complaining to her. She supports me, she gives me advice on how I can survive, how I can solve this issue, and what I should do.”

Both participants 10 and 11 explained that they are each other's mentors. They said that they met on the job when they first started working and they clicked, they became friends and then 10 years later they started giving each other work-related advice and trusting each other:

P11: “We became friends and without realizing we were having each other as mentors because we don't have anyone else.”

6- Quality of the Mentoring Relation:

Under the quality of the mentoring relation, the participants discussed the reasons that made them choose their mentor. Some discussed the similarity aspects that they both shared, such as having the same educational background or technical expertise. This made the mentors' advice more credible in the eyes of the mentees. P6 works as a solutions architect. She has a bachelor's in Telecom Engineering. She explained that she identified her husband as her mentor because he shares the same technical background. She seeks his advice sometimes when it comes to technical work-related issues. She also explained that he supported her when she decided to start working again after being at home with the kids for a few years. She trusted his

advice. He was up-to-date and guided her how and where to apply for job opportunities.

P6: “He’s in a close domain, he’s in telecommunication and he’s also in engineering so he’s a developer, he is aware of my job so he advices me.”

P26 also explains the similarities that made her identify her university professor as her mentor. They come from the same technical background, Electrical and Computer Engineering. They were both of almost similar ages. Her mentor also had a PhD, which was something the participant was also looking forward to pursuing.

P26: “She has the same undergrad as me, she is not much older than me, only 2 years older. She directly pursued her Phd and directly came back to Lebanon to teach and I felt like ok maybe I can do something with this.”

Mentees identified with the mentors also based on other aspects that they thought were significant. P8 is a Tunisian Senior Architect who moved to Dubai a few years ago looking for better work exposure. Her mentor was the line manager, her direct manager. She explained that she identified him as her manager because they had the same way of doing business. She also drew on the similarities that they shared. Like her, he moved to Dubai from Pakistan many years ago. He had to face many challenges such as the language and the rules and regulations of a new country when it comes to design:

P8: “We got along great, you know, I could really understand him because he also has this language barrier issue with all of the guys.”

P7 who is a solutions architect was one of the few participants who identified gender as the reason for choosing her mentor. According to her this was the main reason she started approaching her mentor initially for advice. They then became friends.

P7: “She was the only lady. At the beginning we didn’t know each other that much so I had to bug her a lot (joking) I am sure she was bothered and little by little she liked me and we became better acquainted then we became friends. At the beginning I am sure she was very busy and I had a lot to ask but it was easier to ask another female.”

Unlike some other participants, P15 didn’t build on technical similarities with her mentor. On the contrary, they both come from different domains. Her mentor is the health and safety manager at the firm. But according to the participant, she shared her passion about the work. They were both goal-oriented. She also built on the similarity that they were both working mothers with kids. So her mentor understood the challenges she faced in terms of balancing both responsibilities in her life.

P15: “She is not an engineer she has a PhD in environment protection. But she is just like me she has a passion for her field. I have seen how this passion motivated her. We have things in common. Like she didn’t accept any job because it didn’t match with her goals just like me. She also had family responsibilities she had to consider at some point. We have lots of common points. “

Some participants identified their mentors as role models that inspired and motivated them to excel and commit in their occupations:

P27: “I saw her as a role model, she’s very knowledgeable, she has the power, she is a good decision maker and she has all the technical knowledge as well as the leadership knowledge and she is so powerful. I saw her as a superwoman, yes she is a superwoman. she has her work, her home. And she’s studying as well. She is controlling everything you know.”

In some cases, the mentee would appreciate a trait that she doesn’t have while she identifies it in her mentor. This is a reason also while the mentoring relation between the two would develop, where the mentee would be benefiting from the teachings of the mentor. P6 who identified her husband as her mentor explains that one of the reasons she has identified him is because he holds traits that she lacks. He always teaches and coaches her on how not to be impulsive and act upon her feelings and then regret it. She says he is a calm and logical person who has guided her on avoiding certain situations at work, take the time to consult with others, and think before rushing into a decision or action.

P17: “My mentor he’s the contrary, he is someone who thinks before doing anything, and he taught me that.”

P6: “This helped me especially that he is a calm person and I am an emotional person and sometimes I make decisions based on emotional feelings. He used to fine tune my decisions.”

The quality of the mentoring relation between the mentor and mentee is further strengthened when the mentor is proud of the achievements of his mentee and does an effort to express this. He would showcase her achievements and success, this gives the mentee a sense of pride and appreciation for their relation. This is what P17’s husband whom she identified as her mentor did. This elevated the quality of

the mentoring relation even further. The fact that he is proud of her and her achievements increased the respect between them as mentor and mentee.

P17: “He did, especially the way he introduces my work to others, for example people who don’t know me, from his side of the family, or people that we meet. He’s proud of me, he puts it directly at the table my achievements and the things I’ve done, and I do the same for him also so, he has some really achievements also so we do that to each other and that I am very grateful for it.”

Participants discussed the benefits that they sense from the mentoring relation which motivates them to keep on investing in such a relation. In addition to the similarities that P17 highlighted in her relation with her mentor, she also discussed the differences that she considered as added value in the relation. She felt that because he had a different approach to certain situations was a plus. He is rather calm and rational while she described herself to be full of rage in certain situations where she can’t control her emotions. She was learning something new and different from him that she felt she lacked in her personality and communication with people.

P17: “He’s my mentor a long ago. I’m someone who’s full of rage and he’s someone who really knows how to, if you want to, I don’t know how to say it, he knows how to control or hold my this rage I have you know, and how to direct it and no one has ever done this, not even my parents.”

P21 is an Emirati R&D and Quality Manager. She comes from a biology background. She used to be a lab technician and decided to take the challenge and move to a different industry. She identified her co-worker at the time as her mentor. Although he was not senior but he was in the

industry for around 20 years and she appreciated the fact that he was willing to teach her. He guided her in the field of quality management. She stressed the fact that he allocated a considerable amount of time to discuss with her certain technical issues that she was not aware of. He also encouraged her at time when she doubted herself and felt that quality management might not be the right place for her.

P21: “He really encouraged me to read a lot not only in one field. He is an engineer he knows about food safety he read about it. He has many certificates so when I discussed with him I found really this guy is aware of what I'm talking about. He taught me how to read a lot, to take risk, and also he encouraged me a lot. Also to be positive and also to be strong when I take a decision.”

The time spent together, the increasing communication, and the knowledge sharing between the mentor and mentee further strengthens the quality of the mentoring relation as well especially in difficult situations when the mentee felt that she needed support. This was the case with P17.

P17: “During my PhD, even before him being my husband, we were friends I was already engaged to someone else, even at that time, he was my mentor because I was in a difficult situation back then.”

The quality of the mentoring relation could be further developed with trust and friendship. This was the case with P15. She built on certain similarities she was able to identify with her mentor as discussed previously. She was also attracted to the fact that her mentor had knowledge and experiences that she lacked and would benefit from her learning.

P15: “Despite this difference between us we directly get along together and there is a chemistry between us. As I told you my training was assigned to her, so we got to know to each other we worked close to each other. This helped me also consider her as my mentor.”

Participants discussed the attitude of the mentor, this was an important factor that would motivate them to initially approach him or her. The relation would further be strengthened when the mentor shows willingness to help and, in some cases, also bear the responsibility of aiding in the success of his or her mentee.

P20: “...so it was that we did so well initially that he kept me on permanently. It’s not only me like he is very approachable to everyone in the department. Like if you have an issue, you can go and walk to his office and talk to him. He’s a very open kind of person, so even if I wasn’t directly reporting to him, I was indirectly reporting to him. I was reporting to his second in command for like a year and a half. He would be like yeah what can I help you with? Like this was his attitude, you know. So even if you call him boss he’s like no I’m not your boss, I’m just X don’t call me sir or anything like that, you know. Like he never lets these barriers form between like, he never acted like manager, he was always a leader.”

P14 is a Jordanian presales and solutions enterprise consultant who had the chance to join a formal mentorship programme for women in STEM. The participants were assigned two different mentors. P14, however, she had a very good relationship with one of them and the mentoring relation between them continued even years after the programme ended. She still contacts

her mentor until the present day for support. According to her, her mentor was very eager to help and was very cooperative and helpful. She has been mentoring her now for the past 4 years.

P14: “Well, actually she was more into the product development which is basically my field and I thought she was more committed to the mentorship program than the other two (mentors). That is something between us though (laughs). She was very committed and passionate to make it very successful. “

The quality of the mentoring relation is defined by aspects that the mentee would consider significant for the success of the relation like for example physical meetings and communication that would help break the boundaries between the two parties and make the mentee more comfortable in sharing her thoughts with the mentor. P20 explained that at her previous firm they introduced a mentorship programme for females in STEM where each employee gets to choose a mentor from a pool of volunteers. The relation was virtual in the sense that the mentee was in Dubai while her mentor would be in another branch of the company somewhere in Europe or the USA. She said that the programme was not very successful among the employees because it lacked direct communication between the mentor and the mentee. According to her, she felt she couldn't communicate or connect with her mentor the way she would expect or want to. She didn't feel she would benefit from such a virtual relationship.

P20: “I don't feel that it was working because if my network is sitting in Russia and I can't just message her whenever I want and expect her to respond. Ultimately, I ended up not signing for a virtual mentor I was like I don't see the point. “

The quality of the mentoring relation is also based on the fact that the mentee views the mentor as someone knowledgeable, efficient and trustworthy in terms of career and expertise advice. The mentee, in such a situation, would further access the benefits she will be receiving from such a relation.

P1: “Because I was always fascinated with the knowledge that he has. And with the way he handles cases and how he deals with everyone. He is really good at what he is doing.... because he is more aware and has more experience so he knows what the required qualifications are, required learning materials that I should have or take.”

P1 who works as a network support engineer explained during the interview that all the team she works with are very friendly. They have a family-like atmosphere at the office where all are ready to help one another. However, the reason she identified her manager as her mentor was because she viewed him as very knowledgeable. She considered his assistance and guidance very valuable to her career and knowledge about the market.

P10: “Like (my mentor) if she says something I will hear her from my heart you know. I know that if she talked to me about something she's really talking with me like I am talking with myself.”

Also, one of the participants discusses a reciprocal attitude within the mentoring relation where she believes her mentor has invested in her and taught her a lot so she doesn't want to disappoint him in any way.

P19: “He made me feel he can depend on me all the time. I didn't want to disappoint him I know he trusts me a lot. He gave me his trust from the very early beginning. He trusted me and he was sure I would be able to achieve

something from day one.”

7-Peer Mentoring:

When participants were asked about how they felt if people were assessing the success of their commitment, the majority of the answers revolved around the support and encouragement they received from their families and social network of friends.

P17: “Everyone looks up to what I’m doing which is something that really makes me feel happy. My family they’re really proud of me and everyone around me gives me a positive feelings when I talk about my work.”

Such encouragement and support did have a positive impact on the career development of the participants where some of them had a stronger commitment to their occupation while others further developed their skills and expertise in the domain:

P1: “It is mainly because of the encouragement I received all the time. So for example when I share with my friends things at work like oh my God I have this certificate and I don’t know how to study they tell me no come on you should do it, focus on it, it’s for your future, for your career path.”

P18: “My dad actually passed away a few years ago, my mom and my brother were the most supportive people. Everyone in my family was very supportive. For my Master’s thesis defence everyone was there even my cousins. No one will ever stand in my way.”

In some cases, the support that the participants received helped them to successfully adapt to new environments:

P8: “I am coming from Tunisia and working here they can see that I am achieving big things. Because the relocation is not easy because we have our system there, it is francophone and here it is English and also the regulations. Everything is new here so it’s like a big achievement. Waaw you can do that!”

P8, is an architect who had her own firm She relocated from Tunisia, to Dubai for better career exposure. At first, she found it very challenging to adapt to the new country regulations in the architectural field. Her friends and family were totally aware of this. Instead of discouraging her, they were supportive and, as she explained, understood the amount of hard work she had to do in the new country.

The participants seemed to discuss the support of their family and friends specifically when they were asked if they had to cope with a difficult situation. Their answers varied, but the majority did discuss that having supportive family or friends was one of the main reasons they were able to deal with the situation:

P13 for example had to cope with a difficult situation where she felt she was stuck at some point and didn’t know how to handle it. She was a full time senior software, decided to pursue her masters at the time and in order to pay for the masters, she had to give tutoring jobs at night and also worked at the university as a research assistant. She didn’t expect the amount of work to be so much that at some point she felt she couldn’t take it anymore. However, she survived because according to her she had the support of her family:

“I survived because I had support from my family. They were really supportive. They were not able to support me financially but they motivated me. They supported me with their words. I remember my dad before he passed away, every single day when I come home he would say those beautiful words like the bird is coming, the smiley face is coming, the strong woman is coming, the superwoman came. These words would really help you a lot. These were the main strength. And every cycle you do is another motivation for the next 24 hours.”

8- Protean Attitude:

Under protean attitude, we have two concepts: personal values and self-directedness. Protean attitude has been defined as an attitude toward a career that shows freedom, self-directedness, and decision making on the bases of personal values (Briscoe & Hall 2006). On several occasions during the interviews, the participants discussed their admiration for their occupations and the domain they work in. Specifically, when they were asked why they chose to pursue an occupation in STEM domains:

P25: “Actually, I’ve chosen this domain because since childhood I was interested in radio parts, the T.V. parts, how the signal works, how we can repeat the radio signal, how does the T.V. work. So it’s part of my interests, I was very good in science at school then I chose to go for Engineering. Then I started at the university like 2 common years before starting the specialty (courses) so I love the computer part, programming part, so I chose Telecommunication Engineering.”

Several participants also mentioned that the values driven aspect is a major factor that has helped them stay and commit to their occupation:

P6: “First when you have passion in a thing you will be able to be productive and creative. Because I love this domain I want to stay.”

P6 who is a mother of two boys had to face a lot of challenges to return to the workplace after taking some time off at home with her two children. She explains how passionate she is about being in the Telecom Engineering sector. She said that as a kid she used to enjoy working with an old radio where she would disassemble the parts and work her way back to building it.

The participants also stressed the concept of values-driven when they were asked to give advice to new females who are about to enter the profession at the end of the interview:

P19: “To make sure that they choose whatever they love. If you are not going to work with passion then don’t work at all because the job is already hard and challenging. It is hard enough so it is not nice to work on something that you don’t love. Make sure that this is what you like, what you want, and won’t get bored of it.”

The protean attitude theme contains 11 concepts that are related to self-directedness, such as adaptive. Most of the participants showed strong adaptability skills which is a much needed one in such fast growing and changing industries:

P28: “I think mostly it is being able to improve myself in terms of knowledge of latest trends and the trends relating to engineering and being able to adapt to any situation like for example in my current work I don’t only work on the conceptual aspect, I also

worked in project management, the business department of architecture so it is just the ability to adapt to any environment. That was very helpful, it helped me learn a lot.”

Ambition is also one of the driving forces for some of the participants as mentioned by P13:

“Where are you seeing yourself after a few years if you join this company? This is the famous questions that all employers ask at interviews and this is frustrating me recently to be honest because I am willing to tell it clearly to the interviewee that I can see myself wherever the company sees me. Because sometimes you are more ambitions that the company’s limits or environment. So if the company can see me in a higher level in the coming years, I can see me in a higher level. But if the company is not offering a career development path for me, then I might not be there after 5 years.”

Participants also showed flexibility in terms of dealing with challenges and unexpected events.

P13: “This was a switch in my career. I took the decision to move from a start-up company to a big international prestigious company better working environment, more employees. I considered that back then an advancement in my career which is still. Now I am having both the technical and the business skills. This is really interesting. After a few years in IT you really need the business skills. So now being in the business industry this is helping me a lot. Now I am not only doing coding and applying the technical

tasks, now I am managing projects and workflows of the company.”

In reply to one of the questions whether the participants thought they were free in terms of choosing their own career paths and making their own decisions compared to other females in the industry, the majority expressed a wide range of freedom in this respect. Some explained that after gaining the experience and the needed knowledge in the industry they feel they have a clearer idea of the work environment and possess more freedom others. Working moms explained that they had to make certain compromises at the beginning of their careers because their kids were still young and needed care and attention, but after their kids grew up they had the freedom they want to choose:

P15: “Well, before it used to matter. But now no, it has nothing to do with them its all up to me. Even my husband (laughs). The situation is different now from when I had to turn down multiple opportunities because of the kids. Nothing stays the same continuously it is a dynamic world. Everything has changed and I myself have changed as well. I am not the same person in 2008 in terms of my mentality and the way I look at things, the way I take my decisions. It doesn’t matter what others opinions in my decisions now.”

Job satisfaction is another aspect that the participants discussed that has helped them develop a sense of direction in terms of their career progress:

“To what extent do you attribute the success of committing to your occupation to your own self? Why? What makes you think the way you do?

P1 works as a network engineer and she explained during the interview on several occasions that she felt lucky that the work atmosphere at the company where she works was very friendly. She was aware of the fact that this is not the case in all companies in STEM industries. Some of her friends had to work in competitive work environments. She explained that she was very satisfied with her job. However, many of her colleagues in other firms were staying because they need the salary. They don't have any other choice. If a better opportunity presents itself to them they would most probably move.

P1: On a scale of 10? I don't know... I don't know how to answer this because if this was in another company I don't know if I would have loved it. Because I talk a lot with my colleagues who were at (university) with me. They are just staying at work to get paid they are not happy. Because in other companies there is this competition between them which we don't have (here). We don't have this mentality. None of my colleagues has this mentality. At other companies you see them if they know something they don't share it they keep it for themselves and don't share it with anyone and get credit for themselves only. This is not the case at (my company), if I find something I go and share it and it is the same with my colleagues. “

Looking for challenge is also a concept that has been prevalent in the data, where participants stressed the fact that they are interested in new challenges and are always on the look for challenging assignments and experiences. Participant 26 decided to leave her job as a software developer in one of the prestigious companies in Lebanon and travelled to Canada to do her PhD and start a career as a researcher in the

Industrial Engineering domain. Although her family and mentor encouraged her to take such a step, a lot of her co-workers didn't. They couldn't understand why she would leave her job in a very reputable Lebanese company and her family and travel abroad to study. For her, being challenged and exposed to new things was a must.

“Maybe in my previous job I was doing a very routine job that was not really challenging. I like the challenging part of the engineer. This is why I went to the research because you can learn new things, explore new things and then apply that.”

Persistence and positive outlook were two other concepts that some participants discussed. Some participants advised other females who are about to join the STEM field to be persistence and fierce. In some cases, the participants also explained that they knew since the very early stages of choosing a STEM major that it was not going to be easy to commit to such fields. They set their expectations right from the very beginning and had a positive outlook that even when things get tough they can still make it.

P20: “Don't give up, I mean even if you're put through a tough time, you will always come out better at the end. This is my number 1 thing like please don't give up on the field, give up on the project, give up on the battle, even if you have difficult people to deal with, even if you have a difficult manager, difficult colleagues there is always something that you can do to minimize the situation or learn from it and obviously if that situation didn't work up for you it doesn't mean in all situations are bad so maybe you could try a different job in a different field like in different industry but I mean times are changing, you can always make your mark.”

P20 is a Pakistani Chemical Engineer who worked at a multinational company. When she joined the firm, her manager assisted and coached her through everything. She identified him as her mentor and was still in touch with him even though he left the firm after some time. The new manager who replaced him was not very supportive. He felt that having a female in the department was rather a liability. As a result, she didn't enjoy working with him and was having a hard time managing her job. However, her persistence and positive outlook aided her through such a tough situation. She didn't think of quitting at all. Instead, she continued attending her job and performing her duties while looking for new opportunities in the market in STEM domain. After some time, she was successful and moved to an oil and gas company.

Participant 17 tells a difficult situation she faced with her research advisor at work. She says she had lost months of hard work and research when her advisor decided to allocate the travel budget for another team, so she lost her chance to travel and showcase her work. She reflects on the incident saying:

“I think it was a crossroads because back then I learnt how to take what I want in the best manner possible, and how to really make advantage of this situation even if it's the worst situation, how to do lemonade from lemons when life gives them to you.”

The final three themes under self-directedness that the participants mentioned were responsibility for success, self-assessment and self-reliance. Participants are much aware of the difficulties they had faced and will be facing in these domains and the effort they had to put in to overcome

these difficulties, and thus, the majority attributed their success to a large degree to themselves:

P4: “Of course I credit myself big time actually to what I have now especially that in these 7 years I have faced too much problems and difficulties with people and with my job. Because I love my job and I love what I am doing I succeeded, and I am still in my current position. So of course yes I credit myself big time. “

When asked whether they are capable of making the right career decisions and choices on their own, many of the participants expressed confidence in this matter. They attributed their self-reliance to the experience they gathered across the years working in STEM domains. With respect to facing challenges as an under-represented group in this industry, P15 for example, had to leave her first job as an electrical engineer because she felt that the management were not allocating important assignments for her to work on and expand her experience. She also had to stay home for a few years to raise her kids. When she decided to work again, it was very difficult to find a suitable work opportunity in the technical domain like she wanted. Surviving such challenges and succeeding in committing to her occupation in STEM increased her self-reliance and confidence in her own decisions.

P15: “Yes. I have enough experience now and I went through a lot so that makes me solid in this term. I know my goal and I know where I am heading to. This is why I don’t accept anything now, unlike before.”

Participants seem to have an ongoing self-assessment cycle of their skills, goals and achievements which helps them to further develop their careers:

P13: “Yes sure. I have this habit, I go and sit for interviews even if I am not willing to move but I apply for jobs and do interviews because I really need to test my profile. How is it now being viewed from the interviewer’s side. And in every single interview I have doubts because in every company they have certain strategies of work and you think you might not be good enough to match this job... So yes you might have self-doubts every single time about your competencies and skills but it is up to you. Are these true? You come back home and think. Is it true or I am just overthinking and overdoing it.”

9-Goal Setting:

Goal Setting is also a concept that emerged from the data analysis, it was not planned to be discussed with the participants. Almost all participants at some point during the interviews discussed future goals, setting goals, reassessment of their goals and how this played a part in their commitment to their careers and reflected on their self-efficacy. Goal setting is analysed based on the motivation theory discussed earlier as well. The theory explains that career insight has been defined as the ability to hold a realistic view about one’s own career, to set precise doable goals, and to be able to understand and assess one’s weaknesses and strengths. Lent and Brown (2013) explain that self-efficacy advances career behaviour through an indirect path going through goal setting. Goals motivate certain behaviour according to several researchers (Bandura 1986). Actions that are directed by specified goals result in an individual achieving the outcome he/she desires (Lent & Brown 2013). Goal setting helped some participants to work on improving their skillsets and to develop a

competitive edge in the market. This would further enhance their career development, strengthen their self-efficacy, and occupational commitment:

P9: “Because I have some goals that I’m working on and I think that I should be capable enough to do them. Like I can take the decision on my own, because already I’m working on some stuff, I have some goals to reach. But you know the competition now is very high, and you need to keep improving yourself, and you need like... I’m working on myself through the masters, certificates, trainings, you need a lot of things. I am working on improving my skills in order to achieve more, this is what I am doing at the moment.”

P6 is a Jordanian project manager at her family’s engineering firm. She explained that the business was a bit slow and they were not getting big projects as they used to before. This is why she started putting some goals for herself in order to motivate herself. Her plan was to enhance her skills through certificate and master’s. She is doing her Master’s in Building Services Engineering. This way she will not be missing out on the market.

Also in terms of career development, some participants had goals to build on their technical edge and expand their expertise into other areas such as Business, Management, Education, R&D, and Consultancy. P3 who works as an IT manager at a pharmaceutical firm plans on expanding her expertise in the area of supply chain in an effort to further advance her career.

P3: “Maybe in the future I don’t keep the IT as IT but I can work like in the same position in the same systems like ERP and CRM systems the systems that have IT in addition to business side.

Systems that manage supply chain, purchasing so on. So the field that has both IT and a business, I think I will succeed in such fields. I think I can work something in the consultancy field in such areas is good for me.”

Participant 14 who works as a telecom engineer and has an MBA also expressed her desire to share her technical knowledge in the educational sector as a side job:

“... at some point in my life after getting the experience of the IT solutions I do believe I would work good in the educational field as well. That would be a long term goal at a later stage.”

10-Professional Identity:

Professional identity is one of the concepts that emerged while analysing the data. The interview questions didn't target this concept. However, participants discussed this concept through several times during interviews indicating a clear professional identity and how it played a role in strengthening their commitment to their occupation. Professional identity is defined as the affective bond or link with one's profession (Carson & Bedeian 1994) and is analysed in this study in light with the career motivation theory (London 1983).

“Why did you pursue a career in STEM?

P15: Because this is what I want. This is me... The challenge you have in this industry because I think engineers are responsible for building any society any economy.... I feel I am a useful person.”

P15 is an Emirati Electrical Engineer. As a mother of seven, she had to go through several career interruptions due to family responsibilities. However, one thing she learned through her 10 years of experience in this

domain is that she can't see herself but as an engineer. This is how she identifies herself. This has motivated her to stay in this occupation although she was offered a lot of other jobs in different industries.

P11 struggled at some point during her career because she was not sure which field in engineering would give her a sense of achievement. She first, she worked as an electrical engineer. Then she did a Master's in mechanical engineering and changed her job. Throughout her journey, she was sure of one thing though, that she sees herself as an engineer and could not be doing anything else. She moved into renewable energy and she explained this is where she finally found her true self.

P11: "For me engineering is a way to express myself, I like the reporting, I like doing calculations.... Now I think yeah I am an engineer I think this way these are my strength points. This is who I am and I am happy with who I am."

In some cases, professional identity helped participants to fine-tune their career decisions and developmental paths as well:

"After all these years, do you consider leaving your occupation?
Why? What are the factors behind your decision?"

P11: Today no, maybe last year I would have told you yes. It is not about the industry it is about finding the right fit place for you. When I was working with energy services company I didn't find the meaning of work because someone else would specify the project for us and we need to finish it, we had to rush the project to get the money."

Professional identity has helped some of the participants to gain a sense of direction in what they are doing and also a sense of power and autonomy that further strengthens their commitment to their occupations. P25 is a Lebanese sales engineer who expresses her pride in being a telecom engineer. Both her knowledge and the technical expertise that comes with the occupation give her power:

P25: “Actually, it makes me feel happy, powerful it is like I am the IT consultant of my whole family so I know all the details, I know their activities, I know everything. Actually it gives power.”

Also, the way that P19 talks about her profession signifies the important role that professional identity plays in her occupation. She describes herself as a problem solver rather than a designer in which, according to her, is more inclusive. She identifies a deeper meaning to her occupation as a sustainability engineer.

P19: “But to be honest I don’t describe myself as an architect but as a sustainability engineer. Because architects are designers I am not a designer. For me I solve problems I deal with suppliers, contractors, designers, waste managers, electromechanical and irrigation engineers. I deal with all the people who would be working on the project. I don’t design buildings.”

11-Culture

The concept of culture was discussed by several participants throughout the study. It is an emerged and unplanned concept where none of the interview questions aimed at exploring it. The participants discussed culture in relation to aspects relating to the reasons behind their choice of the industry. Some participants explained that they

studied Engineering because it was one of the professions that was highly looked at in their society or because it was something that their family expected of them.

P20: “In school I was good in science and all were like you should do something in engineering or be a doctor and I didn’t want to become a doctor, so I was like fine I will do engineering because I’m good in science and it was very much like a prestige.”

Participant 17 and 27 discussed the cultural and societal expectations that they had to face when they chose their careers and doctoral studies over getting married and starting a family. P17 had to challenge the social role expectations when she decided to travel to France to continue her PhD instead of settling down and having a family. Despite the pressure that culture has on Arab women, some of the participants were ready to challenge the status quo and pursue what they wanted.

P17: “At the beginning when I did my PhD imagine even at beginning of my career, when I did my PhD I was 23 maybe or yeah I was 23 or 24, people around me and in my family were like, you are doing your PhD and then you will finish at like 27, who will marry you at 27, who will look at you at 27, a woman with PhD no one will marry you, because men need to have higher education than women.”

P26 is a Lebanese researcher who relocated to Canada to pursue her Ph.D. in Industrial Engineering. She has a Bachelor’s degree in Electrical and Computer Engineering. She recalls that when she first moved to Canada, students on campus were surprised to find an Arab female engineer. She also discusses the socio-cultural barriers that an Arab female has to face

when choosing to pursue a STEM career instead of thinking of getting married and having a family.

P26: “Maybe in our culture it is harder for a woman to pursue both things (family and career) because there are more expectations from you on the family side in terms of the household.”

Another participant also explained that societal and cultural expectations of women tend to shape their educational and, ultimately, career decisions. She explained that it is important for Arab women to be aware of the choices they have so they can choose what they want and like rather than what is expected of them:

P13: “Especially in our culture, in our society, a male dominating society, the family sometimes especially in rural areas they affect your decision by saying why are you going to choose these majors? These are tough majors, just go to simple major, do education, work in the education domain and in summer you will have break with your children and these things. Don’t listen to these things. Education is a very good and noble task and a very interesting career but if you like to choose IT, choose it.”

One of the main issues that has been discussed by the participants is the fact that the region lacks a mentoring culture. The mentoring initiative is not something that employees, and organizations in general, are familiar with. It is rare to find an organization pushing for formal mentoring in the region and this is due to lack of awareness about the benefits of having a mentor, especially for females who work in male dominated industries. The lack of the mentoring culture is a major barrier for females in STEM in the Arab region. P11, for example, identified her friend and colleague of 10 years as her mentor. She explained that they only had each other at

the time. They were fresh graduates and were facing the same challenges and wanted support.

P11: “We don’t have a mentor culture here. You can’t call someone and tell him I want you to be my mentor. I haven’t seen anyone around here who is doing this.”

Some participants discussed difficulties that they faced in the workplace because of their gender, and, according to them, it is due to cultural norms and how the culture views females. P22 is a Lebanese Electrical Engineer. She was assigned a project in Jordan. When she arrived at the site, she was surprised to find out that the workers where not cooperative with her nor did they take her seriously. The other project manager who was working with her at the time, a male engineer, stepped in and explained to the workers that she is a leading engineer for the project and, in case they don’t listen to her, the project might be delayed and they all would have to be accountable.

P22: “Concerning the site experience, gender is a little bit like I said the Arab countries don’t help us as females you know.”

P6: “It depends on the culture and the way of thinking in the environment you are working in. I believe in international companies they consider females an added value because they believe in equality. but maybe in the middle east they tend to give more attention to the males. So from my experience, they believe in men more but this doesn’t mean that they don’t believe in women but I think they believe that men are able to put more effort to be more productive. In fact, here at (my company), in my opinion, (the general manager), believes that both men and women

are equal but at a certain point the culture and the way companies we working with are maybe force him to handle some tasks to men. It is not his belief it is the belief of the environment as I told you.”

12- Learning:

The participants discussed learning from different point of views. Some would explain that they have fast learning abilities and how this has helped me to develop skills that are needed in their fast-changing industries. They consider this to be one of the main factors that has helped them stay and succeed in STEM domains. While many discussed that the continuous learning along with the long working hours and projects deadlines are some of the challenges of working in STEM, many participants in this study considered continuous learning as one reasons why they love working in STEM.

P3: “I think it is mainly because I like to learn new things and I like to take new certificates and I don’t say I don’t know to anything. I just go and do researches and enhance my knowledge acquire new certificates. I think this is the thing that make me succeed in this field.”

Others have explained that having the chance to learn new things makes their occupation much more interesting and challenging, and this is the part they like about it the most.

P1 explains that the continuous learning is what makes her occupation less boring especially that she likes the domain thus she doesn’t find it a barrier.

P1: “What keeps me going is that I loved it, because it is challenging, because there are lots of things we need to study and be updated about it. I love it because it is not boring, there is always

something new, it is not boring like something you studied and then get stuck with forever.”

Some participants discussed the learning challenges that they had to overcome. They found a gap between the theoretical knowledge they acquired in college and real-world practice and experience, which was quite challenging.

P20: “Yes, because there are a lot of engineering things that are not taught to us, basically you join any company and they are supposed to teach you so if whoever is assigned to you, doesn’t teach you properly then you have a lot to learn by yourself, you know, I can remember initially I had to literally learn everything on google.”

The challenge of learning is on the mind of many participants as they explained that it is kind of a must since the industry is fast moving and the competition is high. P9 explains that she enrolled in a master’s program in building services because she needs to catch up with the competition especially that the company was not working on any major big projects at the time.

P9: “But you know the competition now is very high, and you need to keep improving yourself, and you need like... I’m working on myself through the masters, certificates, trainings, you need a lot of things. I am working on improving my skills in order to achieve more, this is what I am doing at the moment.”

Learning was also one of the main strategies that the participants resorted to when they were faced by a certain challenge or had to overcome a certain situation they were not happy about. Participant 14 started her career as an IT support officer but found out she was missing out on a lot of information that is essential for her job. Thus, she explained that she focused on learning as much as she could in order to fill this gap:

“I used to read read read read study study study a lot. If I were in a meeting for example or in the office for example I have a lot of colleagues so they used to talk to each other or on the phone whatever I hear them talking regarding work, I used to ask them or search on google. How to connect this or how to do this. I used to invest a lot of my time researching and studying in order to feel that my knowledge is syncing with them. “

Participant 24 also faced a similar challenge at work, that she decided to rely on her learning skills to find out more about the project and try to implement it:

“... for example, we have a swimming pool we are constructing. I have not done this before. I am going over the drawings and I really don't know. It is really challenging. This is the first time I am doing this. I am researching and reading about it more. I am trying to get a workshop with the specialist to find out how to do it.”

P24 is a Syrian architect. She landed a new job as an architect less than a year after her last project ended working at the Louvre museum. She has seven years of experience. In this new job, she was assigned as project manager for a residential tour, something she hadn't work on previously. She thought it was a good chance to expand her portfolio in the domain. She started doing extensive research on such projects, specifically about constructing swimming pools. She also enrolled in a workshop to understand the technicalities relating to such projects. She didn't consider this as a threat to her career but as a challenge that would gain her additional knowledge and exposure.

Learning was also one of the techniques that some participants used to further

enhance and develop their careers. P3 is a passionate Computer Communications Engineer who fills the post of IT manager at a pharmaceutical company. After she felt she had exhausted her knowledge on the job she started expanding her knowledge into other areas that she felt would give her an advantage in her job. She took several certificates relating to project management. This helped her to further expand the services of the IT department she was heading.

P3: “However I did apply what I studied at university the first two years and after that I enjoyed learning something new, something not related to what I studied. It enhanced my knowledge in having new experience in business orientation the ERP and CRM that is why I did project management I thought that it would help me manage the new projects I am being responsible for.”

13- Family Responsibilities:

Work-life balance and family responsibilities were one of the issues that the participants discussed. This is also an emergent concept that was not planned to be discussed during the interview. Not only married participants discussed the challenges that they faced in this area, but also single participants shared their apprehensions about future possible family responsibilities like for example P26. She is single and doesn't have children, however, she sounded a bit worried whether she will be able to effectively balance between family responsibilities and her job in case she decides to get married at some point. Her apprehensions arise from the fact that, according to her, some of her colleagues had to quit the industry when they got married and had kids.

P26: “Right now I don't have a family but seeing working mothers who struggle with working hours and the demand of the job they

are making it work and I don't know if I ever have a family I will do the same. Some people left their jobs when they had a family they didn't have an opportunity to continue working."

A couple of participants stressed the important factor that their spouses played in helping them keep their careers by sharing home and children responsibilities. P6, who is a telecom engineer, has identified her husband as her mentor. He is also a telecom engineer. She explained that:

"I was very dedicated at that time to my work even though I had 2 kids because my husband was very supportive and my work environment was very nice. This is why I was able to balance my work and my family responsibilities."

P17, a married data scientist who has a daughter, identified her husband as her mentor. He also comes from a similar technical background and works as an optical engineer. She explained that her husband strives for her career success as much as she does by sharing a lot of family responsibilities. This has helped her balance both responsibilities:

"Of course, (my job is) in the middle of nowhere and can only be reached on a fixed line, not all the time I cannot talk on the phone all the time and he is very understanding. Although he's in the final year of his PhD and you cannot really imagine how he helped me, like he does the cleaning of house, he does everything. When I say like thank you, he says what are you thanking me for? It's my job. And even sometimes on the price of his career he does that, like sometimes he has to do the compromise on behalf of his job which is something I hate because he doesn't have to do that but

then he does it. He is really good to me, and that's how he wants my success, that is something that isn't really found easily.”

The fact that the partner is willing to share some form of responsibility within the family makes it much easier for a woman to persist in these industries. The support comes as both practical, like helping with the kids or the house chores, or psychological, like being understanding of the wife's long working hours.

Some of the participants attributed the success of balancing work and life responsibilities to the support they received from their organizations and specifically their management.

P7: “I did see a lot of girls whom I now have left because they got married and decided to move to a less demanding jobs, less working hours. Mainly that was the reason. What made me stay is that I had nice managers who let me work from home. After I had my first baby my manager was very supportive. “

In some situations, participants discussed that they had to manage their expectations in terms of careers, take some time off, pass on promotions, or work part-time in order to be able to look after their children and, at the same time, stay in the industry until their children were old enough and the family responsibilities decreased.

P15 is a 39-year-old Electrical Engineer who is married and has 7 children. She had to put her career on hold for four years until she was able to join the workforce again. The challenging part for her was to successfully find a job after this period:

“My first son was born during the graduation year, 2004. And because of this I had to postpone the work placement program that I had to do for graduation certificate for four years.”

P5 who is a senior network engineer and mother of three children explained to me that her husband is not very understanding of her situation as a working mother. He doesn't see the point of her working because, according to him, they are financially well off. They don't need the additional income, he'd rather have her stay at home and raise the kids. She sees the situation from another angle. For her, it is not about the money, but rather about the fact that she is pursuing her passion. She doesn't see herself as a "stay-at-home mom."

She views herself as an engineer. She is trying hard to balance between her family responsibilities and her job. Ever since she had her second son she started to work as a part time. Her in-laws and parents are also very helpful with the kids. According to her, as long as she doesn't quit her job then this is an accomplishment. She said that once her kids are old enough she is planning on going back to full time.

P5: "I feel proud that I am able to balance between my job and my family. This is an accomplishment. I wish that after 12 years of experience I have accomplished a more senior position but I have come to the understanding that where I have reached in my career so far is fine because I am also balancing between work and family."

14- Perceived Barriers:

Participants were asked to discuss some of the barriers that they faced and overcame during their career. Among the things that they mentioned was the challenge of always being up-to-date in fast moving industries:

P1: “Barriers?... let us say ... it is the ever growing and all the updates we have in this industry. There are always something new and we need to be updated. This is challenging.”

Some participants discussed the resistance to change that they had to face in their working environments:

P26: “...people like things the way they are they don’t really accept change that easily. When you are in the tech field it is really hard to get people to accept new technologies or any changes to the technology. At the same time you as an engineer or as a developer are aware of all the new technologies and would like to apply them the field is constantly changing and evolving but you find yourself unable to catch up because it is hard for people to accept change.”

P26 felt at some point that her career was not challenging enough. She was looking for change and she started proposing new ideas that could be implemented in the IT department that would enhance the quality of the work. However, she was faced with resistance. She tried to enhance and include up-to-date software but the management was not supportive. As a result, she decided to shift her interests to something more useful to her career where she can enhance her knowledge and portfolio. She finished her Master’s degree and then moved to Canada for her Ph.D. She didn’t let such resistance slow her down.

Gender is also one of the barriers that was mentioned by the participants. They discussed some incidences where the management would assign a project to a male rather than a female thinking they would be more competent or committed.

P28: “I think sometimes being overshadowed by males in the industry. Right now I have my boss who believes that females are better than males in this domain, but when you are dealing with clients sometimes they are suspicious and don’t trust female architects.”

Another barrier was the lack of experience that participants had at the early stages of their careers, so managers or clients would be sceptical of their abilities and knowledge:

P7: “At the beginning it is not easy because people do not believe in you. You are still new and don’t know anything even if you come from a computer engineering background.”

15-Unperceived Contextual Barriers:

Under this theme, I paired several concepts that the participants discussed such as job dissatisfaction. Some participants expressed their dissatisfaction with their jobs due to various reasons, such as low salary and lack of management support. This has caused them to think of changing jobs, or stay and persist until they would find a better opportunity, but not to the extent that they would consider leaving the STEM industry. P20 was dissatisfied with her job because of the unsupportive work environment and lack of monetary increases. She explained that she was persisting in her job because she couldn’t find something better at that time. She also explained that she would stay in her current company if they offer her the promotion she wants.

P20: “Yeah, and I would continue, honestly I would continue but first of all the pay increase, it’s not really happening number 1, number 2 my new manager doesn’t support me.”

Some participants explained that their job dissatisfaction was due to the quality of the work they had to do. P28 is an architect who explained during the interview that she was surprised by the nature of the architectural industry when she started working. The industry was more oriented towards client satisfaction and increases in profits while she was expecting more freedom in terms of design and creativity:

P28: “Not very free, I am very disappointed when it comes to the fact that I can’t focus on design.”

P22 was not happy with the position offered by her firm but she stayed because she enjoys working in the engineering industry in general and was not planning on quitting.

P22: “Yes when I came to Lebanon when the project finished in Jordan, I came to Lebanon, I didn’t want to be an electric design engineer, but that was the only position available at the company then I accepted, I told them, I told the H.R. manager that I prefer the planning department, but I will stay now in the design department till there is an opportunity.”

Participants also were asked about situations where they felt they had some self-doubts about their competencies. The majority agreed, especially at the beginning of their careers when they had limited knowledge about some aspects of their jobs:

P22: “Sure, for example I had to make the earthing system for the waste water treatment plant, I don’t..., I didn’t have any clue about how to make the earthing system.”

The lack of awareness on the educational and occupational spectrum was considered by some participants as a job dissatisfaction factor since they had certain high expectations during college years. Yet, they discovered a totally different reality

after they graduated. P11 is an Omani energy services manager. She explained to me that she had very high hopes during university and right after graduation about all the things she could do as an engineer. However, she was struck by reality, that, in some cases, corporate gain comes at the expense of idealistic and theoretical beliefs she had held since university days. She had several clashes with her managers in one of the companies she worked in, because according to her, she viewed things from an engineer's perspective while he saw things from a businessman's perspective. She struggled at the beginning of her career due to their differences but didn't leave the industry. On the contrary, she persisted. She moved several jobs and companies and acquired a considerable amount of experience amounting to eleven years.

P11: "My feelings had to be corrected from university when we first started studying engineering, the explanation of engineering, what does it mean. Unfortunately, we don't understand this until after graduation. We are struck by reality."

P13: "We don't lack freedom in Lebanon, we lack awareness. We are free to choose the job we want but we are not aware what is this job about. Or where would choosing this career lead me? We lack awareness not freedom."

Lack of motivation among some participants is also considered as a barrier for them to further develop their careers. Interestingly this lack of motivation has led them to strive for better work situations rather than think of quitting the industry.

P10: "Really, sometimes I am really depressed, and the problem is I don't have any motivation, sometimes I am happy I think I don't know. Sometimes I try to motivate myself, I tell myself look at this project, I joined this project, you know, I am a part of this project."

I am just trying, but I am not feeling it. Like I remember the Marina mall project. I was on the team that helped in the details of the drawings, I know everything and when I was there, I was telling my family, look I did this one but it's not coming from my heart, you know I don't care but I am trying to motivate myself.”

Lack of support is also a barrier that has caused some participants to either move to another job or consider moving. This lack of support might be from the work environment of the participants or from their social network and family. Although the prevalent theme was the support and positive environment that most participants experienced and discussed, several ones did suffer from lack of support as indicated by the following participant:

P26: “Even when I was still working and doing my masters, I would say I can’t go out with you I have an exam or when I finish work I am going to the lab, I have some friends and co-workers who would say why did you do this to yourself. They don’t really see you can actually do both.”

P26 at the time was working full time as a technical support and at the same time she was a full-time Master’s student in Engineering Management. She felt that she was not being challenged at work and was not learning anything new. This is why she decided to pursue her Master’s degree. Her friends, however, did not see the point of this especially given that she had a good position at a leading firm with a good salary. However, this lack of support didn’t really hinder her. Once she finished her Master’s studies, she tried looking for a more challenging job, but due to the small Lebanese market she was not able to find what she wanted. This is when she decided to relocate to Canada to continue with pursuing her Ph.D.

The restricted freedom of some participants had basically dictated some of their career choices. As discussed earlier under the family responsibilities theme, some working mothers had to take a break from the industry for several years in order to tend to family needs. It was a duty rather than a personal choice in some cases. In other situations as well, restricted freedom was discussed by another participant:

P20: “Not at all (free), I mean because when I started looking for a job 9 months after I graduated I thought I would be working in renewable energy or gas but I ended up in F&B just because the opportunity presented itself. Even now for (this new company) I was looking to move to technical department but a friend of a friend asked me if I knew any chemical engineering to move, and I asked him what is the job description you know so in that I feel like it was very much the opportunity presenting itself to me.”

Summary of the Qualitative Findings

In this chapter the findings of the qualitative research study were presented. The chapter opens with a table that includes the second order themes in the first column and examples from the first order data in the second column. Each of the 15 second order themes was presented and discussed in detail along with relevant quotations from the participants.

The findings of the qualitative phase included the following fifteen second order themes: Coping self-efficacy, normative commitment, affective commitment, continuance commitment, mentoring functions, quality of the mentoring relationship, peer mentoring, protean attitude, goal setting, professional identity, culture, learning, family responsibilities, perceived barriers, and unperceived contextual barriers. These second order themes were grouped into four aggregate dimensions: Internal drivers, occupational commitment, contextual supporters, and barriers.

CHAPTER FIVE

Quantitative Study: Preliminary Data

This chapter presents an overview of the quantitative data. The first section starts with sharing the results of the normality tests and the descriptive statistics. In the final section, multicollinearity and singularity test results are presented and discussed.

5.1 Normality Test:

The shape of the distribution and specifically how close is it to being normally distributed is a significant aspect about the data set. Due to fact that checking the normality assumption is a requirement for most statistical methods, there exists a vast amount of normality tests in the literature (Razali & Wah 2011).

Skewness is defined as the measurement of the asymmetry of the distribution of a data set while kurtosis is an indication of the peakedness of this distribution (Kim 2015). Values less than or equal to two for skewness (Neuman 2005, West *et. al* 1996) and values less than 7 for kurtosis (Kim 2015, West *et. al* 1996) indicate a somehow normal distribution of the data. The threshold for the Kurtosis has been indicated by some researcher as -10 to +10 when utilizing SEM (Brown 2006). The results of measuring the skewness and kurtosis for the data set of this study are presented in Table 11 and indicate an acceptable indication of a normal distribution of the data. Appendix I lists the results of the skewness and kurtosis for all of the 91 items of this study as well.

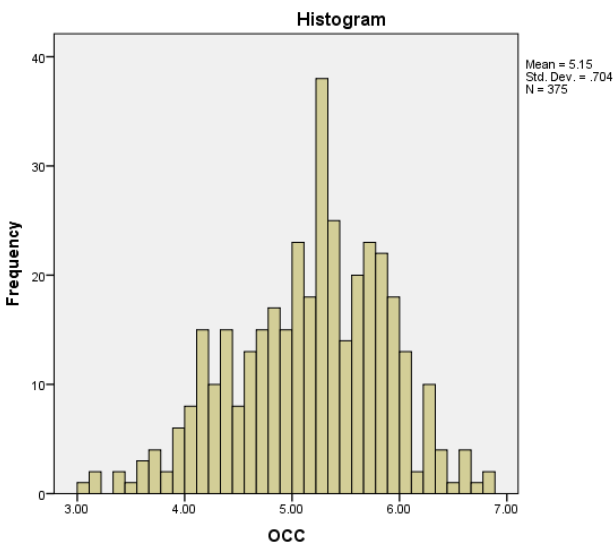
Table (11): Normality Tests Results

Variables	Skewness	Kurtosis
OCC	-0.349	-0.172
CSE	-0.151	-0.330
GSE	-0.511	0.009

PAT	-0.670	1.189
PLD	-0.933	1.203
MEF	-0.497	0.019
QUM	-0.911	0.715

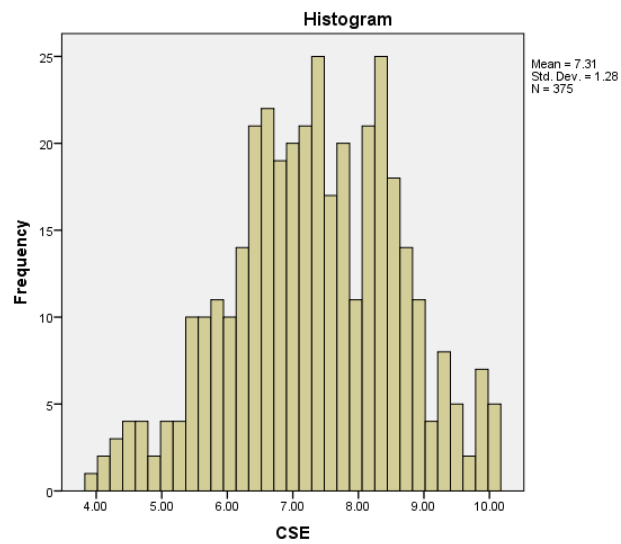
The skewness of the variable OCC is -0.349 which is less than 2 and the kurtosis is -0.172 which is less than 7. This indicates a rather normal distribution of the data. A graphical presentation is included in the below histogram.

Graph (1): OCC Skewness Histogram.



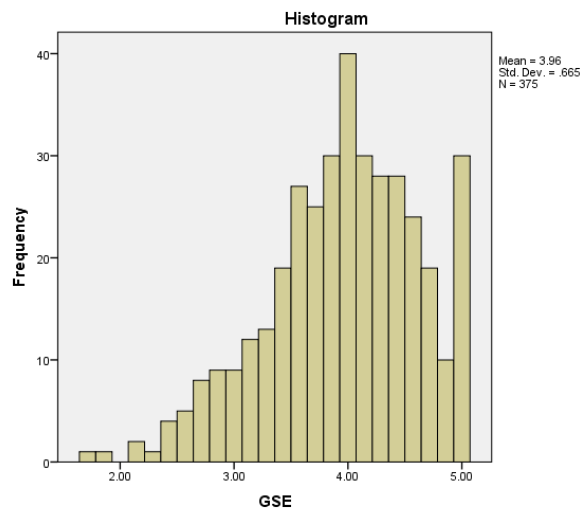
The skewness of the variable OCC is $-0.151 < 2$ and the kurtosis is $-0.330 < 7$, therefore, it can be concluded that the distribution of the data tends to be normal. A graphical presentation is included in the below histogram.

Graph (2): CSE Skewness Histogram.



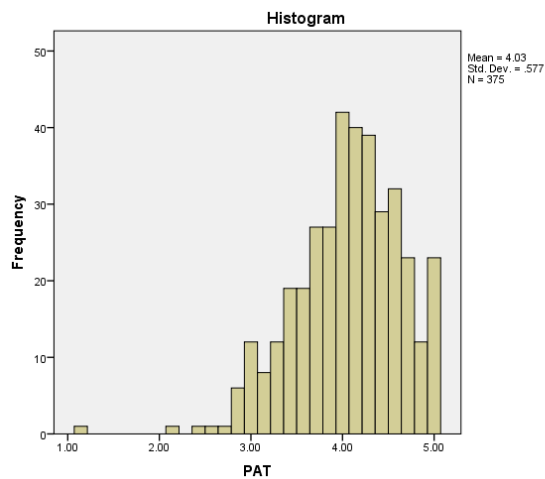
The skewness of the variable GSE is $-0.511 < 2$ and the kurtosis is $0.009 < 7$, therefore, it can be concluded that the distribution of the data tends to be normal. A graphical presentation is included in the below histogram.

Graph (3): GSE Skewness Histogram.



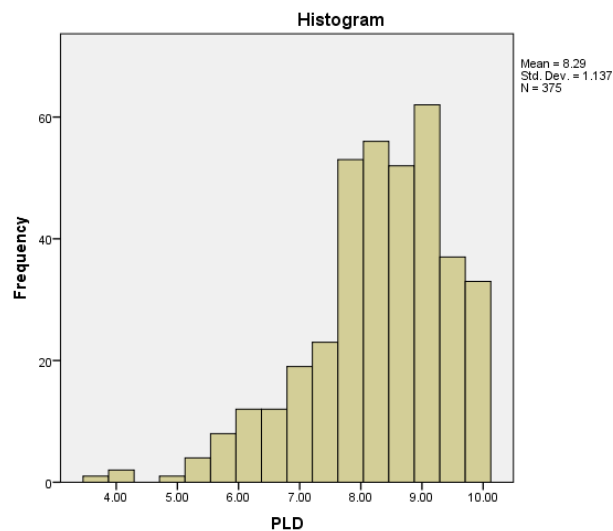
The skewness of the variable PAT is $-0.670 < 2$ and the kurtosis is $1.189 < 7$, therefore, it can be concluded that the distribution of the data tends to be normal. A graphical presentation is included in the below histogram.

Graph (4): PAT Skewness Histogram.



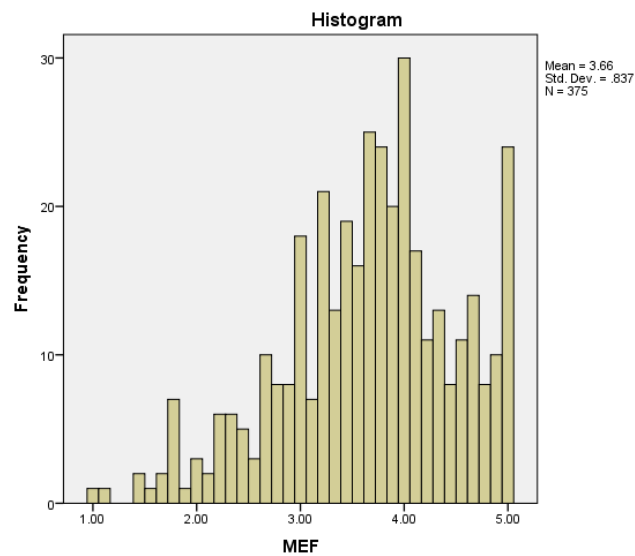
The skewness of the variable PLD is $-0.933 < 2$ and the kurtosis is $1.203 < 7$, therefore, it can be concluded that the distribution of the data tends to be normal. A graphical presentation is included in the below histogram.

Graph (5): PLD Skewness Histogram.



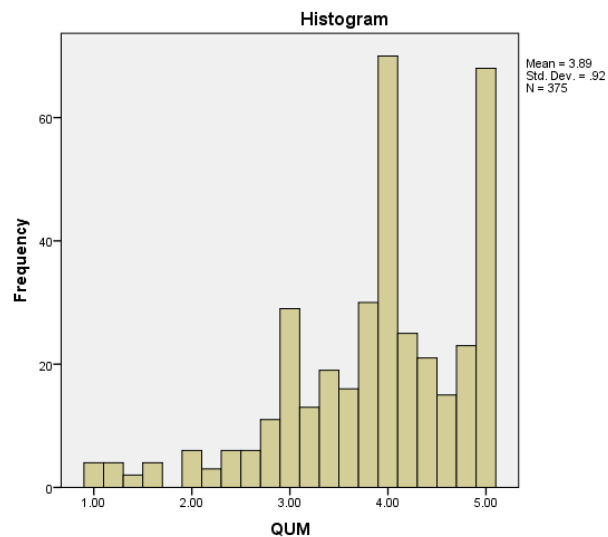
The skewness of the variable MEF is $-0.497 < 2$ and the kurtosis is equal to $0.019 < 7$, therefore, it can be concluded that the distribution of the data tends to be normal. A graphical presentation is included in the below histogram.

Graph (6): MEF Skewness Histogram.



The skewness of the variable QUM is $-0.911 < 2$ and the kurtosis is $0.715 < 7$, therefore, it can be concluded that the distribution of the data tends to be normal. A graphical presentation is included in the below histogram.

Graph (7): QUM Skewness Histogram.



5.2 Descriptive Statistics:

Out of approximately 1000 surveys that were administered, 410 were answered. Therefore, the response rate is 41%. From these 410 responses, 375 identified having mentors and were able to answer the last two sections of the survey about mentoring functions and the quality of the mentoring relationship. Therefore, the usable rate is 91%. In order to have a better idea about the data set, certain descriptive statistics have been calculated and included in the following tables. The central tendency of a distribution presents the estimation of the centre of the distribution of a certain value. The table below shows two out of three types to estimate central tendency, mean and median, relating to the seven variables of this research. Table 12 also includes the standard deviation of the variables. The standard deviation aids in understanding the dispersion of data points. It measures the scatter of data around the mean (Begum & Ahmed 2015).

Table (12): Descriptive Statistics

		OCC	CSE	GSE	PAT	PLD	MEF	QUM
N	Valid	375	375	375	375	375	375	375
	Missing	0	0	0	0	0	0	0
Mean		4.2999	7.3150	3.9570	4.0622	8.2916	3.6631	3.8907
Median		4.3529	7.3462	4.0000	4.0769	8.4167	3.7778	4.0000
Std. Deviation		.72015	1.28031	.66462	.57712	1.13671	.83674	.91995

Note: GSE: Goal Setting

QUM: Quality of the Mentoring Relationship

CSE: Coping Self-Efficacy

OCC: Occupational Commitment

PLD: Personal Learning Development

PAT: Protean Attitude

MEF: Mentoring Functions

As Table 12 indicates GSE (M=4, SD=0.66) has a median of 4. Quality of the mentoring relationship has M=4, SD= 0.919, and median of 4. Coping self-efficacy has a mean and median of 7.3 and 7.3 respectively while SD=1.28. Occupational

commitment has the following M=4, median= 4, and SD=0.72. The mean for the Personal learning development variable is 8.29, the median is 8.41, and SD is 1.13. Protean attitude shows a mean of 4.06, median of 4.07, and SD of 0.57. Finally, mentoring functions has the following results respectively, M=3.66, median=3.77, and SD=0.83.

5.3 Multicollinearity and Singularity:

Collinearity is defined as a linear relationship between two predictor variables. It is considered that these variables are fully collinear if a perfect linear association exists between them. Multicollinearity is when two independent variables or more are associated with each other, and also related with the dependent variable in a multiple regression. Although a full multicollinearity in a dataset is seldom found, researchers explain that when the correlation between two predictors, for example, is +1 or -1 then it is considered a perfect multicollinearity. Multicollinearity impacts the data by unjustifiably enlarging the standard errors of the coefficients. Thus, *multicollinearity* causes certain variables to become insignificant when they might actually be significant. Checking multicollinearity can be done by calculating the variance inflation factor (VIF). VIF estimates the increase in the variance of the coefficients within a regression when the independent variables are related (Akinwande *et. al* 2015).

There is no multicollinearity within the data of this study. According to Hair *et. al* (2010) multicollinearity does not exist in a dataset when VIF values of the constructs are within the acceptable threshold < 4 and the Tolerance values are also within the acceptable threshold > 0.2 . The results are included in Table 13.

Table (13): Multicollinearity Results

Model	Collinearity Statistics	
	Tolerance	VIF
1 (Constant)		
CSE	.743	1.346
GSE	.657	1.523
PAT	.604	1.654
PLD	.632	1.582
MEF	.379	2.640
QUM	.368	2.717

a. Dependent Variable: OCC

Summary of the Qualitative Findings

This chapter presented an overview of the quantitative data. The first section included the normality test. The results of measuring the skewness and kurtosis indicated that the data are normally distributed. The second part of the chapter presented some descriptive statistics such as the mean, median, and standard deviation. The final section of this chapter defined multicollinearity, discussed its impact on a dataset, and why it is important to check for multicollinearity. Multicollinearity were checked by calculating the VIF. The values for all the constructs were within the acceptable threshold, therefore, there is no multicollinearity within the data.

CHAPTER SIX

Quantitative Results and Data Analysis Findings

6.1 Correlation Test:

Pearson correlation test has been administered to check the strength of the relationship between the variables. The correlation coefficient (r) ranges from +1 to -1 indicating the strength and direction of the relation between the variables (Pallant 2016). For example, a small positive correlation exists between GSE and OCC [r=.12, n=375, p<.05]. A medium positive correlation exists between QUM and PAT [r=.332, n=375, p<0.1] and a high positive correlation exists between PLD and PAT [r=.501, n=375, p<0.1]. Table 14 presents the results of these correlations.

Table(14): Correlation Results

	OCC	CSE	GSE	PAT	PLD	MEF	QUM
OCC	-						
CSE	.055	-					
	.289						
GSE	.124*	.391**	-				
	.017	.000					
PAT	.014	.384**	.523**	-			
	.782	.000	.000				
PLD	.059	.435**	.451**	.501**	-		
	.255	.000	.000	.000			
MEF	.047	.229**	.213**	.317**	.270**	-	
	.363	.000	.000	.000	.000		
QUM	-.011	.215**	.240**	.332**	.331**	.784**	-
	.830	.000	.000	.000	.000	.000	

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

6.2 Common Method Bias:

Common method variance (CMV) is defined as the variance related to the method of measurement rather than to the constructs being measured (Fiske 1982). CMV according to many researches, is a potential issue in behavioral research (Kline *et al.* 2000, Conway 1998). Method biases are considered an obstacle in data analysis because they represent a source of measurement error. Measurement errors impede the validity of the findings concerning the relations between the constructs and are commonly known to have an arbitrary and an organized aspect to them (Bagozzi & Yi 1991).

Harman's single factor test is considered one of the most common methods to check CMV (Podsakoff *et. al* 2003). The variables are all loaded into an EFA to test the unrotated factor solution in order to identify the number of factors that account for the variance in these variables. This technique lies on the assumption that in case CMV exists then either a single factor will result from the analysis or one common factor will be responsible for the bulk of the covariance (Aulakh & Gencturk 2000). However, some researchers using this method have recently turned to CFA for a more advanced testing (Iverson & Maguire 2000).

To test the common method bias (CMB) Harman's single factor score is used in this study. The total variance shows a loading of 10.435% which is less than 50% indicating that CMB does not affect the data.

6.3 Factor Analysis:

The main purpose for conducting a factor analysis is that it helps in minimizing a large set of variables. It also helps in refining the theory by providing certain dimensions between the measured and latent variables. Finally, it offers construct

validity for the scales (Thompson 2004, Gorsuch 183). However, before conducting factor analysis, certain tests have to be administered to determine whether factor analysis can be used on a certain set of data. Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy (Kaiser 1970, Kaiser *et al.* 1974) and Bartlett's Test of Sphericity (Bartlett 1950) are among these tests. The index for the KMO is between zero and one where 0.5 is deemed acceptable for factor analysis. Bartlett's test should indicate a significant level less than 0.05 (Hair *et al.* 1995, Tabachnick 2007). The KMO is $0.881 > 0.7$ indicating that the sample size of 375 is sufficient for factor analysis. The Bartlett's test of sphericity shows $.000 < 0.05$ also indicating that there are enough correlations between the variables for factor analysis.

6.4 Exploratory Factor Analysis:

The main aim of the factor analysis is to sum up the data to help ease the interpretations about existing relationships. Exploratory factor analysis works by usually assembling the variables into certain groups according to the shared variance. In doing so, it aids in separating concepts and constructs (Child 2006). The aim of the EFA is parsimony, that is, trying to come up with a simpler way to interpret the data (Harman 1976). Researchers indicate that the EFA is used to uncover the number of factors that affect the variables and interpret which can be grouped together (DeCoster 1998). EFA is used when dealing with large data that contains many variables. It bundles common variables into descriptive groups. EFA is helpful when working with studies that have little or hundreds of variables or items from questionnaires that can be minimized to smaller sets to enable better interpretation of the data (Rummel 1970). Some scholars indicate that the sample

size should be at least 300 and the variables should have between five to ten observations each (Comrey & Lee 1992).

An exploratory factor analysis (EFA) using principal component analysis is administered on the 91 items of this study. The cut-off point is set at 0.5 as a minimum factor loading in the aim of having factor loadings above low. According to Hair, Anderson, Tatham, and Black (1998), factor loadings above 0.6 are considered “high” and below 0.4 are categorized as “low”. The EFA resulted in 65 items loaded onto 6 factors as indicated in Table 15. MEF and QUM are loaded on a single factor, however, according to theory, they are two separate constructs each with a validated scale as discussed in the measurements section of this study. Therefore, this factor is considered as two, one pertaining to MEF and the other to QUM. The same thing applies to PAT and GSE where the items of both constructs are loaded in one factor. This is also reported and discussed in the limitations section of the study.

Table (15): Exploratory Factor Analysis

	Component					
	1	2	3	4	5	6
CSE13	.827					
CSE14	.818					
CSE15	.792					
CSE16	.788					
CSE17	.777					
CSE9	.691					
CSE18	.669					
CSE25	.653					
CSE19	.642					
CSE20	.588					
CSE26	.563					
CSE12	.537					
CSE7	.525					
CSE24	.507					
CSE21	.505					
CSE10	.503					

CSE22						
CSE11						
CSE3						
CSE6						
CSE8						
CSE1						
CSE23						
CSE2						
CSE5						
CSE4						
QUM5		.814				
QUM4		.807				
QUM1		.801				
MEF8		.781				
QUM2		.778				
QUM3		.741				
MEF5		.734				
MEF6		.728				
MEF2		.723				
MEF9		.710				
MEF3		.708				
MEF7		.678				
MEF1		.577				
MEF4		.567				
OCC18						
PLD5			.748			
PLD9			.740			
PLD12			.719			
PLD4			.702			
PLD2			.689			
PLD7			.683			
PLD8			.676			
PLD6			.659			
PLD11			.644			
PLD3			.555			
PLD1			.552			
PLD10						
PAT7				.667		
PAT3				.623		
PAT6				.617		
PAT5				.588		
PAT4				.583		
GSE4				.574		

PAT8				.542		
PAT9				.539		
GSE1				.534		
GSE5				.527		
GSE3						
PAT2						
PAT10						
GSE6						
PAT13						
PAT11						
PA14						
PAT1						
GSE2						
PAT12						
GSE7						
OCC8					.696	
OCC15					.665	
OCC11					.616	
OCC12					.600	
OCC14					.581	
OCC7					.574	
OCC9					.562	
OCC17					.559	
OCC10						
OCC3						.651
OCC2						.598
OCC6						.595
OCC4						.529
OCC5						.524
OCCC13						.507
OCC16						
OCC1						

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

6.5 Reliability Testing-Cronbach's Alpha:

The assessment of a scale includes two important aspects, it's validity and reliability (Tavakol & Dennick 2011). Validity is referred to the ability of a scale to measure what it is meant to measure. Reliability is referred to the extent of measuring

consistency (Tavakol et al. 2008). Despite the fact that both concepts are related, the reliability of a certain measure is not necessarily dependent on its validity (Nunnally & Bernstein 1994). Cronbach's alpha has been considered the most common technique to measure reliability due to the ease of conducting the test in comparison to other reliability testing methods (Tavakol & Dennick 2011, Cohen & Swerdlik 2010). Cronbach's alpha gives an estimate of the internal consistency of a certain scale presented in a number ranging between zero to one. It is important to measure Cronbach's alpha before embarking on a certain research to make sure of the validity of the scales that are being used. Testing the reliability also gives the measurement error in a test. In general, the value of Cronbach's alpha increases when the items of a measure are correlated with one another. But this is not always the case because the coefficient of alpha is dependent on the size of the test (Nunnally & Bernstein 1994). Because alpha is based on the scores of a test in a certain sample, scholars explain that researchers using a certain test should administer Cronbach's alpha and not depend on the published the scales published alpha coefficient (Streiner 2003).

The coefficients of Cronbach's alpha for each scale have been calculated and the results are presented in the following sections. For the Occupational Commitment scale, there are 3 sub-scales each with 6 items. In order to test the internal reliability of the scale used, Cronbach's alpha was administered indicating an acceptable level of consistency for the scale at .77.

The Coping Self-Efficacy Scale has three subscales. Use-problem solving coping contained 12 items, stop unpleasant emotions and thoughts contained 9 items, and get support from friends and family contained 5 items. In order to test the internal reliability of the scale used, Cronbach's alpha was administered indicating a high level of consistency for the scale at .925.

The Goal Setting scale has 7 items. To test the internal reliability of the scale used, Cronbach's alpha was administered indicating an acceptable level of consistency for the scale at .80.

The Protean Attitude scale has two subscales, self-directed and values-driven, each with 8 and 6 items respectively. To test the internal reliability of the scale used, Cronbach's alpha was administered indicating a high level of consistency for the scale at .0.85.

The Personal Learning Development scale has two subscales, rational job learning and personal skill development each with 6 items. The Cronbach's alpha indicated a high level of consistency for the scale at .0.91.

The Mentoring Functions Questionnaire scale has three subscales, career support, psychological support, and role modelling, each with 3 items. Cronbach's alpha indicated a high level of consistency for the scale at .0.89.

The Quality of the Mentoring Scale contains 5 items. Cronbach's alpha indicated a high level of consistency for the scale at .0.93.

6.6 Composite Reliability:

Composite reliability (CR) is used to measure the internal consistency of items in a scale (Netemeyer, 2003). It is considered a less biased reliability estimation compared to Cronbach's alpha. The acceptable threshold is 0.7 and above (Alarcón & Sánchez 2015). To compute the CR for this study, the following formula is used where λ_i represents the loading of each measurement item on its corresponding construct (Gefen & Straub 2005):

$$(\sum \lambda_i^2) / ((\sum \lambda_i^2) + (\sum (1 - \lambda_i^2)))$$

The results of the CR are as follows: 0.92 for CSE, 0.741 for OCC, 0.891 for QUM, 0.892 for MEF, 0.900 for PLD, 0.797 for PAT, and 0.544 for GSE. Although the CR value of GSE is below the threshold, for theoretical considerations this construct is still retained in the analysis. GSE is an integral part in the career self-management model and the social cognitive career theory (Lent & Brown 2013), the theoretical framework of this study. Its relationship with both constructs the independent (CSE) and dependent (OCC) has been thoroughly discussed in the Literature Review Chapter 2. The scale used to measure GSE is a validated one as well (Honkanen & Verplanken 2004). In addition, according to Hair et al. (1998), CR values below 0.7 have been considered as acceptable.

6.7 Confirmatory Factor Analysis:

Confirmatory factor analysis (CFA), also referred to as the measurement model, is considered a major element of SEM (Ullman & Bentler 2013). It is a confirmatory technique and most importantly it is driven by theory. In other words, planning of the analysis process is dictated by the theoretical frameworks that depict the relations between observed and unobserved variables. A hypothesized model, conceptual framework, is put in place in order to examine a population covariance model against an observed covariance one. Thus, CFA aids in decreasing the difference between the observed and estimated models (Schreiber *et al.* 2006). The important part of CFA is the reliability testing of the variables. The measurement model also offers information about any possible interrelations among the latent constructs (Schreiber *et al.* 2006).

The second step of the data analysis in this phase is to conduct a confirmatory factor analysis (CFA) and check the model fit. Based on the results of the EFA, OCC loaded on two different factors. The initial CFA considered both factors as one,

however the goodness of fit reported was not within the acceptable threshold for both models A and B. CFA was conducted again including only the first factor loading of OCC, the goodness of fit reported was not within the acceptable threshold for both models as well. Finally, CFA was conducted by including the second factor loading of OCC and the indices for the goodness of fit for both models was good. Results are discussed in the following lines. The CFA for model A included the all the constructs for the model, namely: coping self-efficacy (CSE), mentoring functions (MEF), occupational commitment (OCC), and quality of the mentoring relationship (QUM). The CFA results revealed that $p > \chi^2 = 0.000$. The fit indices also indicate a good fit of the data. The CFI is .942 and the TLI is .935 exceeding the minimum cut-off of .90 (Kelloway, 1998; Kline, 1998). The RMSEA = .047 which the recommended criterion of .08 or less (Steiger, 1998) for a reasonable fit. Finally the SRMR is .05. Thus, the CFA results show that the model attains a good fit for the proposed factor dimensions, indicating evidence of factorial validity and convergent validity of the study's measurement (Bagozzi & Yi, 1988).

The CFA for Model B was conducted by including all the constructs of the model, namely coping self-efficacy (CSE), occupational commitment (OCC), goal setting (GSE), personal learning development (PLD), and protean attitude (PAT). The results show that $p > \chi^2 = 0.000$. The fit indices also indicate a good fit of the data. The CFI is .929 and the TLI is .922 exceeding the minimum cut-off of .90 (Kelloway, 1998; Kline, 1998). The RMSEA = .045 meets the recommended criterion of .08 or less (Steiger, 1998) for a reasonable fit. Finally, the SRMR is .050. Thus, the CFA results for Model B show that the model attains a good fit for the proposed factor dimensions and therefore, indicating evidence of factorial validity and convergent validity of the study's measurement.

6.8 Hypotheses Testing:

The results of the hypotheses testing for Model A reveal that hypothesis H1 that posited that MEF impacts OCC is accepted. H2 that posited that MEF impacts CSE was not accepted. H3 that posited that QUM mediates the relationship between MEF and CSE was not accepted. And finally, H4 that posited that CSE impacts OCC is accepted. The details of the p-value are included in the following table. Further discussions and justifications of the results are presented in Chapter Seven: Discussion.

Table 16: SEM Results-Model A

Structural Relation	Coefficients	P-value	Significance Level
MEF → OCC	0.223	0.000	5%
MEF → CSE	-0.016	0.931	ns
CSE → OCC	0.176	0.000	5%
MEF → QUM	0.907	0.000	5%
QUM → CSE	0.236	0.233	ns

For Model B, H1 that posited that CSE has a positive impact on OCC is considered not supported at significance level of 5%.

Table 17: SEM Results-Model B

Structural Relation	Coefficients	P-value	Significance Level
CSE → OCC	0.117	0.086	10%
CSE → GSE	0.356	0.000	5%
GSE → OCC	0.288	0.000	5%
*Multi1	-0.018	0.78	ns
*Multi2	-0.029	0.65	ns
PAT	0.060	0.43	ns
PLD	0.0221	0.75	ns

Note: Multi1=factor score of CSE factor score of PAT

Multi1=factor score of CSE* factor score of PLD

6.9 Testing the Mediators:

Testing the mediators was done using structural equation modelling on Stata. The initial steps of Baron and Kenny (1986) were followed in this respect. The steps include:

- Determining a significant relationship between the independent variable and the dependent variable.
- Determining a significant relationship between the independent variable and the mediator.
- Determining a significant relationship between the mediator and the dependent variable.
- Determining that the relationship between the independent variable and the dependent variable is no longer significant when the mediator is introduced.

In case the last step was achieved, then a full mediation exists, otherwise, it is considered a partial mediation (Zhao *et al.* 2010). In Model B, H2 posited that GSE mediates the relationship between CSE and OCC. The relationship between CSE and GSE is significant where $p\text{-value} < 5\%$. The relationship between GSE and OCC is also significant where $p\text{-value} < 5\%$. The relationship between CSE and OCC is not significant where $p\text{-value} = 0.086 > 5\%$. Therefore, GSE is found to fully mediate the relationship between CSE and OCC.

It is important to note that the mediation effect of GSE on the relationship between CSE and OCC which was found significant can be considered a complementary partial mediation at the significance level of 10%, where the direct effect of the independent variable on the dependent is significant and the indirect effects through the mediator variable are also significant. Both of these effects point in the same

positive direction (Baron & Kenny 1986). This further implies that a part of the impact of coping self-efficacy, for example, on occupational commitment is mediated by goal setting, while coping self-efficacy still explains a part of the occupational commitment of females that is dependent on goal setting. The complementary mediation, tested above, indicates that the intermediary variable, goal setting, confounds the relation between the independent variable, coping self-efficacy, and the dependent, occupational commitment in the case of this study (Carrión *et al.* 2017).

The mediating relationship was also tested using bootstrapping using Hayes macroprocess on SPSS. In step one of the mediation model, the regression of CSE on OCC, ignoring the mediator GSE, was significant: $b=0.0882$, $t(373)=3.479$, $p<0.05$. Step two indicated that the regression of CSE on GSE was also significant: $b=0.188$, $t(373)=7.193$, $p<0.05$. Step three of the mediation process indicated that the mediator GSE, controlling for CSE, was significant: $b=0.284$, $t(372)=5.922$, $p<0.05$. Step four of the analysis showed that, controlling for the mediator GSE, CSE was no longer a significant predictor of OCC: $b=0.0347$, $t(372)=1.339$, $p=0.181$. Under the indirect effect of CSE on OCC the lower level confidence interval (LLCI) and the upper level (LLCU) for GSE were 0.0606 and 0.1597 respectively. Therefore, the bootstrapping results indicated a mediating effect of GSE on the relationship between CSE and OCC. The full table of results is included in Appendix J.

6.10 Testing the Moderators:

The moderator models test the proposed influence of the independent variables on the dependent variable due to a third variable (Z). The moderator impacts the relationship's direction and also strength between the independent and dependent variable. The effect of a moderator is referred to as the interaction between the

variables whereby the impact of a certain variable relies on the levels of the other variable within the analysis (Aiken & West 1991, Fairchild & Mackinnon 2009).

Factor scores have been calculated for the constructs to be tested for moderating impact, PLD and PAT, on SPSS. The results are uploaded to the Stata software where multiplications are generated for each moderator as follows: Multi1=factor score CSE x factor score PLD; Multi2= factor score CSE x factor score PAT. A direct relation was included in the measurement model between the moderator and the dependent variable (OCC) and also between the moderator interaction and the dependent variable (Aiken & West 1991).

In Model B, H3 that asserted that PAT moderates the relationship between CSE and OCC is not supported since the interaction effect is not significant, $p\text{-value} = 0.78 > 5\%$. Hypothesis 4 that asserted that PLD moderates the relationship between CSE and OCC is also not supported since the interaction effect is not significant, $p\text{-value} = 0.65 > 5\%$. The results are shown in Table 17.

Summary of the Main Findings

The findings of the qualitative phase first reveal four new ideas that have been derived from the literature review thematic analysis. Using the Gioia methodology, the analysis of the interview data sets reveals 54 first order concepts, ten of which were emergent. In the second stage of the analysis, fifteen second order themes are presented based on similarities and differences that have been identified among the first order concepts. In the second order analysis, the main question is whether the themes were indicative of ideas that might help in answering the research questions. The analysis in the third stage has been done in ways that attended to the theoretical realm of the study, the SCCT. The fifteen concepts from the second order themes are further distilled into four aggregate dimensions. Internal drivers which contained coping self-efficacy and new concepts from the literature review thematic analysis such as professional identity and personal learning development is the first dimension. Occupational commitment, the second aggregate dimension, contains normative, affective, and continuance occupational commitment. The third dimension is contextual supporters that refer to mentoring functions and the quality of the mentoring relation. The last dimension is the barriers. The findings of the qualitative phase have assisted in further expanding the hypotheses and developing the conceptual framework for the quantitative phase.

The findings of the quantitative analysis support the two main hypotheses formulated and are consistent with the results of the qualitative phase. Mentoring has a positive impact on occupational commitment. Coping self-efficacy has a positive impact on occupational commitment. The quality of the mentoring relationship was not found to mediate the relationship between the mentoring functions and coping self-efficacy. In the second model, goal setting was found to

mediate the relationship between coping self-efficacy and occupational commitment.

CHAPTER SEVEN

Discussion

7.1 Main Findings and Interpretations:

This study attempted to investigate the under-representation of females who work in STEM industries. The research was guided by the Social Cognitive Career Theory. Using mixed methods design, the aim was to try to understand the impact that both mentoring and coping self-efficacy have on the occupational commitment of these females. The study also tested at the impact of several moderators and a mediator on these relationships using structural equation modelling. In addition to the theoretical framework, the research was guided by the following research questions:

1. How do females succeed in committing to their STEM occupations?
2. How does mentoring impact occupational commitment?
 - What is the relation between mentoring and occupational commitment?
3. How does mentoring impact coping self-efficacy?
 - What is the relation between mentoring and coping self-efficacy?
4. How does coping self-efficacy influence occupational commitment?
 - What is the relation between coping self-efficacy and occupational commitment?

1. Research Question Two:

The Impact of mentoring on occupational commitment:

The second research question asks how does mentoring impact occupational commitment. The interview dataset revealed three second order themes, normative, affective, and continuance that were arranged under the Occupational Commitment aggregate dimension. In line with Meyer's (1993) three component model, the

participants discussed the three forms of occupational commitment on various occasions. However, affective commitment was among the main reasons why participants decided to pursue a major in STEM and later work in these industries. It was also identified as a strong factor for staying in the occupation. One of the main aims of the study was to investigate the effect of mentoring as a contextual factor on coping self-efficacy and occupational commitment since such area of research has not received the research attention it deserves (Lent *et al.* 2000). Mentoring is believed to impact the mentee's reactions towards her job. The mentoring functions are intended to positively help the protégé enjoy more favourable work experiences (Lankau & Scandura 2002). Such mentoring functions have been found to positively enhance job satisfaction and decrease turnover intentions. Mentoring influenced the participants' occupational commitment through teaching and coaching where the participants were able to either solve work-related problems or deliver high quality end results. These mentoring functions provided the mentee with important information and knowledge for their skill development and career performance. Other mentoring functions, such as sponsorship and challenging work, might as well have played a part in enhancing the participants' occupational commitment. Challenging work exposes the protégé to undiscovered levels of skills and knowledge that further promote her career. Sponsorship enables the protégé to access social channels she might not be able to unlock on her own. Due to the barriers that the participants had to go through and the pressure and isolation in some cases, the counselling-mentoring function as an external influencer played a compelling role in supporting the participants through tough times. This enhanced their work experiences, job satisfaction, and ultimately their commitment. While participants discussed, in details, the experiences they lived through the mentoring relations, both career-related and psychological related functions of mentoring were mentioned as being of help for them. However, career-

related functions seemed to play a more vital role. Sharing knowledge and on-the-job experience by the mentor was considered of great importance for the participants. This aided the latter in narrowing the gap between the theoretical knowledge that they acquired at universities and the practical knowledge that was minimal since they were fresh graduates. It is also of importance because of the fast-moving nature of these domains. Employees in such occupations are expected to continuously follow up and be updated on emerging trends, technologies, and practices. Peer mentoring also played a part in enhancing the occupational commitment of the females. Peer mentoring was specifically discussed when participants would be sharing a difficult experience they had to go through for example. Peer mentoring in most cases served as a motivating tool for the participants. They explained how the positive feedback and encouragement they received from their families and friends boosted their moral. The positive support helped some to adapt to new jobs. This enabled them to work hard on enhancing their expertise and committing. Scholars discussed the concept of “shock” experience to explain how new teachers struggle as they tried to understand the reasons behind the high rates at which they leave the profession (Caspersen & Raaen 2014). In line with these findings, other studies concluded that including fresh graduates in mentoring programs led to a decrease intent to quit (Helms-Lorenz *et al.* 2013). The participants explained that mentoring was needing mostly at the very early stages of their careers when they were still fresh graduates. This falls in line with similar findings from other searchers (LoCasale-Crouch *et al.* 2012, Joftus & Maddox-Dolan 2002). They lacked the necessary experience, they also struggled with the fact that the knowledge they had from universities was only theoretical. They explained that mentoring programs during early career helped them decrease the impact of such obstacles. The feedback received from the mentor, information about how the mentee can improve her skills and clear and honest assessment of her

work and what is clearly expected of her was positively related to affective occupational commitment (Christophersen *et al.* 2016). The quantitative results showed a positive impact of mentoring functions on occupational commitment.

Goal Setting:

Career insight has been defined as the ability to hold a realistic view about one's own career, to set precise doable goals, and to be able to understand and assess one's weaknesses and strengths. Mentoring can enhance occupational commitment through various career related functions and motivate the protégé to think about the long-term impact of her present work behaviour and to establish clear career plans. While discussing career-related aspirations, the mentor shares with the mentee practical career options and expectations. This helps the mentee to plan her future career advancements and to set goals. Fair and precise feedback provided by the mentor would also aid the mentee in assessing her employability options. The mentor acting as a coach would encourage the mentee to set future goals. The career development road is made up of many goals and achieving these goals leads to career success (Greenhaus *et al.* 1995). According to Lent *et al.* (1994), goal is a major player in the career-decision making process. They explain that goals play a significant role in self-regulation pertaining to behaviour and expectations. By having goals and committing to them, individuals become more in control of their behaviour, increase their motivation, and are more likely to achieve success in their career decisions (Lent *et al.* 1994). Through the mentoring functions, a mentor can coach and aid the mentee to formulate goals and make future career plans. Having goals and looking forward to achieving them further increases her motivation and her commitment to her occupation

Some of the mentors in this study were able to motivate their mentees to establish clear career paths and think about future career developments. By providing

continuous feedback and allocating time to discuss future career options with the mentee, the mentor helps the latter in setting career goals which are considered to play an important role in one's career decision (Lent & Brown 2013). Goal setting aided participants to work on improving their skillsets and to develop a competitive edge in the market. In terms of career development, some participants had goals to build on their technical edge and expand their expertise to include other domains of work.

Professional Identity:

A final concept that is worth discussing in this section is professional identity of the participants. Mentoring functions play a key role in advancing the mentee's professional identity (Eby *et al.* 2013). The qualitative findings in this study are consistent with the above mentioned research article. By providing certain career and psychological-related functions such as coaching and role modeling, some of the mentors were able to help the participants develop a certain degree of professional identity. Such professional identity development aided the participants to embark on better career decisions and further develop their occupations. It also helped some to acquire a sense of direction in their career path and a degree of power and autonomy that further strengthened their occupational commitment. Research indicates that individuals who receive psychological mentoring tend to enhance and refine their professional identity (Pan *et al.* 2011) since professional identity has been found to be dynamic in nature (Beijaard *et al.* 2004). The rational identification theory suggests that employees identify with a certain role in a relation (Sluss & Ashforth 2007). The theory explains that the identification with a mentor based on common values, beliefs, and attitudes can be generalized to include professional identity (Sluss & Ashforth 2007). Through performing professional job duties and helping the mentee establish a sense of professional identity, the mentor can

influence the mentee's professional commitment (Kram 1985). Some researchers analysed the predictors of occupational commitment through the lens of the career motivation theory which is made up of three features, career identity, resilience, and career planning (Carson & Bedeian 1994). Professional identity is defined as the affective bond or link with one's profession. Career identity is the degree of defining oneself by one's work. It is related to involvement on the level of the organization and the profession. It has been linked with the desire for career advancement and acknowledgement (London 1983, Day & Allen 2004).

The rational identification theory explains that people identify with a certain role in a relationship (Sluss & Ashforth 2007). The theory suggests that the identification with a mentor can be generalized to include professional identity. Professional identity impacts career related decisions such as occupational commitment as indicated by the career motivation theory (London 1983, Day & Allen 2004). Some participants were able to develop their professional identity by mimicking the behaviour of their role models. In such a case, the participants were not only building on perceived similarities with the role models, but they were viewing their desired professional self-image through the role models. Scholars indicate that protégés don't just stop at the commonality perceptions, but their interpretations go beyond that to try to comprehend the meaning of these commonalities in terms of future selves (Sluu & Ashforth 2007). The authors also explain that the deep perceptions of the role models impacted the protégé's' organizational and occupational commitment. The participants' self-conception as an architect or engineer, for example, played a vital role in their career advancement and commitment. Some explained that their occupation was basically who they were and that they couldn't imagine doing anything else in life even if they wanted to. Such identity formation became the motivation that strengthened their commitment.

2. Research Question Three:

The Impact of mentoring on coping self-efficacy:

The third research question asked how mentoring impacts coping self-efficacy. The social cognitive career theory explains that self-efficacy is not a fixed but rather a dynamic, changeable, and domain-specific trait (Van Vianen 1999). Self-efficacy is reinforced through four sources. Enhancing self-efficacy through vicarious experiences and verbal persuasion have been identified by researchers as significant due to mentoring relations. When participants saw similar others succeeding and committing to their careers, their self-efficacies were positively impacted. Some participants identified role models who inspired them not to give up easily. Verbal persuasions also contributed to participants' self-efficacy. Some mentors continuously supplied positive feedback to participants. According to participants, they did receive such persuasions and encouragement from family and friends, but it didn't have much of an effect on them. One participant explained that her parents were very supportive and thought she was very smart, but that didn't motivate her much because, as she said, they were supposed to say these nice things as her parents. The verbal encouragements that came from mentors, senior management, and industry professionals seemed to positively enhance participants' self-efficacy. Some researchers explained the mentoring process in terms of the Social Exchange Theory. The theory deposits that material and social resources are interchanged among human interactions based on reciprocity norms (Blaue 1964). In the exchange relation between the dyads, the mentee's benefits can include improved self-efficacy (Richared *et al.* 2009). The challenging work which is identified by Kram (1986) as a career-related mentoring function, enabled the participants to further develop their expertise and ultimately strengthen their self-efficacy. The most prevalent function

of mentoring discussed was the coaching. It helped the participants acquire knowledge as fresh graduates, specifically, and later on, when working on new types of projects. The acceptance and confirmation mentoring function aided some in major career decisions in terms of changing jobs or adjusting. The continuous support and understanding of the mentor enhanced the self-efficacy of these females. Providing the mentee with positive feedback and advice on better performance encourages increased levels of self-efficacy (Deci & Ryan 1985). Also, the counseling activity helped them survive tough situations at work. For working moms who had to take some time off work to stay with their babies, returning to the workforce after some years was difficult. Having to sit for a series of unsuccessful job interviews, the counseling activity helped to restore their self-efficacy. The results of the quantitative testing showed a positive relation between mentoring and coping self-efficacy.

The Quality of the Mentoring Relationship:

The quality of the mentoring relationship gave more insight about the interactions taking place between the participants and their mentors. New findings in the mentoring literature show that the mentee's perceptions of the quality of the mentoring relationship pertaining to trust and satisfaction with the relation are considered to be a result of mentoring functions and an indicator of career outcomes (Eby *et al.* 2013). Several scholars have discussed the characteristics of the outcomes of mentoring to include trust and support (Ibry 2014).

Perceived similarity theory could explain the participants' choices of their mentors. Interestingly, none of the participants mentioned that she chose her mentor based on gender. The focus was on the fact that both shared the same technical and occupational backgrounds. This made the mentors more credible, knowledgeable, and efficient in the eyes of the participants. The mentoring relationship was stronger

and the impact of the mentoring functions appeared more on participants' self-efficacies. The similarity attraction theory also known as the surface similarity claims that mentor-mentee demographic similarities impact the quality of the mentoring relation (Black-Beard *et al.* 2011). Scholars have long advocated that race and gender are significant demographic similarities that could lead the mentee to identify with a role model (Hernandez *et al.* 2017). However, more recent research reveals that the duration of the relation or the amount of time spent together between the two has a more significant impact than the effect of the demographic similarities. The contact between the mentor and mentee has been previously discussed by many scholars. Kram (1985) describes the mentoring relation as constituting four phases: initiation, cultivation, separation, and redefinition. These phases mature with time. Although such an aspect of the mentoring theory has not been studied much, current searches indicate that the contact between the dyads plays an important part in the quality of the relation. More benefits are reaped from the relation when the mentors and mentee communicate more and when the relation lives for longer periods of time (Eby *et al.* 2013, de Janasz & Godshalk 2013). In the early stages of the mentoring relation where minimal contact is initiated, demographic similarities may foster high quality of the mentoring relation based on the paradigm discussed earlier. However, when both parties increase the level of communication and interaction, the demographic commonalities seem to have a diminishing effect on the quality of the mentoring relation and is expected to be substituted by psychological similarities such as common values, aspirations, and beliefs (Turban *et al.* 2002).

Perceived similarity, also known as deep-level similarity, acknowledges dyads' similarities based on values, attitudes and beliefs. The theory explains that such similarities are important elements in developing interest, friendship, liking, and, subsequently, the quality of the mentoring relation (Harrison *et al.* 1998). Although

few research discusses the types of similarities that cause attraction between the dyads, studies in the social influence literature discuss different types of similarities like hobbies, names, or physical attributes, even slight commonalities can impact the quality of the relation (Gehlback *et al.* 2016). In this study's case, participants discussed similarities in technical background, experiences, aspirations, and ways of thinking. The findings of Smith and Ingersoll (2004) reveal that when individuals received mentoring from mentors who share the same technical background, they tend to commit more to the profession. This falls in line with findings of Fletcher *et al.* (2008) where they studied inductive mentoring programs for new teachers and found that the quality of the mentoring was enhanced when both mentor and mentee share common backgrounds. The research also showed that the mentee benefited more from the mentoring relation when more time was spent between the dyads. Findings from this study reveal that the quality of the mentoring relation might be, at times, based on the fact that the participant lacked knowledge or information that the mentor can provide. When the participant felt there was potential benefit from the mentor, she made additional effort to further develop the relation. The mentor on the other hand, enhanced the quality of the relation when he or she showcased the achievements of her mentee and expressed his gratitude and pride towards her. The attitude of the mentor played a role as well. The relation was further strengthened when the mentor was friendly, expressed signs of collaboration, and allocated time for the participant. The impact of the frequency of interaction between the mentor and protégé has been discussed in several studies to positively enhance the quality of the relation (Fletcher *et al.* 2008). Some participants were offered formal e-mentoring programs by their organizations, but they were not interested because they thought the program wouldn't be beneficial due to long distance relations and minimal communication.

The mentoring functions' impact on coping self-efficacy was further enhanced when the quality of the relation was more developed. The quality of the mentoring relation fosters higher levels of self-efficacy (Chemers *et al.* 2011). Respect has been considered a major factor in the mentoring relation. The verbal persuasion of the mentor might not have the desired impact on the mentee's coping self-efficacy if the latter does not view the mentor as credible and trustworthy. The communication and interaction between the two will help unfold additional similarities in values, goals, and beliefs. Increased self-efficacy among minority Science students was due to high frequency of communication between the students and their mentors (Santos & Reigados 2002). The further the relation was developed, the more willing was the participant to ask for help from the mentor in difficult situations or request feedback after she completed a job which would ultimately enhance her self-efficacy. Recent research indicates that mentees who receive clear feedback and advice from their mentors have less intentions to quit their occupations and higher levels of self-efficacy (Lejonberg & Tiplic 2016). Mentoring that is based on constructive principals of learning rather than transmissive, increases the mentees self-efficacy (Richter *et al.* 2013).

The results of the structural equation modelling analysis indicated no significant relationship between MEF and CSE and also indicated that QUM has no mediating impact on this relationship. This can be explained in light of the attribution theory. Two aspects that are worth considering in light of this theory (Kelly 1973) are the fact that some participants thought that mentoring for females in STEM industries might be an added value rather than a major contextual support. The other issue is that many have attributed their success solely to themselves. One thing that is clear from the dataset is the high level of self-efficacy that the participants enjoyed. The theory explains that individuals with high self-efficacy tend to be prone to self-

serving bias where they believe their better job performance, for example, is an outcome of their own efforts. Although they explained that they received various forms of support from their mentors, they seemed less appreciative to such mentoring support. Boore and DeBrabander (1997) explain that individuals with low self-efficacy tend to be more conscious to mentoring functions and are usually waiting for help or a push from their mentors to perform certain tasks. This has led many scholars to conclude that mentoring support is less perceived by individuals who tend to have higher self-efficacies.

Personal Learning Development:

In industries such as STEM, updating one's knowledge is considered a competitive advantage. The IT profession is considered, for example, an occupation where fiercely changing technologies dictate continuous learning so the individual can stay in these fields (Major *et al.* 2013). Learning, acquiring new knowledge, and getting exposed to new technologies were major issues discussed by the participants in this research. Some considered the ability to learn new things was a main factor that helped them succeed in committing. The learning process was of interest to the participants because they felt challenged. Learning was also one of the solutions that they resorted to when they felt stuck at work, bored, or not being challenged as they wish. They also resorted to learning when they had to deal with novel situations. One of the main duties of the mentor is to aid the mentee in the learning process about the industry and the organization in which she operates. Thus, the wish to learn has important ramifications on the mentoring relation (Kagan 1994). Mentors have been considered a vital resource for personal learning development. Mentees can learn vicariously by watching others' behaviours, specifically a role model. Mentoring can improve the personal learning development via increased communication and exchange of beliefs, ideas, and feedback (Kram 1996). In line

with the findings of this research, Lankau and Scandura (2002) explain that mentoring positively impacts mentees' new skills through coaching and assigning challenging work. The psychological functions of mentoring enable the mentee to feel safe, inquire about unclear issues, talk about any unpleasant emotions she might be going through, and take risks (Kram 1985). The counselling activity enables the mentor to listen to the mentee's problems and try to advise and help to come up with useful solutions. In case the mentor is viewed as a role model, the mentee will mimic his or her attitudes and beliefs. Such functions elaborate how mentoring positively influences learning developments. Findings from a recent meta-analysis that studied 173 major searches on mentoring revealed that a modest relationship between mentoring functions and learning developments exist (Eby *et al.* 2013). The mentor advances opportunities for the mentee to further expand her learning opportunities. This may be done through the career-related functions of mentoring where the mentor would be teaching and guiding the mentee through new knowledge and experience. This new knowledge will help the mentee to deal with obstacles or challenges that she might face in the workplace which will ultimately enhance her self-efficacy (Hunter 1986). By exposing the mentee to challenging work, the mentor would also be exposing the latter to new learning opportunities and grooming her for higher level job performance (Lahkua & Scandura 2002). The role modelling function of mentoring further enhances the personal learning development of females in STEM where they would mimic the role model's behaviour and beliefs. Kram (1986) defines personal learning development as the act of acquiring knowledge, proficiency, and skills that aid an individual in career development. The personal learning development is improved by the feedback that the mentee receives from the mentor, whether from the coaching activity or the acceptance and confirmation. These findings fall in line with previous research that indicates that science students enjoy better learning achievements when they are exposed to

positive interactions with their mentors (Lundberg & Schreiner 2004). The majority of the participants were particularly interested in developing their skill-based learning which includes interpersonal skills such as problem-solving, communication and analytical skills.

Mentoring is considered an adequate tool to encourage an individual to invest in learning development and generate favourable work outcomes that would ultimately enhance her competitive edge. Personal learning indicates the perceived amount of knowledge a person acquires. It also includes interpersonal skills, competencies, and problem-solving skills, all of which aid the participants to further advance their careers. Scholars have indicated the important role that this mechanism plays in advancing the benefits of the mentoring relation (Lankau & Scandura 2002). They explain that the effort done by the mentors in offering support is positively related to the mentees' personal learning development. The literature on active learning systems explains that trainees best learn when they eagerly engage in acquiring skills and knowledge (Bell & Kozlowski 2014). This falls in line with the self-determination theory that claims that learning is a self-directed mechanism that is highly operative when an individual is fully self-motivated and willing to engage in learning activities (Ryan & Deci 2000). The findings of this study reveal that the majority of the participants had high learning self-efficacies. They believed they were fast learners and that being exposed to new things did not intimidate them. On the contrary, many explained that one of the reasons they decided to work in STEM is because it offered them an opportunity for continuous learning. Scholars explain that the social context further motivates learning autonomy for individuals (Gagne & Deci 2005). The participants of this research mentioned that the nature of the STEM industry dictates continuous learning and development. These industries are fast-moving on new trends and practices. In addition, part of the support that the

participants talked about was the motivation and guidance they received from mentors. Their mentors would recommend for them certain trainings or workshops to attend or certain certificates to study in order to enhance their skills and update their knowledge. Some mentors provided the participants with study materials needed for the certificates. Others were understanding and supportive when the participants enrolled in master's programs for example and had to leave early from work to attend classes. They would facilitate for them taking some time off to study. Some also sponsored the participants financially to pursue trainings and workshops. In one case, the mentor provided coaching support for his mentee in terms of helping her out with her master's thesis. He assigned time to sit and discuss with her the updates of her work and provided her with feedback on how to enhance the thesis. Mentor's autonomy support, which is defined as the degree to which mentors grant mentees with opportunities to self-express their actions and also support them when they engaged in such actions, enhances the learning process (Gange & Deci 2005). This can be seen throughout this study via the challenging work and exposure career-related mentoring functions. The mentor assigned the participant on a project which as a junior architect was very challenging for her. This increased her knowledge and skillset and gave her privilege in advancing her career. Some mentors facilitated chances for their mentees to showcase their proficiencies by letting them attend important meetings with clients or senior management. In one example, the mentor, an architecture consultant and university professor, invited the participant to one of his lectures and asked her to explain about LEED architecture. He introduced her to his students as one of the prominent experts in the field. Such opportunities and support motivated the participants to pursue further learning opportunities. Moreover, these situations provided the participants with pertinent information and chances for autonomy. They built on recognizing the participants' feelings and thoughts while decreasing the pressure and demands of learning. This

helped the participants to proactively engage in learning development processes and be persistent. The majority of the participants, as a result of such mentoring functions, sought out new learning opportunities and prearranged their actions based on what they wanted to achieve and what they were interested in rather than what they were unable to do. Enhancing the learning development of participants was impacted in some cases by the support of friends and family which falls under peer mentoring in this research. Family members expressed pride towards their daughter's pursuing master's or PhD degree which motivated her to work hard. Friends and colleagues complemented some participants for being able to balance both the demands of work and those of university. In addition to being autonomous and taking responsibility for their own learning development, individuals should first understand what exactly they need from the learning process (Rogers, 2002) and this was one of the main duties that the mentors helped the participants identify via coaching where they offered career advice and guidance. The qualitative findings of this study fall in line with Eby *et al.*'s (2004) research that confirmed a positive relation between mentoring relations and learning. Other studies as well indicate that protégé's learning increased when the mentor offered more help in terms of the learning process (Jones 2009). Lack of learning, for example, could lead to the end of the mentoring relation (Hezlett 2005). One of the participants identified her co-worker as her mentor ever since she joined the company 10 years earlier. She explained that she was looking for another mentor within the firm since her company offers formal mentoring because she felt she reached a point where she was not learning much from her current mentor. Two factors that have been cited by researches that impede learning development at work are: work overload and the instability of the organization. One of the participants who moved from Egypt to Dubai expressed her frustration because she felt she was being pressured by unrealistic deadlines at her new job and was falling behind in her learning

advancements. She said she was not able to catch up with any workshops or conferences because of that. Another participant was not satisfied with her current company and felt she was not learning anything new because the firm was going through a financial crisis and was downsizing on employees.

The results of this study show that mentors enhanced the personal learning development of the participants by guiding and coaching them about the technical knowledge they need for the job. They also coached them in some cases about what was expected of them from other members of the organization especially senior management. They taught them, usually through role modelling, about the attitudes and behaviours they are expected to carry. In other words, not only did the mentors enhance the personal skill development of the participants, but also in an effort to groom them for senior posts, as was the case with two participants, they aided them in improving their relational job learning. Coleman (2011) explains that employees nowadays should be able to widen their attention on the links between actions and outcomes. Mentors also improved the learning development of the participants by motivating them to discard their own mental frames and step into others'. One of the participants explained that her mentor helped her develop her architectural skills by always reminding her to think like an architect not like a draftsman. He would push her at times and make her redo her designs in order to learn and improve. Another participant said her mentor took her with him to meetings where she got the chance to interact with suppliers and contractors in order to view things from a different perspective. Through the sponsoring, participants were able to access different social networks specifically among senior management. This also allowed the participants to learn more about the organization and develop career visions about their career paths and advancements. Psychological support also had a positive impact on the participants' learning experiences. Two participants who met at the early stage of

their careers developed a deep friendship and became each other's mentors. For 10 years, they were able to help each other face difficulties in the workplace by trusting each other and sharing their fears and anxieties. One of them said that, as a female minority in the Engineering field, she felt she was not understood by her male colleagues although they were helpful and friendly. Her mentor was a great listener and helped her look at things from a different perspective. She provided her with useful feedback since she also, as female, went through similar obstacles in her career. The fact that they both were able to share such ideas and feelings helped them develop their rational job learning.

Throughout this study, learning is viewed as an outcome rather than a process. The analysis focused on understanding what happens as the participants pursue learning specifically in terms of self-efficacy. Personal learning has been found to cause changes in behaviour (Lankau & Scandura 2002). Research indicates that personal learning development advocates proficiency in dealing with problems (Gouillart & Kelly 1995). Several participants mentioned that they faced technical barriers at the beginning of their careers that hindered them from solving work-related problems. One of the solutions they found was to research and ask colleagues and try to acquire as much information as possible. After working on enhancing their skills and expertise due to personal learning some were able to enhance their work performance. They felt more competent due to their developed communication skills which enabled them to interact with clients, co-workers, and senior management. These skills and competencies they developed through personal learning had a direct impact on their work performance where they felt more in control. Personal learning also results in change in attitude and affects how employees respond to organizational environments. The participants who went through personal learning processes developed more positive attitudes towards their work because they were

more confident. Some participants developed better problem-solving and communication skills resulting in better performance and heightened feelings of competency which strengthened their self-efficacy and allowed them to receive favourable feedback concerning their work contributions.

3. Research Question Four:

The impact of coping self-efficacy on occupational commitment:

The fourth research question asked how does coping self-efficacy impact occupational commitment. The results of the quantitative testing also support the hypothesis that CSE impacts OCC. Coping self-efficacy refers to convictions about the person's capability to surmount certain barriers (Bandura 2006). According to Bandura (1986) coping self-efficacy impacts an individual's decisions, her efforts to surmount barriers, her emotions of distress and tension, and her attitude and coping behaviour. The strong coping self-efficacy of the participants was behind their persistence and commitment to their occupations. The participants discussed how they were able to deal with various stressful issues at work by being so confident that they could overcome these barriers. They built on their past experiences to improve their self-efficacies. They also believed that they had the skills needed to perform the job and solve any problem that might arise. They believed they were fast learners and could learn new things that came their way. Participants, after some experience, were aware of certain demotivators in their career life whether in the organizational context or within their social network. They were able to limit the negative effect of such demotivators on their moral by not focusing on them. They isolated themselves from negative and critical people, for example, and instead enjoyed the positive encouragements they received from their families and friends. In many cases, the verbal motivation they received from their social network helped in enhancing their moral and made it easier for them to deal with stress and preserve

interest in their occupations. Many participants had a high degree of career resilience especially those who had to adapt to new work environments, take risks, or pursue new achievements.

Scholars have long argued about the important impact that this cognitive variable plays in shaping human agency career development and outcomes. It acts as a motivating force that enables individuals to perform certain actions, persist, and follow their goals. As discussed earlier, Bandura (1986) explains that self-efficacy is informed through four main sources: mastery experiences, vicarious learning, social persuasion, and psychological indexes. The success and achievements of the participants helped strengthen their coping self-efficacies more through these sources. Specifically, the mastery experiences where they would explain that they were confident in successfully performing a job because they did it before successfully. Scholars indicate that individuals with protean attitude enjoy a more developed psychological capital where self-efficacy is one of its elements (Direnzo *et al.* 2015). The analysis of the interview dataset revealed that coping self-efficacy was a significant factor in the lives of the female participants. Coping self-efficacy was mostly demonstrated when the participants discussed a certain obstacle they had to face and overcome. They had a noticeable sense of self-confidence that was mainly present when they discussed their feelings about their achievements after overcoming these “challenges”, as they labeled them. The high degree of self-efficacy enabled some to manage demotivating incidents or individuals they met along their careers. They were able to control such demotivating effects and not allow them to affect their career decisions. Common situations cited in the literature that pertain to the IT work environment include: unanticipated continuous change in user demands, the challenge of keeping up with ever-advancing technologies, and unrealistic job demands (Shih *et al.* 2013). These occurrences can also be sighted in

other STEM domains which make commitment more challenging, not to mention the under-representation of females and the chilly climate they have to deal with.

Drawing on their self-confidence and motivation, these females were proud of their interpersonal skills. They considered these skills as a key aspect that enabled them to further commit to their occupations. The high degree of coping self-efficacy was behind the decision of some to take risks in their careers such as change jobs or move to other departments despite criticisms they received from friends and colleagues. Self-marketing was also a strategy that some used to promote their careers. As discussed earlier, coping self-efficacy was a prevalent theme in the interview dataset. It played a major role in their career choices, beliefs, persistence, and emotions. They seemed to deal efficiently with barriers and difficulties. Many participants used the term challenges when discussing the barriers they had to overcome in their careers. This seemingly positive outlook on things, along with their persistence that started early on during their years at university where they were also a minority, helped them to commit. Some participants explained that they were aware and prepared for the harsh environment in the workplace while at university where some of their university professors told them it might be difficult in the workplace and advised them not to give up easily. Others felt what it really meant to work in a male-dominated industry early on since university days where they would be the only females in class or on a team. They kept persisting when they felt they were stuck or unsatisfied and exerted more effort after they thought they failed at times. Some participants mentioned that being a female who works in STEM was actually to their advantage. They believed it gave them an advantage in terms of knowing how to deal with female clients and understanding their design requests, for example, more than their male co-workers. They built on that to further enhance their career. At the

end of it all, they explained that they were satisfied with their achievements, but they wanted more and still strived for more experiences and success.

Continuance occupational commitment implies a person keeping to their occupation due to the difficulties entailed by leaving for another, or it may be due to financial constraints (Meyer & Allen 1997). Further explanation on this notion can be seen in the investment model that social exchange theorists built on to introduce the concept of investment (Rusbult 1983). It pertains to the resources that a person has devoted for a certain relation. These investments act as a psychological link that heightens the commitment because of the high costs of ending the relation. The amount of effort or investment the participants put on building their coping self-efficacy has increased their continuance commitment to their occupations. When discussing the reasons why they were committing to their occupations, the participants recall the hard work they had to put to overcome certain barriers or the time or money they invested in their education. These investments for them represent a value on hand and a sunk cost simultaneously preventing them from moving to another industry.

A common stressor among working mothers, including those who have been interviewed for this study, is role conflict (Duxbury and Higgins 2003). Even single participants discussed their apprehensions concerning having a family in the future. Individuals who go through role conflict are more likely to experience increasing turnover intentions and lower organizational commitment (Harr 2004). Research indicates that perceived control affects the quality of women's experience in this area (Carrier & Roskies 1993). Other researchers concluded that hardiness as a personality trait made up of challenge, control and commitment (Kobasa 1979) is negatively associated with job stress and work-life balance (Bernas & Major 2000). Similarly, self-efficacy is considered an important factor in decreasing stress resulting from multiple roles (Martire *et al.* 1998). Participants who had to struggle

with family responsibilities at some point during their careers were able to commit due to their high self-efficacy. Some of them had to leave the industry for some years and found it difficult to return, but they persisted and worked hard in order to finally get back in the market. They refused to settle for something outside STEM. Others still worked while they had to attend to parental responsibilities. They positively assessed their coping skills. They explained that they were proud for starting a family and at the same time still being able to continue working. They also explained that although they were moving at a slower pace in terms of career advancement than their co-workers since some of them had to decrease their working hours, it was only a matter of time before they would be able to catch up. They perceived the obstacles facing them in a lower level of distress. As working moms, their strong self-efficacy heightened their belief that they had the needed skills to cope with the pressures of work and family, they were able to control their stress levels, showed a stronger perseverance in the face of adversaries, and used their time and energy efficiently.

Personal Learning & Development:

The results of the quantitative test reveal that PLD is not a moderator of the relationship between CSE and OCC. This may be due to several factors. STEM industries rely heavily on learning and knowledge updates. Females operating in STEM may not be receiving enough learning opportunities that would ultimately motivate them and increase their self-confidence compared to their male colleagues (Dekoulou & Trivellas 2015). Such lack of learning opportunities may lead to problems with career advancement and job dissatisfaction that decrease occupational commitment (Mulraney & Turner 2001). Researchers indicate that providing employees with learning possibilities can improve their job satisfaction (Eylon & Bamberger 2000). Choi & Jacobs (2011) explain three possible ways individuals can learn. These include learning with other parties such as sharing information and

knowledge such as working in a group project. Self-experimentation, another way, is when an individual personally seeks experimentation and exploration. Finally, external scanning when a person is involved with learning activities such as attending conferences, trainings, reading research, etc. All of this influences a person's learning and development that would ultimately influence the strength of the CSE-OCC relationship. Several participants in this study explained that they faced challenges in pursuing learning opportunities due to lack of time. The heavy deadlines and long working hours they had to exert at work made it challenging for them to pursue an educational certificate or degree. Consequently, some decided to delay their learning plans for the future. The literature presents a number of cases where females working in male dominated industries such as STEM miss out on learning opportunities because they lack the proper channels and networks. Learning and development includes females being exposed to coaching, having access to networks, undergoing certain organizational performance plans to understand their learning needs, and having a mentor (Marsick & Watkins 2003).

Protean Attitude:

The participants explained that the major driver leading them to pursue a career in STEM was based on their personal values. They discussed their love and interest in STEM as occurring from a young age. The values-driven aspect of a protean attitude was also considered a major factor that the participants advise other females who are thinking of joining STEM to consider. Given that these participants were always looking for new challenges and learning experiences, they were able to enhance their skillset. This accorded them a strong sense of employability and freedom. They were able to create growth and learning opportunities for themselves outside the boundaries of their organizations. They were able to enjoy the success of their achievements, feel proficient, autonomous, and satisfied due to their attitude of self-

directedness. They attributed this success to their own efforts which further strengthened their self-efficacy.

Self-efficacy is related to the concept of adaptability which is embedded in the protean attitude theory. The participants' strong self-efficacy enabled them to acquire knowledge and adapt faster to new jobs, organizational environments, colleagues or learning situations. It empowered the participants in self-managing and directed their careers. Individuals with high self-efficacy are more confident and eager to engaged in work related activities (Gubler *et al.* 2014). They experience autonomy and self-confidence (Hall 2002) that enhances their self-directedness and personal values. Participants took career decisions based on their perception of their adaptability. They believed they can succeed in STEM because they were able to adapt to new changes continuously. They were ambitious and this was seen by the amount of effort they exerted to reach what they want. Some participants had to work for long hours as full-time employees and university students as well. Because they had to put in so much effort, they took responsibility for their own success. The high degree of self-efficacy enabled them to believe that they were capable of making the right career decisions on their own and exhibiting high degrees of self-reliance. They also relied on themselves in terms of solving problems and, according to many, they only reverted to their mentors when they exhausted all possible solutions. Many were also looking for new challenges, in fact, they viewed their own commitment to their occupation as a major challenge whether they were mothers trying to balance work and family or female minorities on a construction site. Their self-efficacy allowed them to persist in the face of hardships believing that at some point things get better. Some participants were not happy in their working conditions, but they were confident they that, if they persist, something better would

come along. Their perceived ability to succeed in new learning and career-related challenges strengthened their protean attitudes.

The protean attitude, as in being ambitious, adaptive, optimistic and always looking for new challenges and goals, that the participants had made them thrive for continuous personal growth and a sense of autonomy. On several occasions, they shared experiences where they fully believed they were capable of making the right career decisions on their own. They relied, in most cases, on their own sense of judgement to pursue different strategies for development. When they felt that the organizations they worked for limited their autonomy or personal growth, the participants started to look for new opportunities elsewhere. The more the participants were able to acquire knowledge, the more they felt they can contribute and further enhance their occupations. The participants formed favourable work attitudes as a result of their increased skill development and confidence. Some participants started planning their own side businesses through their social network. Others joined formal mentoring programs outside their organizations to expand their social network and enhance their skills. In doing so, they were able to have greater control of their work environment and feel successful. The efforts that the participants put in investing in their work resulted in more knowledge, better performance and a stronger commitment to their profession. Strong adaptability skills also were a factor for females to further commit to their occupations. They were able to adapt to new environments easily. They were flexible in terms of dealing with challenges and had a high degree of self-reliance and assessment. Aspects of self-directedness, such as being ambitious and looking for challenges also aided the females to commit. The achievements and success that the participants enjoyed at some point in their careers was in some cases due to their self-directedness and personal values career management. Some participants

demonstrated proactive attitude, as part of protean attitude towards their careers. They were able to shape work occurrences to serve their own benefits. They proactively searched for new continuous knowledge that would improve their performance. Their improved performance led to favourable work situations, job satisfaction and ultimately increased commitment. Even when facing unfavourable work situations, some participants were proactive in dealing with the situations. In the case of one participant who was faced with discriminatory attitudes at work by a co-worker, she sought to deal with the problem with HR and senior management and also started exploring new job opportunities within her domain. Proactive individuals have been found to take initiatives in advancing their own careers by planning, consulting with experts, and developing their skills (Seibert *et al.* 2001).

The values-driven aspect of protean attitude also allowed the participants to define their own formula of psychological success that resulted in further occupational commitment. They believed they had the power to achieve something useful for society through their work. When trying to understand the effect of protean attitude on occupational commitment, most of the participants discussed their commitment based on personal values of love, desire, and interest. For them, it was a dream and a desire to work in STEM from the start, it was what they believed in and what they enjoyed doing the most. Affective commitment is seen to be connected to occupational turnover (Colarelli 1998) which is seen as a loss to the organization, and the society as well, due to the loss of experience that a certain profession will endure. They also discussed the psychological success they had thanks to the nature of the profession. They felt they were contributing to society at large in some way, whether the participant was a roads engineer who explained her job made people's lives easier or an energy engineer who felt she had a social responsibility towards the environment. The findings of this study reveal the significant role that coping

self-efficacy plays in strengthening occupational commitment as well. Coping self-efficacy played a major role in motivating the participants as they faced various challenges because they are under-represented in STEM industries. The strong and dominant impact of coping self-efficacy in enhancing occupational commitment might be one of the reasons why the latter decreases the impact of protean attitude on occupational commitment when testing the moderation relation. This finding supports previous research that stresses the important role self-efficacy plays in career outcomes (Hirschi *et al.* 2016).

Protean attitude was not found to moderate the relationship between coping self-efficacy and occupational commitment. This might be the case because the respondents had strong self-efficacies that was sufficient to increase their commitment. In such situations, individuals build on past experiences and vicarious learning and persist in the face of difficulties. Individuals with high self-efficacy tend to feel confident, autonomous, and employable. The belief that they can overcome barriers makes them interested in new challenges and experiences. This strong self-belief enables them to be adaptable and proactive. This provides them with a sense of success that they attribute to their own efforts. Ultimately, this may overshadow the impact of protean attitude and will strengthen their commitment despite the presence of adversaries. All of this may explain why protean attitude failed to moderate the relationship between coping self-efficacy and occupational commitment.

Goal Setting:

The results of structural equation modelling analysis support the impact of goal setting as a mediator of the relationship between coping self-efficacy and occupational commitment. Drawing from social cognitive career theory, this study claims that individuals who have goals tend to be more in control of their career

decisions, career advancement, and occupational commitment. Such goals are identified by the individual based on her personal beliefs, values and desires in an attempt to reach a favourable outcome. Therefore, by setting goals, individual's self-efficacy strengthens her occupational commitment. These findings fall in line with other research that discuss the positive impact that goals have on commitment (Fernandez *et al.* 2006, Van Hooft & Woordzij 2009). High efficacious individuals tend to set higher goals for themselves (McKee *et al.* 2006). Therefore, their outcome expectations are also greater compared to individuals with lower self-efficacy. High outcome expectations may cause the individual to exert more effort to enhance her performance. Self-efficacy has been shown to impact career outcomes either directly or indirectly through goals.

4. Research Question One:

The question of why and how some females are able to commit to their occupations while the majority cannot is of great interest and importance to scholars, career advisors and organizations at large. The fast-growing industries of STEM are attracting talented individuals and although the number of females in some of these industries has been on the rise, the leaky pipeline is still a major concern. Females opt out of these industries after some years for various reasons. This drastically affects the available talent pool. The pressure is high on organizations to attract and retain such talented employees who will aid in technological innovations and provide a competitive edge. Employees on the other hand, are starting to adopt new career strategies to promote their success and grant them employability. The findings of this research fall in line with the new career strategies and theories. The participants were successful in committing to their careers despite being under-represented by adopting a protean attitude. They demonstrated that they were responsible for pursuing career opportunities that enabled their career development

and advancement. They also showed that they can manage their careers according to their own interests. The participants pronounced that they were independent of organizational boundaries where they sought learning and career growth opportunities from various other sources. Their autonomy, proactivity, and adaptability enabled them to foster new learning advancements, expand their network, and adapt to changing environments. They were also able to thrive in STEM industries due to continuous self-assessment and awareness. These attitudes highlighted for them the needed skills and competencies they should develop and build on. The participants also had a high degree of persistence and ambiguity tolerance especially at the early stages of their careers when they lacked experience to deal with barriers and unpredicted situations. They were driven by their own personal values that allowed them to direct their choices and decisions based on their desires and preferences. In addition to protean attitude, the female participants used their strong self-efficacy to motivate their actions and behaviours. Their coping self-efficacy aided them in establishing and maintaining learning developments that enhanced their job skills and performance. It positively impacted their beliefs of persistence, success, and career commitment. Building on the four sources of self-efficacy, the participants coping self-efficacies further developed and increased. The mastery experience is the most effective source of self-efficacy (Bandura 2006). The participants relied on successful past experiences from their university years at the beginning of their careers to motivate them. They described incidences where they had to deal with being minorities from the early years of college. They also explained how successful they were in managing stress and deadlines back then. They also drew on past experiences throughout their careers that enhanced their beliefs about their capabilities and success chances in STEM. The positive past experiences motivated some to put in more effort and hard work to commit. The negative experiences, as well, for some acted as motivators. Some remembered having to

work in domains different from STEM at some point in their careers or having to stay at home for some time due to family responsibilities. These past experiences raised their awareness on their desire to continue working in STEM fields. The second source that they built on was vicarious learning which is observing social or role models and attempting to mimic their behaviour or beliefs. Although the participants operated in environments where they were minorities, having females who work with them enhanced their coping self-efficacy especially, if these females were higher in seniority or had been working in the industry before them. Single participants also acknowledge their anxiety to becoming mothers and having families. Watching other co-workers or friends who were able to cope with dual responsibilities eased their own anxiety and enhanced their self-efficacy. Verbal persuasion also informed the participants' self-efficacy. For some of them, their university professors heightened their awareness about the challenges they might face in the workplace. Their family members also encouraged them by expressing their pride or being there for them in difficult situations. Spouses who came from the same technical background had a positive impact on participants' coping self-efficacy. Mentors also played a role by continuously reminding the participants of their big potentials. High levels of coping self-efficacy were shown when they discussed their inter-personal skills, when they talked about how motivated they felt because they were working in STEM, and the confidence they manifested in the face of difficulties. A third factor that played an enormous part in enabling participants to commit to their occupations was mentoring. The participants discussed various types of support received from their mentors. The career-related functions such as coaching and challenging work enabled the participants to improve their skills and perform better on the job. They were taught practical aspects of the job as compared to the theoretical knowledge they acquired at university. This made them feel more confident and increased their job satisfaction. The mentors sponsored the

participants and aided them in promoting their careers by allowing access to social networks. The participants were exposed to different perspectives and expertise which increased their understandings about the organizations they operated in and the domain in general. Constructive feedback and open communication enhanced the quality of the mentoring relation further. The mentors offered the participants opportunities to showcase their achievements and proficiencies in an attempt to get their work recognized. The protection function helped the participants in tough situations especially when they were faced with problems they didn't know how to solve on their own. Although the majority of the participants focused on career-related functions and how important those were in advancing their careers, psychological functions also enhanced the participants' coping self-efficacy and strengthened their commitment. The mentors offered counselling in tough situations for the participants where they had to take an important career decision for example or when faced with an unpleasant work situation. The mentors also supplied continuous assistance and respect that increased participants' coping self-efficacy. The mentoring relation sometimes grew stronger and turned into friendship where both enjoyed a caring relation beyond work. This relation fostered encouragement and trust. The participants felt at ease to inquire about certain life or work-related issues. They were free to discuss their anxieties without fear of being judged. They were able to engage in candid conversations about gender and culture with the mentors whom they considered friends. Finally identifying with the mentor and considering him/her a role model facilitated further learning and understanding about the work environment.

One aspect that is worth considering is the fact that research discussing women's career development has singled out external and internal obstacles hindering women's career advancement, affirming that career decision making and

advancement for women tend to be more complicated than men (Maltin 1992). One of the interventions proposed to improve female's career development is to increase women's self-efficacy relating to aspects of coping, decision making, and careers. A number of participants explained the gender role socialization they had to face when talking about challenging stereotypes and pursuing their career or education of choice. They explained that unlike other females who settled for a career in teaching, for example, they enjoyed challenging the stereotypes, found it interesting to prove others wrong and graduate from Engineering school, and then build an Engineering career. Others explained that their desire and interest in STEM was stronger than social expectations. This indicates that their self-efficacy was a strong motivator that enabled them to take decisions accordingly. Few participants discussed the lack of awareness they experienced as young girls struggling to choose a college domain. Their awareness about STEM and their potentials grew and developed along the way as they graduated and started working. As a result, they urged other females who are about to start college education to be open to different educational and career options and not to limit themselves to gendered roles.

7.2 Contribution to Knowledge:

The main contribution to knowledge that this research offers is in indicating the importance of three aspects that strengthen the occupational commitment of women in STEM fields. These aspects are mentoring as a contextual factor, self-efficacy as an internal driver, and protean attitude.

Mentoring as a Contextual Support:

Overall, and consistent with previous research, the results of this study contribute to SCCT by drawing attention to the important role that mentoring plays as a contextual factor in enhancing the coping self-efficacy and occupational commitment of

females working in STEM. This research offers detailed insights about both the career-related and psychological related functions of mentoring. In addition, the quality of the mentoring relationship indicates that commonalities rather than demographic factors, may have a positive impact on the quality of the mentoring relations.

The study sheds light on the antecedents and consequences of perceived similarities in terms of identity formation and its importance on the quality of the mentoring relation. Finding and asserting similarities, even minor ones, could enhance the perception of the similarities which can positively impact the quality of mentoring relationships. This is important since gender was found in this empirical research study not to be influential as one of the elements of demographic similarity enhancing the quality of the mentoring relationship. This is consistent with a group of studies reported in the literature (e.g. Hernandez *et al.* 2017).

Another contribution to knowledge that this study offers is it demonstrates the need to adopt a more integral stance in research on role models and professional identity. It also offers more knowledge and understanding about the reasons behind the leaky pipeline that STEM industries are suffering from. In addition, it stresses the need to heighten awareness and knowledge about role models.

Some participants described how the lack of available role models made it difficult for them to identify with one. This issue has been emphasised in many previous studies, where the lack of role models for females in STEM industries not only affects their occupational commitment, but also their likelihood of reaching senior posts (Sealy & Singh 2010). One explanation for this is the low number of females perceived to be similar to those searching for role models. Gibson (2003) identifies two dimensions of role models: close/distant and up/across (down). The first structural dimension pertains to how well the female employee knows a potential

role model. The second dimension refers to the degree of seniority of that person. The higher the posts of the females in STEM or the longer the years they have been working in these industries, the less is the availability of role models that they will be able to identify based on perceived similarities and in degrees of closeness compared to their male co-workers, as Gibson (2003) discusses. This may partially explain the reasons many find it challenging to commit to these occupations. This might also offer a reasonable explanation for the leaky pipeline where more than two thirds of females exit STEM professions after 15 years of graduation (Hill *et al.* 2010, Hunt 2016, Frehill 2008).

Traditional career theories claim that a person's self-confidence becomes stronger as he or she gets older and acquires more experience (Super 1957, Erikson 1950), therefore, it has been claimed their need for role models weakens. However, these theories do not offer a clear explanation concerning the high percentage of females who leave after more than 10 years of working in STEM domains. The desire to identify a role model does not decrease with age, but rather females alter the focus they have placed on some dimensions. In their early stages of career, individuals attempt to identify positive role models to copy. They also try to find close similarities and closeness in range with certain individuals to identify them as their models and then mimic their behaviours and beliefs in order to be able to develop their own professional identity (Gibson 2003). The mid-career stage is considered the stage characterized by refinement of the self-concept refinement. For participants who have been working in STEM for over 2 or 3 years, some explained that, in comparison to their early years in the industry, they feel they had a clearer idea as to where they want to advance their careers. Some moved on from their mentors because they felt the relationship was not offering them anything new anymore. Some explained they were at a crossroads in their careers and would like additional

guidance. A few also explained they did not have a lot of career choices and they were only remaining in their current jobs because there were no alternatives available at the moment. Gibson (2003) explains that minorities in employment contexts go through these challenges in their mid-career due to the lack of role models. At this stage, individuals create compound role models from diverse people for various reasons. While companies may feel that female employees at this stage in their careers can find their own way, they may be risking losing an important cohort of talent by not recognizing this developmental requirement. Losing valuable experience and talented employees, in particular, the minority group of females in STEM industries is a critical issue for organizations and the wider professions and labour markets. By recognizing this need and attempting to address it, organizations may be able to retain females and begin to contain the impact of the leaky pipeline. Bandura (1977) explains that learning to acquire behavioural skills has to be improved through experimentation. In the case of role modelling, mimicry is the most common form of experimentation (Ibarra 1999). In her study, Ibarra (1999), as in Gibson's (2003) study, sheds light on the importance of selective imitation where the individual incorporates features from several role models to design a self-tailored identity. In contrast, individuals who adhere to their old selves would find it difficult to develop existing and new skills and will begin to experience longer-term disparities between their ideal and present selves. This study contributes to knowledge in terms of explaining why females in STEM tend to struggle as they reach the mid-stage of career. They are faced with a scarcity of role models which limits appropriate formation of their mosaic, self-tailored career identity and persona.

Another contribution to knowledge that this research offers is in discussing the significant impact that personal learning and development has on the occupational

activities and skills of females in STEM fields. Females who work in STEM should find new and continuous learning opportunities for themselves that aid them to improve their skills and gives them a competitive edge in these fast-changing industries. Development can elevate their job performance and attainment, which can all reflect positively on their self-efficacy. It may also increase their job satisfaction as well as occupational commitment. Although personal learning and development has been considered an important result of the mentoring relationship, the antecedents of personal learning within the mentoring relation is an area yet to be further explored. Empirical research indicates that mentoring functions enhance the learning and development of the mentee, however, not much has been discussed concerning the factors contained in the mentoring process that motivate further learning for the protégé (Liu & Fu 2011). The findings of this study have attempted to provide an in-depth explanation concerning the career and psychological-related functions of mentoring. The study also provides detailed explanation of the impact of both personal learning and development, namely personal skills development and rational job learning. It also contributes by reiterating Lankau and Scandura's (2002) call through their prominent work on mentees' personal learning to further examine the potential outcomes of mentoring.

Through helping to draw on the advantages of mentoring, this study seeks to motivate increased awareness amongst organizations and educational institutions about this contextual support system's wider ramifications on both self-efficacy and occupational commitment as a career outcome.

Self-Efficacy as an Internal Driver:

This study has contributed to knowledge by identifying self-efficacy as an internal driver for women who successfully commit to their STEM occupations. While trying to investigate the important ramifications of coping self-efficacy on participants'

careers, the study delved deeper into the process to try to understand the sources of participants' self-efficacy that were considered when assessing their capabilities. Verbal persuasion appears to be important for participants when they are new to the workplace. Verbal encouragement and persuasion from their family and friends seems to have a diminishing effect, whether it was positive or negative, on the participants' self-efficacy as their work experience expands. More importance was given to past work experiences as participants advanced in their careers. Their self-efficacy grew stronger as they drew on their achievements and success stories of the past. Vicarious learning also played a role in helping participants to role model the behaviours of some mentors. Psychological arousal also played a part in positively influencing the self-efficacy of participants when they might be struggling with role ambiguity due to new work environments or role conflicts as working mothers.

Various research has discussed the importance of career interventions to increase the self-efficacy of females operating in male-dominated industries (Bandura 1986, Brown & Lent 1996). For example, interventions targeted at increasing Career Decision Making Self-Efficacy (CDMSE) can eliminate the impact of gender role socialization that was discussed earlier and tends to unilaterally dictate some girls' and females' educational and career choices. This strategy can also help to develop awareness about the vast career options that females can choose from. Interventions to enhance CDMSE can have a positive influence on career attitudes (Luzzo 1993), self-confidence, career indecision (Taylor & Popma 1990), and gender role stereotypes. As some participants indicated females nowadays do not so much lack freedom of choice but rather they lack awareness. Thus, self-efficacy interventions can increase the exploratory behaviour of females within themselves and their environment. Based on the fact that low self-efficacy might cause females to make a premature decision to eliminate a particular career domain or career opportunity,

and since a values-driven protean attitude plays an important part in increasing self-efficacy, the results of this study contribute to knowledge by indicating that career advancement interventions should be used to enhance females' efficacy beliefs about their interests, values and talents.

Towards A Protean Attitude:

This research has also contributed to SCCT by unravelling the significant role that protean attitude plays in strengthening the relationships between coping self-efficacy and occupational commitment. The research aims to understand the impact of protean attitude on employee outcomes which has been considered an important area that requires further investigation (Gubler *et al.* 2014). This study argues in favour of a mindful protean attitude for females working in STEM. Despite the fact that the concept of protean attitude is of great interest to scholars, new ideas and refinements are still called for in terms of both the hypothetical and practical implications of the theory, especially in response to criticisms that the literature on the newer theories lacks sufficient rigour (Rodrigues & Guest 2010). The findings of this study increase knowledge about the impact that protean attitude has on behaviour by analysing how the two aspects of protean attitude, self-directedness and values-driven career management, influence coping self-efficacy.

7.3 Summary of the Thesis

The under-representation of females in STEM is a main concern for scholars, career advisors, and senior managers. It threatens the attempts to react to the vast technical and scientific challenges happening in the world. It also drastically reduces the talent pool and equal opportunities among individuals. Scholars have been profoundly attempting to understand the reasons behind females' under-representation in STEM and trying to come up with useful recommendations to tackle this issue. The main

focus of many researches has been, however, in the educational setting, that is what majors do females choose at universities or the challenges faced by females in STEM majors. Even in the occupational setting, the main focus has been more on the challenges females face in these industries. This study attempts to shed light on certain factors, namely contextual factors and internal drivers, that might offer a reasonable explanation to this phenomenon. Attention is given to factors that allowed females to succeed in committing to their occupations, while the majority are quitting STEM industries after several years. The theoretical framework for the study is the SCCT that builds on Bandura's (1986, 2006) self-efficacy theory. Bandura (2006) explains that contrary to the conventional understanding that individuals are controlled by external factors, they do have to a certain extent control over their career decisions and ultimately career advancements. Lent and Brown (2013) build on this notion and presented the Career Self-Management model that put forward three deeply inter-related variables: self-efficacy, outcome expectations and personal goals in order to explain career decisions and advancements more. Guided by this theoretical framework and the research questions, this study attempts to understand how and why some females are able to succeed in committing to their STEM occupations while the majority aren't. The findings of both the qualitative, as the core component, and the quantitative, as the supplementary component, analysis indicate the important roles that mentoring and coping self-efficacy play in strengthening occupational commitment. Several themes emerged from the data analysis as well, such as protean attitude that seemed to play a vital role in moderating the relation between coping self-efficacy and occupational commitment. Professional identity that is further developed through the mentoring functions, in turn, strengthens the occupational commitment of females in STEM fields. The fast moving and changing STEM industries require continuous learning and this is why personal learning development was singled by participants as a significant factor for

career development. Although the percentages of females joining STEM industries has been on the rise, the leaky pipeline is still a major concern. This study attempts to understand this phenomenon by suggesting that the lack of role models for females in these industries, especially in high ranking positions, may be one possible reason. The number of role models that females can associate with is initially low and tends to decrease more as females advance in their careers in this type of industries. Several recommendations are offered in this study in terms of attaining and retaining females that may aid HR management, career advisors, and scholars in mending the leaky pipeline.

CHAPTER EIGHT

Conclusion and Recommendations

8.1 Conclusion:

Many of the studies about the under-representation of females in STEM have been conducted in academic settings. The workplace continues to struggle with unanswered questions pertaining to the decreasing number of females joining and committing to their occupations. In addition, the leaky pipeline still impacts organizations and STEM professions and occupations. A group of associated psychological, career and mentoring concepts have been discussed in this research relating to the role of some identified internal drivers (coping self-efficacy, protean attitude, professional identity, personal learning development) and contextual supports (mentoring functions) on females' occupational commitment in STEM fields. The framework presented can be improved and expanded to examine other aspects of career development that may have valuable functions in reducing the under-representation of females in STEM.

The lack of role models for participants of this research was an apparent issue. This is consistent with previous studies where the lack of role models for females in STEM industries is a pressing concern that, not only affects their occupational commitment, but also their likelihood of attaining senior positions (Sealy & Singh 2010). Future research on this aspect may uncover further explanation as to why many females find it challenging to commit to these occupations. Continuing to examine the lack of role models for females in STEM may offer reasonable insights and solutions to the leaky pipeline where more than two thirds of females exit STEM occupations and professions after 15 years of graduation (Hill *et al.* 2010, Hunt 2016, Frehill 2008). This study contributes to the literature by attempting to understand the

impact of several internal drivers and contextual factors that drastically enhance the occupational commitment of females in STEM industries.

8.2 Limitations:

Further findings might contribute to SCCT, if perhaps a specified form of mentoring was identified, whether formal or informal. In this study, only two participants identified their mentors as formal. The survey did not attempt to distinguish between formal or informal mentoring. The literature dictates that a formal mentoring relationship may generate better outcomes for mentees than informal mentoring (Campbell 2007). This could be useful in assessing the relationship between formal mentoring and occupational commitment of females working in STEM. It would be interesting to compare findings from both formal and informal mentoring programmes and understand the implications that each type of system has on career outcomes and advancement of females working in STEM. Another limitation of this study is that both personal learning and development and professional identity were not found to moderate the relationships between mentoring functions and coping self-efficacy, and mentoring functions and occupational commitment, respectively.

The impact of mentoring as a contextual variable as viewed by SCCT is a topic that needs further research and investigation. The results of this study are based on self-reported data. Further investigation using different sources of information, other than the participants, might be used to better understand the statistical associations between the variables.

Findings relating to the career development and advancement of females in STEM over time, as well as findings about contextual factors and their impact on other variables in this research, were nested in a single point dimension in this research. A longitudinal study of the career stages of females who work in STEM might give a

clearer insight about the impacts of mentoring functions. Alternative methods of data collection could be used that would give deeper insight about this phenomenon, such as workplace observations and open forum discussions. The study did not control for certain tasks or workplace characteristics that might have an effect on the occupational commitment of females in STEM.

Another limitation of this study is that five mentors refused to attend their interview session after initially accepting the invitation. In one case, two participants were interviewed as mentees and also as each other's mentors. Ten mentee participants are from the same nationality, Lebanese, due to influence of snowball sampling which it should be noted has its advantages in qualitative research by sustaining a research focus on accessing appropriate participants in relation to the research phenomenon. Finally, it is acknowledged that the researcher's positive bias towards the topic might have influenced the wording of the interview questions since it is not always feasible to elicit oneself entirely from such a continuous personal, qualitative research study (Bryman & Bell 2007). Since the core component of the research design for this study is qualitative research, it is important to reiterate that as a multiple case study design, this research investigated a specific number of participants (Yin 2009) and thus may not be representative of the whole population. In addition, since the majority of the information collected during the interviews was retrospective, the information will in some places be subject to the creativity, including the distortions, confusions and associations of specific participants' individual memories and methods of recall.

Several limitations can be mentioned relating to the quantitative analysis specifically in terms of the EFA. Both MEF and QUM and GSE and PAT loaded on the same factor respectively. However, according to the literature and theory each is a distinct construct with a validated scale, therefore we considered the item loadings pertaining

to each construct as a separate factor. OCC was loaded on two separate factors. The initial CFA considered both factors as one, however the goodness of fit reported was not within the acceptable threshold for both models A and B. CFA was conducted again including only the first factor loading of OCC, the goodness of fit reported was not within the acceptable threshold for both models as well. CFA was conducted by including the second factor loading of OCC and the indices for the goodness of fit for both models was good. The CR result of GSE is 0.544 which is below the acceptable threshold of 0.7 and above (Alarcón & Sánchez 2015). This is another limitation of this study.

8.3 Recommendations and Practical Implications for Managers and Employees:

As discussed earlier, some participants explained that the advice they received from some of their university professors aided them in developing an initial awareness about the difficulties they would face in the workplace. Therefore, it is essential that faculty members become more involved with informing and coaching female students in ways that enlighten them at an early stage to potential workplace barriers. This may decrease the “shock” experience that many face when joining the workplace following graduation. Research indicates that students’ self-efficacy increases as a result of feeling respected by faculty members they feel are friendly and available to give advice (Vogt 2008).

Although readers should be considerate to avoid generalizing the findings of this study too broadly, the results may benefit career advisors and HR managers in terms of the importance of the quality of the mentoring relationship, specifically regarding the perceived similarities between the mentor and mentee. Mentors should consider conscious efforts to highlight certain similarities between them and their mentees that could lead to better mentoring outcomes. These similarities become more

apparent when the level of communication between the two increases, and the mentor is perceived by the mentee as approachable. The mentors, therefore, could allocate some time at the early stages of the relation to get to know the mentee more and vice versa. Finding and asserting similarities, even minor ones, could enhance the perception of similarities which can positively impact on the quality of the mentoring relationship. Both sides of the dyad may also try to share personal, not only work-related, information about each other. Such discussions could lead to opportunities where the mentee can perceive more similarities that can lead to identification with the mentor and perhaps encourage formation of a role modelling relationship. Formal mentoring programmes, for example, can also incorporate structuring activities that help the mentee get to know the mentor in the early stages. They can undertake personality inventory exercises and discuss their differences and similarities. They could collaborate in completing worksheets, for example, and discuss past experiences and how these have impacted on their careers. Mentors can also work on decreasing the sense of distance that organizational hierarchy sometimes creates between mentors and protégés. Feelings of interpersonal distance resulting from hierarchical differences between the two may decrease the possibility of the mentee identifying with her mentor. When studying the quality of the mentor, it can be concluded that the mentoring relationship tends to be a complex and long-term system of employee development that requires effort from both parties, mentor and mentee.

The findings of the study also suggest that the exercise of mentoring functions improve the personal learning and development of the protégé and ultimately will have a positive impact on coping self-efficacy. Mentoring is a valuable employee development strategy that can positively improve career outcomes for females working in STEM, since self-efficacy instils confidence to succeed by coping

strategies and being able to overcome difficult situations within the occupation. Several practical implications can be drawn from this study of mentoring relationships.

First, in order to attract and retain females in STEM fields, organizations might be able to positively shape females' attitudes towards their occupations through providing them with opportunities to increase their personal learning and development. It might be beneficial for companies to offer formal mentoring programmes on a short-term basis for female employees. These programmes aim to ease the socialization mechanisms among newcomers and help females to learn more about the culture and practices of the organization (Greenhaus *et al.* 2010). These programmes can assist by explaining certain job tasks to minimise job ambiguity and provide knowledge about the skills required to perform these tasks successfully. Both mentors and mentee may be able to form close relations with some of the mentors that extend to informal mentoring, even after the programme is completed. The focus of both parties would be on enhancing knowledge related to job performance and business practices. The mentors may also motivate employees towards continuous learning and development that can enhance their career success in the long run. By fostering such programmes, organizations will align female employees' career advancement with organizational goals, and also develop stronger mutual bonds between the mentor and mentee that result in beneficial work-related behaviours. Alongside offering mentoring programmes to females, organizations can also include learning as an objective of mentoring systems in training programmes that are offered to the mentors. This will enable mentors to assist protégés with conceptualizing the learning opportunities offered. The mentor can also rethink how certain projects or assignments can be dealt with in ways that support the learning and career advancement of their protégés. Finally, mentors

should pay attention to adopting and modelling behaviours that are critical to skill development and can be mimicked by mentees for increased learning and skill attainment. HRM within organizations can also contribute by designing learning contracts and evaluation processes for mentoring dyads. The evaluation of the learning process and feedback from both could help the mentee understand what is expected from her in terms of individual learning, work and career achievement. Such HR systems will also inform mentors about the learning needs of protégés.

It is very critical that organizations understand the growth needs of mid-stage females by encouraging a culture of exposure to inspiring figures, co-workers, and members of senior management. By being exposed to role models, individuals observe and accumulate tacit knowledge about the attitudes, beliefs, and values of management. They are then able to develop a more informed and sophisticated self-perception regarding the professional identity they wish to assume. They also learn how to portray the role by comparing several role models, and then they can practice and experiment based on what they observed and learnt. They will tend to evaluate these practices and beliefs with reference to the actions external management and peer feedback, as well as their own internal standards (Gibson 2004). Availability and exposure to role models is a vital antecedent for females' occupational commitment in STEM. This also indicates the salient role that professional identity plays in strengthening females' commitment. Organizations have a crucial duty in spreading a culture of role model identification for minorities and under-represented groups. With the emergence of social media platforms, it is becoming easier and more feasible for companies to emphasise role models. Females employed in STEM occupations should be made aware about the importance of role models as one of the ways of increasing their persistence and commitment. They should be encouraged to be proactive and autonomous and work on identifying and developing

a network of developmental relations that can assist them in forming, refining, and later affirming their professional identities.

Additionally, the findings of this research contribute to the literature on professional identity and mentoring by establishing that mentoring has a large influence on the formation of a mentee's identity. For example, training programmes for mentors can be designed to explain the critical role that they can play in shaping the mentees' professional identities. They should be made aware therefore about their duties and responsibilities as mentors in this respect.

The findings of this study indicate that self-efficacy is a major factor in shaping the occupational commitment of females in STEM fields. Therefore, mentors dealing with new female employees can further attempt to strengthen employees' self-efficacy by providing them with positive encouragement and constructive feedback. They can also assist by coaching them and guiding them on what exactly is expected of them for the job in an effort to minimize role ambiguity. They can also aid in communicating and promoting the mentees' work to others by inviting them to attend and present at senior meetings. Career counsellors or mentors may also discuss with females past experiences and particularly focus on recent successful experiences that help them to formulate clear goals, engage in career exploration, and reflect on particular task performances to increase their performance accomplishments. They can also facilitate vicarious learning by connecting the female employees with role models or inspirational people in the STEM and organizational domains. Female employees who are dealing with anxiety that may be related to role ambiguity or role conflict can enrol in anxiety management programmes and learn how to control self-defeating and negative thoughts through relaxation techniques. Organizations can facilitate the availability of such

programmes through corporate wellness schemes. In addition, the mentor and family members should offer encouragement and motivation in difficult times.

Based on the results of this study in terms of the impact of protean attitude on self-efficacy and occupational commitment, females who work in STEM should be mindful of attitudes which enable them to continuously assess their own skills and knowledge, especially given the fact that STEM domains are dynamic and continuous learning and development is a key aspect for individual success. Individuals working in these domains are required to remain up-to-date with new advances in work practices, scientific and technical knowledge and applications. Consequently, women are required to seek learning opportunities autonomously if not offered by their organizations. This enables them to be flexible and employable without being highly dependent on a specific organization. They are encouraged to stay alert and be abreast of new changes and advancements occurring in the industry. Proactivity is an important characteristic of the protean attitude. Females should also vigorously participate in their work environment and search for challenging opportunities that may facilitate career growth. Adaptability to changing environments enables them to succeed when facing unanticipated changes in their industries. Organizations should adopt some strategies to advance employees autonomy which will eventually reflect positively on the organization in terms of maintaining individuals who are continuously building their skillset and knowledge. Senior management in organizations should recognize the role of protean attitude that employees adapt in dynamic markets as the employees attempt to define and find meaning in their careers and success. Consequently, considerations ought to be given to individual orientations of females in STEM towards their careers. As discussed earlier, females with a protean attitude build on their skills through continuous learning which enables them to perform better and enjoy positive

attitudes towards their work and occupation. HR managers are advised to take into account the psychological and autonomy needs of female employees in these domains and facilitate learning opportunities for them when possible. The more organizations are active in promoting their employees' career development, then the more they will benefit from decreasing rates of employee turnover (Briscoe & Finkelstein 2009).

This study offers insight for career counsellors and HRD management about the growing importance of protean careers as opposed to traditional careers. The new contract that the protean career advances is transactional in nature, meaning it is highly focused on growth and performance, relatively low on organizational commitment from both parties (employee and employer) allowing employees to enjoy a higher degree of freedom, and involving a shorter time span (Briscoe & Finkelstein 2009). Therefore, females are urged to enjoy a wider range of flexibility in accepting work assignments and show interest and eagerness in learning new skills that can advance their employability and improve their job performance. Organizations, on the other hand, are advised to encourage employability by offering their employees learning and career growth opportunities. This study indicates that females who work in STEM roles are advised to exercise a high level of autonomy and self-efficacy to shape their career development. Since a protean attitude supports individuals to be self-directed in their career advancement, combined the fact that STEM industries are fast-moving in technical innovation, females employed in these industries should work on improving their work-related skills and abilities through enrolling in continuing education and training programmes, in order to acquire industry-related certificates. They are also highly encouraged to expand the scope of their experiences by participating in challenging work assignments. These

endeavours will ensure that their knowledge and abilities are relevant to present and evolving work demands.

8.4 Recommendations for Future Research:

Due to the fact that females in STEM struggle with the lack of availability of mentoring programmes within their organizations, further research is required to examine and publicise important career-related outcomes that would benefit both organizations female mentees. Such research would aim at increasing the awareness and motivation among organizations to include mentoring programs for females in STEM.

While attempting to investigate the impact of the quality of the mentoring relationship, the participants discussed several similarities that enhanced its quality. However, gender was not identified by almost all participants as a valuable demographic element of similarity. Additional research on this topic is recommended to further understand the reasons behind such attitudes.

Due to the importance of role models as discussed earlier in this chapter, future research should focus on investigating role models for females who are under-represented at different stages in their careers, especially at mid and late career stages where the leaky pipeline is a major concern.

The implications for women's learning and development arising from this study were measured from the mentees' point of view, future studies might consider measuring learning from other sources such as the mentor or the direct supervisor. Additional research could further investigate the role of the protean attitude on personal learning and development. Individuals with protean attitudes are described as eager to enrol for continuous development programmes and enjoy creating learning opportunities for themselves. It would also be interesting to understand the

reciprocal process of what mentors learn and its implications for mentoring relationships. Research indicates that mentors benefit from mentees as a source of information (Mullen 1994).

While peer mentoring was discussed in this study with reference to the support received from friends and family, additional research could investigate how these relational networks can contribute to mentee's learning and career progress. Since professional identity and personal learning and development were not found to moderate the relationships between the variables, further research might examine the effect of each of these two variables while controlling for external influences.

The results of this study, in terms of self-efficacy, call for further investigation on the sources of self-efficacy, especially taking into account that this variable is a key player in the occupational commitment of females in STEM. Further research might attempt to understand which source of efficacy seems to have a major impact on an individual's beliefs, and what are the possible relative weights of each source in motivation and behaviour.

Where many scholars have called for interventions in enhancing the self-efficacy of females working in male-dominated industries, longitudinal research that attempts to study self-efficacy's fluctuation over periods of time and at different stages of career is also recommended. The huge amount of empirical research conducted on this cognitive variable provides support for its importance in shaping individuals' career decisions and, ultimately, outcomes. This study is consistent with previous findings reported in the research literature.

While scholars argue that both personal values and self-directedness in career management leads to favourable career outcomes, research is still needed to understand the intricacies of the process that translate protean attitude into a positive

antecedent of employee behaviour and career advancement. Further research on this topic is deemed necessary due to its importance in attempting to understand the advancement of females' careers from a different perspective than those based on traditional career theories.

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Appendix A

Interview Protocol (Females in STEM)

Demographic Questions:

1. What is your age?
2. What is your work status?
3. What is your occupation? (current position).
4. What is your marital status?
5. Do you have any children? If so, how many?
6. What is your major?
7. How many years have you been working in STEM?

The aim of the demographic data is to help identify any relations among groups, sub-groups, and specific demographic attributes.

Research Questions	Related Interview Questions
How do females succeed in committing to their STEM occupations?	1. Why did you pursue a career in STEM?
	2. What makes you to stay in your occupation? a. What are the most important reasons/factors? And why are they important? b. What skills and characteristics you possess that you think allowed you to stay so far in STEM? c. Does having a mentor help in devolving these skills?
In relation to coping self-efficacy	3. What are the main barriers you had to overcome so far in your career? a. How was your attitude when you initially encountered these obstacles? b. How where you able to overcome these obstacles? c. Did mentoring play a part in overcoming these barriers? How? d. How did overcoming these barriers make you feel?

In relation to Affective Commitment	4. Being in this occupation for X years, how does that make you feel?
In relation to Normative and Continuance Commitment	5. After all these years, do you consider leaving your occupation? Why? Why not? What are the factors behind your decision?
How does mentoring impact occupational commitment? In relation to occupational commitment and self-efficacy	6. Do you or have you even in the past had a mentor, advisor, counsellor, or someone who helped you with your career? How did that person help?
	7. Can you specify the type of mentoring you received? (formal/informal/peer)
	8. Why do you think you were able to receive mentorship?
In relation to self-efficacy and occupational commitment	9. In your opinion, do you feel that having a mentor is something important to you? Why? In what ways?
	10. Do you think that women working in STEM occupations need to receive mentoring? a. Would that help them to stay in their occupations? How? b. What can your organization do to improve the availability of mentors for women?
How does coping self-efficacy influence occupational commitment?	Sources of Self-efficacy (Q11-14)
In relation to past performance accomplishments	11. What experiences contribute to your decision to stay in your occupation?
In relation to vicarious learning	12. How were you influenced by others (mentors/friends/family) to keep working in your occupation?
In relation to verbal persuasion	13. Along your way, what did people (mentors/friends/family) say to you as you were pursuing your career in STEM? What kind of sociocultural messages did you received?
In relation to psychological Indexes	14. How would you describe your feelings and beliefs about your occupation? a. How does working in your occupation make you feel?

	b. Does having a mentor enhance or help alleviate these feeling? How?
In relation to Self-efficacy (Q15-17)	15. Were there events or occasions in your career when you felt you couldn't do or move forward with a direction you wanted to take? why?
	16. Have you ever had any self-doubts at some point in your competencies or in other areas which might have impacted your commitment to occupation? a. How did you deal with the situation? b. Did your mentor aid you through this? How?
	17. What accomplishments have you had during your career that have made you proud or made you feel you might have contributed in some way?
	18. What advice would you give to other women entering your profession?
	19. Is there anything else you would like to discuss or comment on?
Protean attitude to OC Self-directedness	1. To what extent do you attribute the success of committing to your occupation to your own self? Why? What makes you think the way you do?
	2. How free do you consider yourself in terms of choosing your career path and making your career decisions to stay in the industry compared to other females?
Personal values	3. To what extent does your employer's/colleagues/friends' opinion matter to you in terms of your occupational commitment choices?
	4. Do you think you are capable, on your own , to make the right career decisions?
	5. How do you feel about people assessing the success of your commitment to your occupation?

Appendix B

Interview Protocol (Mentor)

Opening Questions

- 1- What is your gender?
- 2- Where is your work location?
- 3- What business unit to you support?
- 4- What is your job level?
- 5- What is your current position?
- 6- What are your years of company service?

Interview Questions:

- 7- For how long have you been a mentor to X?
- 8- Can you describe your duties as a mentor? The type of mentoring?
(formal/informal/peer)
- 9- Why do you think Protégé X was able to receive mentorship?
- 10- In your opinion, do you feel that having a mentor is something important for females working in STEM? Why? In what ways?
- 11- Do you think that women working in STEM occupations need to receive mentoring?
 - a. Would that help them to stay in their occupations? How?
 - b. What can your organization do to improve the availability of mentors for women?
- 12- What do you think has had an influence on X to keep working in this occupation?
(sources: Vicarious)
- 13- Protege describe her feelings and beliefs about her occupation as In your opinion having a mentor enhance or help alleviate these feeling? How?
- 14- Has the protégé ever had any self-doubts at some point in her competencies or in other areas which might have impacted her commitment to occupation?
 - a. How did you deal with the situation?
 - b. Did you aid her through this? How?

Appendix C

Online Survey Questionnaire

This is an invitation to participate in a survey about females in STEM (Science, technology, engineering, and mathematics) industries. The researcher Lama Blaique, is a PhD- Business Management candidate at the British University in Dubai and is conducting this research as part of her dissertation. The answers are confidential. You can leave the survey at any point without any obligations. If you have any inquiries please feel free to email her on 2016156002@student.buid.ac.ae

A.Demographic Information:

Age: -----

Nationality: -----

Marital Status: -----

University Degree: -----

Years of Experience: -----

Current Job Post: -----

B.Occupational Commitment:

Occupational Commitment is defined as a commitment to a specific line of work (Meyer et al. 1993).

Kindly rate the following statements on the scale from **1 (Strongly Disagree)** to **7 (Strongly Agree)**

	1	2	3	4	5	6	7
My profession is important to my self-image.							
I regret having entered this profession.							
I am proud to be in my current profession.							
I dislike being an engineer/architect/IT professional.							
I do not identify with my profession.							
I am enthusiastic about my profession.							
I have put too much into the profession to consider changing now.							
Changing professions now would be difficult for me to do.							
Too much of my life would be disrupted if I were to change my profession.							
It would be costly for me to change my profession now.							

There are no pressures to keep me from changing professions.							
Changing professions now would require considerable personal sacrifice.							
I feel a responsibility to my profession to continue in it.							
Even if it were to my advantage, I do not feel that it would be right to leave my profession now.							
I would feel guilty if I left my profession.							
I am in this profession because of a sense of loyalty to it.							
I believe people who have been trained in a profession have a responsibility to stay							
I do not feel any obligation to remain in the my profession.							

C. Coping Self-Efficacy:

When things are not going well for you, or when you're facing problems, how confident or certain are you that you can do the following:

Please rate the following statements from **0 – 10 (0= Cannot do it at all, 5= Moderately certain can do it, 10= Certain can do it).**

	1	2	3	4	5	6	7	8	9	10
Break an upsetting problem down into smaller parts .										
Sort out what can be changed, and what cannot be changed										
Make a plan of action and follow it when confronted with a problem .										
Leave options open when things get stressful .										
Think about one part of the problem at a time .										
Find solutions to your most difficult problems .										
Resist the impulse to act hastily when under pressure.										
Try other solutions to your problems if your first solutions don't work.										
Talk positively to yourself.										

Stand your ground and fight for what you want.										
See things from other person's point of view during a heated argument.										
Develop new hobbies or recreations.										
Make unpleasant thoughts go away.										
Take your mind off unpleasant thoughts.										
Stop yourself from being upset by unpleasant thoughts.										
Keep from feeling sad.										
Keep from getting down in the dumps.										
Look for something good in a negative situation.										
Keep yourself from feeling lonely.										
Visualize a pleasant activity or place										
Pray or meditate.										
Get friends to help you with the things you need.										
Get emotional support from friends and family.										
Make new friends.										
Do something positive for yourself when you are feeling discouraged.										
Get emotional support from community organizations or resources										

D. Career Insight (Goal Setting):

Mark your answer on the scale from **1=Strongly Disagree** to **5=Strongly Agree**.

	1	2	3	4	5
I have a specific plan for achieving my career goal.					
I have changed or revised my career goals based on new information I have received regarding my situation or myself.					

I have sought job assignments that will help me obtain my career goal.					
I have clear career goals.					
I have realistic career goals.					
I know my strengths (what I can do well).					
I am aware of my weaknesses (the things I am not good at).					

E. Protean Attitude:

Please indicate the extent to which the following statements are true for you, using the following response scale (**1= to little or no extent, 5= to a great extent**).

	1	2	3	4	5
When development opportunities have not been offered by my company, I've sought them out on my own.					
I am responsible for my success or failure in my career.					
Overall, I have a very independent, self-directed career.					
Freedom to choose my own career path is one of my most important values.					
I am in charge of my own career.					
Ultimately, I depend upon myself to move my career forward.					
Where my career is concerned, I am very much "my own person."					
In the past I have relied more on myself than others to find a new job when necessary.					
I navigate my own career, based on my personal priorities, as opposed to my employer's priorities.					
It doesn't matter much to me how other people evaluate the choices I make in my career.					
What's most important to me is how I feel about my career success, not how other people feel about it.					
I'll follow my own conscience if my company asks me to do something that goes against my values.					
What I think about what is right in my career is more important to me than what my company thinks					
In the past I have sided with my own values when the company has asked me to do something I don't agree with.					

F. Personal Learning Development:

Answer the following questions with regard to your learning experiences across the scale from **1= strongly disagree to 11= strongly agree**.

	1	2	3	4	5	6	7	8	9	10	11
--	---	---	---	---	---	---	---	---	---	----	----

I have gained insight into how another department functions.											
I have increased my knowledge about the organization as a whole.											
I have learned about others' perceptions about me or my job.											
I have increased my understanding of issues and problems outside my job.											
I better understand how my job or department affects others.											
I have a better sense of organizational politics.											
I have learned how to communicate effectively with others.											
I have improved my listening skills.											
I have developed new ideas about how to perform my job.											
I have become more sensitive to others' feelings and attitudes.											
I have expanded the way I think about things.											
I have gained new skills.											

Mentoring:

A mentor is an accomplished employee who acts as a role model, offers sustenance, guidance, and feedback in relation to social advancement and vocational plans. He/she provides protégé with advice, looks out for her, and helps in advancing her work achievements to the attention of senior and powerful individuals in the organization. Where there exist two types of mentoring, former mentoring is created by the organization while informal is generally unplanned (Day and Allen 2004). A mentor can be a friend or a coworker as well (Peer Mentoring).

Considering the definition of a mentor (described above), do you have a mentor?

- a. Yes b. No**

If your answer is yes, kindly proceed to answer sections H and I.

G. Mentoring Functions:

Kindly choose the most suitable response for the mentor/role model who most facilitated your career (1=Strongly Disagree, 5=Strongly Agree).

	1	2	3	4	5
My mentor takes a personal interest in my career.					
My mentor helps me coordinate professional goals.					
My mentor devotes special time and consideration to my career.					
I share personal problems with my mentor.					
I exchange confidences with my mentor.					
I consider my mentor my friend.					
I try to model my behavior after my mentor.					
I admire my mentor's ability to motivate others.					
I respect my mentor's ability to teach others.					

H. Quality of the mentoring:

Kindly answer the following questions on the scale where 1=strongly disagree to 5=strongly agree.

	1	2	3	4	5
My mentor and I enjoyed a high-quality relationship.					
Both my mentor and I benefited from the mentoring relationship.					
I effectively utilized my mentor.					
The mentoring relationship with my mentor was very effective.					
I am very satisfied with the mentoring relation with my mentor.					

Appendix D

Recruitment Email

Dear X

I am a PhD student at the British University in Dubai. I need your assistance concerning data collection for my thesis dissertation which is on empowering females who work in STEM (science, technology, engineering and mathematics) industries. The criteria for participating are as follows:

- 1- female
- 2- 2-works in stem
- 3- 3- has or had a mentor at some point in her career. The mentor can be for example your manager or co-worker, someone you think has a positive effect on your career in terms of guiding, coaching, assisting, and teaching you.

If you are interested, you may provide me with your contact number and I would love to give you a call and briefly further discuss the details. Looking forward to hearing from you.

Best regards,

Lama Blaique

Appendix E

Literature Review Thematic Analysis Dataset

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Appendix F

Literature Review Thematic Analysis

Literature	Codes	Themes
“Two recent meta-analyses find that protégé perceptions of similarity to mentors are consistently related to positive mentoring outcomes. Eby et al. (2013) found that meta-analytic correlations between deep-level similarity (i.e., protégés’ perceptions of similarity to their mentors in terms of attitudes, values, beliefs, or personality) and protégé perceptions of mentoring were consistently large, ranging from .38 for instrumental support to .59 for relationship quality. Similarly, Ghosh (2014) found mean meta-analytic correlations of .42 between perceived similarity and career mentoring and .60 between perceived similarity and psychosocial mentoring. These results support the similarity-attraction paradigm (Byrne, 1971), which posits that we are attracted to those who are similar to ourselves because they reinforce and validate our beliefs, attitudes, and behaviour” (based on: Mitchel , Eby, and Ragins ,2015, p.2).	Shared similarities – Attraction Paradigm. Communication unfolds the similarities	Quality of the Mentoring Relation
“Most research has examined demographic similarity between mentors and protégés (i.e., gender, race) and has found it is either not related or is weakly related to protégé perceptions of similarity (Allen & Eby, 2003; Lankau, Riordan, & Thomas, 2005; Turban, Dougherty, & Lee, 2002). In discussing existing gaps in the literature on perceived similarity, Turban and Lee (2007) argue that actual similarity in characteristics that are interpersonally-oriented may be particularly important to examine in the context of understanding the effects of mentoring relationships on protégés” (based on Mitchel et al., 2015, p.2).	Similarities may include gender, values, or personal trait.	Quality of the Mentoring Relation
“In mentoring relationships, the securely attached mentor is likely to engage in appropriate caregiving toward his or her protégé and the securely attached protégé is likely to expect and accept the support provided” (based on Mitchel et al., 2015, p.3).	Attachment orientation- Attachment Theory.	Quality of the Mentoring Relation
“Secure individuals are likely to perceive themselves as similar to other secure people due to their similarities in internal working models; that is, similar individuals will recognize when others share their characteristically positive models of the self and others. In addition, securely attached individuals are more likely than insecurely attached individuals to engage in self-disclosure (Mikulincer & Nachshon, 1991), increasing the likelihood that an interaction partner will discover common values, interests, and beliefs, and thus perceive greater similarity. secure attachment orientations are most relevant for perceived similarity because they facilitate relational	Secure attachment further strengthens the relation.	Quality of the Mentoring Relation

closeness and disclosure” (based on: Mitchel et al., 2015, p.3).		
“According to Kram (1985), the process of role modeling occurs when the protégé recognizes aspects of his or her current or idealized self in the mentor and strives to emulate these aspects. As such, the process of identifying with a role model first involves perceiving similarity between the self (or one’s ideal self) and the mentor” (based on: Mitchel et al., 2015, p.4).	Role model identification due to perceived similarities.	Quality of the Mentoring Relation
“Petty & Cacioppo (1981) pointed out, however, that in spite of the encouragement received from a mentor, the influence of verbal persuasion may become negated if a protégé’s perceived credibility of the mentor is negative in terms of the expertness, trustworthiness, and attractiveness” (based on: Bang & Reio, 2017, p.152).	The quality of the relation moderates the relation between mentoring and self-efficacy. The mentee has to perceive the communication from the mentor as credible.	Quality of the Mentoring Relation
“A mentor has a deeper personal relationship with the protégé than does a manager.” (based on: Pan, Sun, & Chow, 2011, p. 265).	Deep personal relation is the foundation for the mentoring relation.	Quality of the Mentoring Relation
“A mentor is committed to the long-term development of the protégé. and have responsibility for their subordinates’ work-related development.” (based on: Pan et al., 2011, p. 265).	The mentor is dedicated to mentee’s career development.	Quality of the Mentoring Relation
“They may share with one another their personal values as well as on-and-off-the job goals and experiences.” (based on: Pan et al., 2011, p. 265).	Sharing personal beliefs further enhances goal setting for the mentee.	Quality of the Mentoring Relation
“Supervisors have personal knowledge of their subordinates’ needs and workplace environments” (based on: Pan et al., 2011, p. 265).	Mentors know and understand the needs of mentees.	Quality of the Mentoring Relation
“The frequent daily interactions between the participants of a supervisory mentoring relationship might foster a closer relationship and a higher degree of trust and commitment than between participants of a non-supervisory relationship” (based on: Pan et al., 2011, p. 265).	Both parties are committed to the relation. The relation is built on trust.	Quality of the Mentoring Relation
“Finally, subordinates collaborate with their mentors, so they regard their mentors as role models, friends, and councillors. These mentors are more likely to bring knowledge, skills and abilities to the mentorship.” (based on: Pan et al., 2011, p. 266).	The quality of the relation affects knowledge transfer. Knowledge sharing or transfer is done through vicarious learning (role modeling).	Quality of the Mentoring Relation Mentoring (Common Norms) PLD
“The paradigm of social exchange theory suggests that employee’s strong perception about supervisory work-related support influences employee’s commitment, job satisfaction, and perceived career success” (based on: Arora & Rangnekar, 2015, p. 65).	Quality of the mentoring relation can explained by the Social Exchange Theory.	Quality of the Mentoring Relation
“The role of the supervisor in the Indian context is similar to that of the nurturant-task leader (Sinha, 1980), who is always ready to spend his or her personal time and energy in mentoring subordinates and also offer greater organizational opportunities for their career advancement. Subordinates, in turn, reciprocate the same by exhibiting greater loyalty and commitment to the supervisor” (Arora & Rangnekar, 2015, p. 66).	Social Exchange Theory explains the quality of the mentoring relation.	Quality of the Mentoring Relation

"This strengthens the bond of their relationship as they move from being strangers to acquaintances to a mature relationship" (based on; Arora & Rangnekar, 2015, p. 66).	The reciprocal attitude between the mentor and mentee strengthens the relation.	Quality of the Mentoring Relation
"Sluss & Ashforth (2007) propose that relational identification may generalize to organizational and other identity outcomes. As they explain: "in identifying with a role-relationship, one may come to identify with the collective that embodies and sustains the role-relationship. In effect, one sees the collective as an extension of the role-relationship" (p.18). This perspective suggests that a protégé who views his or her mentor as a role model may generalize this identification to larger collectives, such as the organization and profession" (based on: Mitchel <i>et al.</i>, 2015, p.4).	Role models affect occupational commitment.	Predictors of OC PLD
"Third, receiving psychosocial mentoring tends to develop and refine his or her professional identity" (based on: Panet <i>al.</i>, 2011, p. 266).	Psychological mentoring function can enhance mentee's professional identity	Predictors of OC Mentoring (Common Norms) Professional Identity
"Carson & Bedeian (1994) reported about OC on the basis of Hall's (1971) and London's (1983) career motivation theory as comprising three major dimensions-career identity, career resilience, and career planning. Career identity is the emotional linkage and association with one's line of work" (based on: Arora & Rangnekar, 2015, p. 65).	Career identity strengthens OC (Motivation Theory)	Predictors of OC Professional Identity
"Career resilience is the degree of willingness to persist in the face of adversities" (Arora & Rangnekar, 2015, p. 65).	Career resilience increases OC	Predictors of OC
"And career planning is the active engagement of an individual with goal-setting and goal-determination activities (Okurame, 2012)." (based on: Arora & Rangnekar, 2015, p. 65).	Career planning enhances OC through goal setting.	Predictors of OC Goal Setting
"Several studies from the literature have also identified perceived supervisory career support as a key factor affecting employee's career satisfaction and career development (Wickramasinghe and Jayaweera, 2010)." (based on: Arora a&nd Rangnekar, 2015, p. 65).	Career-related functions of mentoring enhance career outcomes such as career satisfaction which ultimately increases OC.	Predictors of OC
"Because of the proximity between the mentor and the protégé (Raabe and Beehr, 2003), protégés with supervisory mentors enjoy greater career mentoring support. Because the hierarchical mentors have direct supervisory responsibilities on them (Allen and Eby, 2011; Fagenson-Eland <i>et al.</i>, 1997; Haggard <i>et al.</i>, 2011), they easily provide more vocational support to their subordinates and also facilitate their socialization process, thereby enhancing their professional development and career commitment (Mezias and Scandura, 2005; Okurame, 2012)." (based on:Arora & Rangnekar, 2015, p. 66).	Sponsor career-related mentoring function enhances occupational commitment.	Predictors of OC
"When constructing a social cognitive theory of career, Lent <i>et al.</i> further acknowledged the importance of goals in self-regulation of career-related expectancies and behaviors. They contended that by setting and	Occupational commitment	Predictors of OC Goal Setting

committing to goals, people are better able to organize and direct their own behaviors, to motivate themselves, and to increase the likelihood of attaining desired outcomes in career decisions. As an important attitude in goal management, goal commitment (GC) is believed to vitally influence goal pursuit processes and to be a prerequisite for accomplishing goal tasks such as planning and implementing career decision-making activities”(based on: Jiang, 2016, p. 53).		
“People with higher levels of PC show greater interest in their professions (Meyer et al., 1993) and subsequently may foster positive attitudes toward ongoing career construction and exploration (Nauta, 2007), which may further assist them in maintaining and increasing their confidence in career decision making.” (based on: Jiang, 2016, p. 33).	Commitment and career achievement will also foster stronger self-efficacy.	Predictors of OC
“Career commitment was found to positively affect learning motivation and learning transfer (Cheng and Ho, 2001). Individuals with a learning goal orientation were found to commit themselves to developing a plan for performance success. (Ballout, 2009, p. 658).	Facilitate learning Learning objectives are positively impacted by OC.	Predictors of OC PLD
employees who are highly committed to their careers are motivated to set personal and assigned career goals and then develop plans to attain such goals (Ballout, 2009, p. 659).	OC is enhanced through goal setting and goal seeking.	Predictors of OC Goal Setting
“Ballout’s (2009) study revealed that, career commitment has a significant influence of career satisfaction through the moderation effect of self efficacy.” (based on: Karavardar, 2014, p. 100).	Goal Setting Self-efficacy motivates the individual to commit to her goals. Self-efficacy motivates the individual to commit to her occupation.	Predictors of OC Benefits of SE Goal Setting
“The extant research (see Table 1) shows that commitment is associated with a variety of different facets of satisfaction, including the work itself, pay, and coworkers as well as the job in general (Lee et al. 2000; Mathieu and Zajac 1990).” (based on: Major, Morganson, and Boken., 2013, p.302).	Occupational commitment is affected by job satisfaction. Occupational commitment is affected by organizational environment.	Predictors of OC
“Two facets of satisfaction that may be particularly germane to IT are not considered in the meta-analytic study of occupational commitment. One is satisfaction with growth opportunities (i.e., the chance to engage in training and development and to update skills); Weng and McElroy (2012) found a significant relationship between professional ability development and occupational commitment in a sample of Chinese managers “(based on: Major, D. et al., 2013, p.302).	Personal learning enhances occupational commitment.	Predictors of OC PLD
“In the broader commitment literatures, meta-analyses (see Table 1) have shown that job stress is negatively related to both occupational and organizational commitment (Lee et al. 2000; Mathieu and Zajac 1990).” (based on: Major, D. et al., 2013, p.304).	Efficient management of stressors such as deadlines enhances OC. Stressors can be managed by high self-efficacy	Predictors of OC

“Although research has demonstrated that OSD motivates employees to participate in training (e.g., Birdi et al., 1997; Maurer et al., 2003), we believe a reciprocal relationship among these two general constructs is likely. That is, employees who have personally participated in developmental activities are likely to have more knowledge about these activities and to see them as more prevalent in the organization than someone who has not previously participated. Since the specific activities represent the level of resources invested by the company in support of employee development (Tsui, Pearce, Porter, & Tripoli, 1997), employees who have participated in these activities will be more likely to form the perception that the company is supportive of employee development overall (D. G. Allen, Shore, & Griffeth, 2003; Wayne et al., 1997).” (based on: Kraimer et al. 2010, p. 287).	Enhancing occupational commitment through mentoring	Predictors of OC
“Relative weights for men and women differed in the prediction of occupational commitment, where growth satisfaction and work–family culture were weighted more strongly by women and job stress was more strongly weighted by men.” (based on: Major, et al., 2013, p. 301).	Occupational commitment is enhanced by learning opportunities and family friendly organizational culture.	Predictors of OC PLD
“The emergence of favourable work situations as a result of the proactive efforts of individuals seems likely to lead to the arousal of positive affective states and thus higher affective commitment. This means that any appraisals of benefits could be logically assumed to lead to pleasant affective states.” (based on: Yousaf, Sanders, & Shipton., 2013, p. 214)	Proactivity enhances occupational commitment.	Predictors of OC Protean Attitude
“The investment model posits that decisions to end or to stay in a relationship are mainly determined by feelings of commitment. Two structural elements, satisfaction and dependence, characterize interdependence in a relationship. Based on social exchange theory, Rusbult [41] further extends these notions by introducing the concept of investment, which refers to the resources that an individual has put into a relationship. Such invested resources serve as a psychological inducement to strengthen commitment because the act of investment raises the costs of terminating a relationship. In other words, an individual would be “tied in” a hold-up situation because an invested resource creates value on one hand, and it generates a sunk cost at the same time, which prevents the person from seeking a new relationship. In sum, a relationship continues if the individual wants to persist (feels satisfied), needs to persist (has high investment), and has no choice but to persist (possesses poor alternatives).” (based on; Fu & Chen, 2015, p. 539)	Falls in line with Meyer’s 3 OC model: Affective, continuance, and normative. Facilitation of learning	Predictors of OC PLD
“Career investment refers to accumulated resources in one’s career that would be deemed worthless or lost if one decided to switch to another career. ITPs continuously invest their time and energy in studying programming languages, development tools,	Mentoring career-related functions would widen the career investment of individuals	Predictors of OC Mentoring (Common Norms) PLD

algorithms, system architectures, data structures, etc. However, these competencies are specialized and non-transferable and are worthwhile and imperative only in information system design and development. Therefore, the substantial volume of investment could “trap” an ITP in the present career even if he or she does not like it because leaving the career represents a substantial loss of investment. More investments in specialized knowledge and techniques may cause an ITP to commit to the specific career. In contrast, a career change often implies a loss of investment in one’s professional identity and years of discipline as well. Therefore, the greater the investment an ITP has devoted to an IT career, the higher his or her career commitment is” (based on: Fu a&nd Chen, 2015, p. 539)	and thus increase their occupational commitment. Career Investment.	
“Previous research has showed that protean career orientation is related to several work- and career-related outcomes, including job satisfaction, organizational commitment, job performance, proactivity in career management, and job change (Briscoe et al., 2006; Gasteiger, 2007; Superli & Creed, 2016).” (based on: Ngo & Hui, 2018, p. 427)	PA enhances job satisfaction and organizational commitment. both job satisfaction and organizational commitment are strong predictors of Occupational commitment. Protean attitude enhances occupational commitment.	Predictors of OC Protean Attitude
“High job scope should convey the message that the organization supports employee development by giving protégés opportunities to put into practice what they learn from their mentors. Indeed, high scope jobs are rich, complex and challenging, and put fewer constraints on behavior (Fried & Ferris, 1987; Hackman & Oldham, 1980). Through increased skill variety and task identity, high scope jobs enable employees to use a wider range of skills and manage more complex work processes. Increased task significance enables employees with new knowledge and skills to concretely make a difference and positively influence others. Through increased feedback, employees can also learn from their mistakes and refine their competencies. Finally, through increased autonomy employees can innovate and try new ways of doing things” (based on: Lapointe & Vandenberghe, 2017, p. 100).	Career related function of mentoring impacts the mentee’s job scope.	Mentoring (Common Norms) Professional Identity
“Personal accomplishment refers to one’s feelings of competence and successful achievement in his or her work (Maslach, Jackson, & Leiter, 1996). Personal accomplishment directly relates to mastery experience, which is the most robust source of self-efficacy (Bandura, 1986). Hence, an individual with high levels of personal accomplishment related to his or her job is likely to be confident that they will perform creative work well, even at higher levels of difficulty than his or her previous job. This indicates that personal accomplishment creates the framework for the development of competence itself and of task mastery (Elliot & McGregor, 1999), which links to the individual’s efficacy beliefs in his or her	Personal accomplishments (mastery experiences) enhance self-efficacy.	Mentoring (Common Norms)

ability to produce creative outcomes” (based on: Bang & Reio, 2017, p. 151-152)		
“Mentors also provide proteges with verbal persuasion. Individuals who are verbally persuaded that they are capable of completing and mastering a given task are more likely to perform the task (Bandura, 1986)”. (based on: Bang & Reio, 2017, p.152).	Mentoring enhances self-efficacy through verbal persuasion. The quality of the relation mediates this relation.	Mentoring (Common Norms)
“Workplace affect is thus closely related to physiological states, one of the four sources of self-efficacy (Bandura, 1986, 1997). Relying on somatic and emotional states, individuals interpret their stress reactions and tension as signs of vulnerability to dysfunction or poor performance (Bandura, 1994).” (based on: Bang & Reio, 2017, p.153).	Counseling psychological function enhances the psychological state (a source of self-efficacy) of the employee.	Mentoring (Common Norms)
“As one of the four sources of self-efficacy, physiological states are important in raising an individual’s self-efficacy, especially in health functioning and in coping with stress (Bandura, 1997). When individuals cannot cope with stressful situations, they unintentionally develop high levels of distress states producing the very dysfunction they fear (Bandura, 1997). Considering the dependence of individuals’ physiological states on their different coping capabilities, experiencing physiological arousal alone would not fully explain the development of creative self-efficacy and in turn creative work involvement” (based on: Bang & Reio, 2017, p.149).	Coping self-efficacy is strengthened by mentoring functions of counseling, friendship, and acceptance and confirmation.	Mentoring (Common Norms)
“Prior studies predominately support that supervisory mentoring enhances subordinate’s subjective and objective outcomes (Allen et al., 2004; Underhill, 2006). First, supervisors possess more job knowledge. By providing subordinates with that job knowledge, subordinates are able to respond to problems that arise on the job (Hunter, 1986).” (based on: Pan <i>et al.</i> , 2011, p. 265).	The mentor works on enhancing mentee’s problem solving skills.	Mentoring (Common Norms) PLD
“Second, supervisors transfer new skills to their subordinates (Lankau & Scandura, 2002). This coaching process involves tactics and techniques that are required by high levels of job performance” (based on: Pan <i>et al.</i> , 2011, pp. 265-266).	New skills taught by mentor enhance career outcomes.	Mentoring (Common Norms) PLD
“The mentoring literature also suggests that mentoring relationships should be inherently linked to career satisfaction (Kram, 1985; Levinson, Darrow, Klein, Levinson & McKee, 1978). On the one hand, supervisory mentoring not only serves as a mechanism for knowledge acquisition but also provides access to social networks through which subordinates have opportunities to acquire information which is unavailable through formal channels and to display their skills and talent within the organization” (based on: Pan, <i>et al.</i> , 2011, p. 266).	Exposure mentoring function enhances career satisfaction and ultimately occupational commitment.	Mentoring (Common Norms) PLD
“On the other hand, supervisors serve as veteran models of behavior for their subordinates and provide subordinates with the rules that govern effective behaviors in the organization.” (based on: Pan, <i>et al.</i> , 2011, p. 266).	Benefits of mentoring: understanding the context of organizational life. A faster way to acquire knowledge.	Mentoring (Common Norms) PLD

“Supervisors have been regarded as an important resource for personal learning. Individuals learn vicariously by observing the behavior of others and the outcomes that result from this behavior (Bandura, 1977). Through intensive interaction, sharing and exchanges, mentoring relationships provide a useful platform through which individuals can enhance personal learning (Kram, 1996). Lankau and Scandura (2002) investigated personal learning in mentoring relationships. Their findings have shown support for the impact of supervisory mentoring on subordinate personal learning. vocational support by supervisors enables subordinates to acquire new skills through direct coaching and challenging project assignments” (Pan <i>et al.</i>, 2011, p. 266).	Mentors enhance mentee’s personal learning development.	Mentoring (Common Norms) PLD
“Psychosocial support by supervisors makes subordinates feel safe to ask questions, take risks, and discuss fears, anxieties, or disagreements. role models by supervisors make subordinates try to emulate the supervisor's attitudes, values and behaviors (Kram, 1985).” (based on: Pan <i>et al.</i>, 2011, p. 266).	Enhancing mentee’s personal learning can be done through psychological mentoring functions.	Mentoring (Common Norms) PLD
“Personal learning yields changes in behavior (Lankau & Scandura, 2002) and it is a necessary condition for performance (Hunter, 1986). Personal learning promotes competence in approaching work-related problems (Gouillart & Kelly, 1995). Subordinates who experience personal learning may do better in their work because they have more skills.” (based on: Pan <i>et al.</i>, 2011, p. 266).	Mentoring functions can enhance mentee’s job performance and satisfaction. Personal learning mediates the relation between mentoring and self-efficacy.	Mentoring (Common Norms) PLD
“Similarly, personal learning yields a change in attitude, and shapes how individuals in organizations respond to a work environment” (based on: Pan <i>et al.</i>, 2011, p. 266).	Personal learning enhances adaptability and flexibility.	Mentoring (Common Norms) PLD
“Employees who experience personal learning may have more positive reactions to their work because they have greater confidence and skill. Personal learning should thus be related to attitudes. Employees who have developed communication and problem-solving skills may feel more competent and may receive feedback about the value of their contributions” (based on: Pan <i>et al.</i>, 2011, p. 266).	Personal learning enhances self-efficacy. Personal learning enhances mentee’s communication skills	Mentoring (Common Norms) PLD
“Pinho <i>et al.</i>’s (2006) qualitative research found that formal mentoring programs are important in assisting a protégé’s career development. The mentoring programs which include social, role modeling and vocational support are more likely to affect self-directedness behavior toward their jobs and career development”. (based on: Wong, Rasdi, & Abu Samah, 2017, p. 283).	Career-related mentoring functions would enhance self-directedness, strengthen identity awareness and professional commitment.	Mentoring (Common Norms) Professional Identity
“On the basis of a demands–resources fit perspective, Voydanoff (2005) has proposed that resources are essential to achieving balance because they enable employees to meet the demands of the work	Demands-resources fit perspective- resources are an important factor to manage work-life balance.	Mentoring (Common Norms)

and family domains and participate effectively in both domains. Research regarding the antecedents of work–family conflict and work–family enrichment has been consistent with Voydanoff’s assertion. Resources from work (e.g., supervisor support and flexibility) and from home (e.g., spousal support) are associated with reduced work–family conflict (Byron, 2005; Michel, Kotrba, Mitchelson, Clark, & Baltes, 2011) and enhanced work–family Enrichment” (based on: Drenzo, Greenhouse,& Weer,2015, p. 539-540).		
“Empirical studies suggest that the amount of supervisory mentoring provided predicts subordinate-reported career outcomes, such as career satisfaction, career commitment, and low turnover intentions “(based on: Pan <i>et al.</i> 2011, p. 264).	Mentoring strengthens occupational commitment.	Mentoring (Common Norms)
“Supervisor-rated career outcomes, such as promotion, compensation or salary increase (Dreher & Ash, 1990), and job performance.” (based on: Pan <i>et al.</i> , 2011, p. 264).	Impact of mentoring on career prospects.	Mentoring (Common Norms)
“The idea that perceived similarity engenders identification with others is also consistent with Sluss and Ashforth’s (2007) theory of relational identification. Role modelling can be seen as a form of relational identification; role modeling involves the protégé identifying with the mentor and the protégé internalizing valued aspects of the mentor into his or her self concept (Kram, 1985). Sluss and Ashforth (2007) also suggest that perceived similarity is an antecedent to relational identification. They explain that as two individuals interact, a personalization process unfolds inwhich each comes to see the other as a unique person rather than a prototypical member of a social group. This increases the likelihood of perceived similarity, which can ultimately lead to relational identification. Thus, there is strong theoretical rationale from both the mentoring and relational identification literatures to expect that protégé perceptions of similarity to a mentor will be related to perceptions of the mentor as a role model” (based on: Mitchel et al., 2015, p. 4).	Theory of Rational Identification explains identifying with a role model.	Mentoring (Common Norms)
“The COR perspective defines resources as objects, states, personal characteristics, and energies that people value (Hobfoll, 1988; ten Brummelhuis & Bakker, 2012) because the resources enable them to achieve personal goals (Halbesleben, Neveu, Paustian-Underdahl, & Westman, 2014). Resources may be contextual (outside the self) or personal (within the self) and may be durable or volatile” (based on: Drenzo et al., 2015, p. 540).	Conservation of resources perspective -valued resources that enable goals achievement.	Mentoring (Common Norms) Goal Setting
“London (1983; London & Noe, 1997) proposed the construct of career motivation. It is defined “as the set of individual characteristics and associated career decisions and behaviours that reflect the person's career identity, in-sight into factors affecting his or her career, and resilience in the face of unfavourable career conditions” (London, 1983, p. 620). Career identity	Career motivation theory explains occupational commitment where resilience presented in terms of coping self-efficacy, career insight as goal setting, and career identity	Benefits of SE Predictors of OC Mentoring (Common Norms)

refers to how central one's career is to one's identity and consists of two sub-domains: work involvement and desire for upward mobility. Career insight is the extent to which a person has realistic perceptions of him or herself and his or her organization, and it involves relating these perceptions to career goals. Those two components represent career identity resources. The third component of career resilience is a person's resistance to career disruption in a less than optimal environment. This component has three sub-domains: (generalized) self-efficacy, risk-taking, and dependency.” (based on: Hirchi, 2012, p. 4).	which is enhanced by mentoring functions.	
“Fourth, the feedback and reinforcement provided by the supervisor likely enhance the subordinate's self-confidence (Day & Allen, 2004) which may lead to higher performance” (based on: Pan <i>et al.</i> , 2011, p. 266).	Self-efficacy enhanced through feedback (coaching function). Self-efficacy motivates better performance.	Benefits of SE
“Individuals with high self-efficacy tend to be actively involved in development and learning activities, thus are more likely to engage in and benefit more from mentoring relationships. We thus predict that the effect of supervisory mentoring may vary among subordinates with different levels of general self-efficacy” (based on Pan <i>et al.</i> , 2011, p. 267).	Eagerness to learn is an indicator of high self-efficacy. Higher self-efficacy leads to better mentoring results.	Benefits of SE PLD
“Self-efficacy moderates the relationship between supervisory mentoring and personal learning. Individuals with different levels of general self-efficacy vary in their need of support and guidance. Subordinates with higher levels of general self-efficacy tend to feel less anxious and more comfortable in mentoring relationships than those with lower levels of general self-efficacy because the former perceive themselves as more competent and more confident than the latter. Therefore, subordinates with high levels of self-efficacy are likely to exert effort to overcome difficulties or to take initiatives to work out problems in mentoring activities (Gist & Mitchell, 1992; Jerusalem & Schwarzer, 1992). When this happens, they actively involve themselves in personal learning” (based on Pan <i>et al.</i> , 2011, p. 267).	Mentees with high self-efficacy are more proactive and problem solvers. Individuals with high self-efficacy deal with change and novelty through learning.	Benefits of SE PLD
“Personal learning involves stress, especially, when the learning task is new and demanding. Subordinates who are confident of their competences in work-related activities tend to regard difficult achievement tasks as more challenging than threatening. Their positive senses of general self-efficacy serve as a resource factor that should buffer against stressor perceptions” (based on Pan <i>et al.</i> , 2011, p. 267).	Self-efficacy enables a positive mindset. Self-efficacy enables overcoming the learning barriers.	Benefits of SE PLD
“Research findings from DiRenzo <i>et al.</i> (2010) provide support for the moderating effect of self-efficacy on mentoring relations. According to goal-setting theory, individuals with higher self-efficacy set more challenging goals than those with lower self-efficacy” (based on Pan <i>et al.</i> , 2011, p. 267).	Individuals with high self-efficacy: look for challenges, explore new things (Goal Setting Theory).	Benefits of SE Goal Setting

“Thus, the high self-efficacious individuals have greater outcome expectations than their low self-efficacious counterparts. Greater outcome expectation may lead to stronger effort and better performance” (based on Pan <i>et al.</i>, 2011, p. 267).	Individuals with high self-efficacy: persistent, set high goals.	Benefits of SE Goal Setting
“Attribution theory (Kelley, 1973) suggests that people with high self-efficacy appear to be especially susceptible to the self-serving bias. Specifically, they view their higher job performance as a result of their own effort. They seem to be less sensitive to the supervisory support given to them than less self-efficacious individuals. high self-efficacious individuals are less sensitive to the amount of information support than low self-efficacious individuals” (based on Pan <i>et al.</i>, 2011, p. 267).	Self-serving bias (Attribution Theory): Mentoring is an added value.	Benefits of SE
“CDMSE refers to individuals’ belief that they can successfully perform vocational decision-making tasks, such as self-appraisal, goal selection, gathering of career information, problem solving, and planning for the future” (Betz & Luzzo, 1996)”. (based on: Jiang, 2016, p. 32).	Self-efficacy: solve problems, se goals, and self-appraisal. SE enhances PA. Self-efficacy enables overcoming obstacles and barriers.	Benefits of SE Protean Attitude
“We expect that proactive individuals due to their innate abilities to mould work situations in their favor owing to their problem solving skills, generate events that are congruent to the pursuit of their personal goals (Weiss & Cropanzano, 1996). Proactive people have been shown to engage in active surveying of their environment, maintaining vigilance, and enacting behaviors intended to bring about desired outcomes. Proactive people actively seek out new information and practices in order to improve their performance (Bateman & Crant, 1993; Crant, 2000). These features are suggestive of the capabilities proactive people have to mould their work situation and environment—in the way they want.” (based on: Yousaf, et al., 2013, p. 214)	Proactive is an aspect of self-directedness. Protean attitude strengthens SE. Proactive individuals take initiatives. Proactive individuals are interested in continuous learning. Proactive individuals are observant and ready.	Benefits of SE Protean Attitude
“ITP expertise is constantly depleted with the “competence destroying” nature of IT. Therefore, the fear of falling behind in the technology race and the ceaseless pressure to stay up-to-date through ongoing learning are extra stressors on top of already tight deadlines and a demanding workload (Mak and Sockel, 2001). In fact, among the 33 most mentioned stressors, four of them were related to the pressures to keep pace with developments for ITPs in the field (Sethi et al, 2004). Failure to maintain and update one’s skills can quickly make a professional obsolete. “(based on: Fu & Chen, 2015, p. 538)	The high SE of females enhances their learning skills and abilities.	Benefits of SE Protean Attitude PLD
“Asense of competence concerning one’s career should promote PCO because selfefficacy increases initiative, effort, and persistence in goal-directed behaviors (Bandura, 2001). It can thus enhance the motivation to take charge of one’s career in a self-directed way. A sense of competence is thereby also closely related to subjective	High self-efficacy further enhances protean attitudes.	Benefits of SE

success and can trigger a “success cycle” in which positive career experiences enhance a self-directed career orientation (Hall et al., 1996). Moreover, people who feel competent to master challenges in the work role might be more ready to direct their career according to their own values instead of relying on an organization.” (based on: Hirschi, Jaensch, & Herrmann, 2016, p. 4).		
“The onset of the twenty-first century witnessed a resurgence of interest in analysing JS variables, recognizing that JS is correlated with labour market behaviour, in particular productivity, quitting, and absenteeism (Gazioglu and Tansel, 2006).” (based on: Baruch, Humbert, & Wilson, 2016, p. 235).	Job satisfaction strengthens self-efficacy.	Benefits of SE
“As suggested by ten Brummelhuis and Bakker’s (2012) work-home resources model, the acquisition of personal resources such as skills, knowledge, self-efficacy, and positive mood enables individuals to achieve positive outcomes (such as high performance and positive attitudes) at work and at home.” (based on: Drenzo et al., 2015, p. 540).	High self-efficacy enables a better balance of work-life responsibilities.	Benefits of SE
“Self-efficacy to regulate work and life is defined as the belief one has in one’s own ability to achieve a balance between work and non-work responsibilities, and to persist and cope with challenges posed by work and non-work demands” (Based on: Chan, Kalliath, Brough, Siu, O’Driscoll, & Timms, 2016, p.6).	Self-efficacy enables the balance between work and family responsibilities.	Benefits of SE
“Consequently, he or she is more likely to believe in his or her own ability to maintain a balance between work and non-work demands, thereby acquiring a strong sense of self-efficacy, and subsequently, achieving work-life balance” (Based on: Chan, Kalliath, Brough, Siu, O’Driscoll, & Timms, 2016, p.6).	A stronger sense of self-efficacy would enable females to work towards achieving work-life balance.	Benefits of SE
“Individuals with protean career orientation proactively establish a proper career goal to autonomously direct their career paths (DiRenzo, 2010). Protean career orientation individuals usually develop unique goals and standards to achieve their own success (Briscoe et al., 2006). Because of their self-directed and values-driven attitudes, they are likely to take the initiatives to establish their specific goals that would enable them to fulfil their values (Briscoe & Hall, 2006). establishing clear goals is thought to be an essential element of proactive career planning and a likely manifestation of one’s desire for personal agency over career growth (Abele & Wiese, 2008).” (based on: Rahim & M.Z., 2015, p.271).	Protean career orientation enables goal setting. Both self-directedness and personal values have a positive impact on goal development and setting.	Protean Attitude Goal Setting
“Self-determination theory (Deci & Ryan, 1985) suggests that people have organismic psychological needs to function autonomously in accordance with their developing core values and interests (Spence, Oades, & Caputi, 2004).” (based on: Jiang, 2016, p. 32).	Self-determination theory-personal values dimension.	Protean Attitude
“Protean career is defined as a career where the individual is experiencing greater responsibility for their career choices and	Protean individuals have a high sense of autonomy and control.	Protean Attitude

opportunities. The individual values freedom and self-growth and defines career success in terms of psychological factors (e.g. job satisfaction, self-actualization, personal accomplishment and sense of self-fulfillment) as compared with traditional career (Hall and Chandler, 2005).” (based on: Wong et al., 2017, p. 280).	Protean individuals perceive career success in terms of psychological success. Protean individuals are always looking for self-development.	
“It encompasses core value of self-growth by focusing on identity changes and continuous learning in career development (Hall, 2004).” (based on: Wong et al., 2017, p. 280).	Protean oriented individual goes through continuous self-assessment. Personal learning is a key aspect of Protean orientation.	Protean Attitude PLD
“Value-driven dimension is generating and evaluating career goals based on one’s internal values rather than other’s standards” (based on: Wong et al., 2017, p. 280).	Value driven dimension explains career choices of some individuals.	Protean Attitude
“Self-directed dimensions is developing the career through independent career management strategies instead of relying on others. employees must be able to be their own career managers, as well as their own futurist, constantly trying to discern trends that will affect their skills and employment, and keep themselves constantly equipped with new knowledge and skills that makes them attractive to employers (Hall and Moss, 1998).” (based on: Wong et al., 2017, p. 280).	Protean individuals are proactive and employable.	Protean Attitude PLD
“The protean careerist is more likely to use their self-defined standards and values to determine subjective career success (e.g. recognition, self-fulfillment and satisfaction) instead of following external standard such as number of promotions obtained, raises in salary and monetary related recognition (Briscoe and Hall, 2006).” (based on: Wong et al., 2017, p. 280).	Protean oriented people focus more on acknowledgement, satisfaction, and self-attainment as indicators of career success.	Protean Attitude
“In particularly, protean careerists tend to have learning and employability rather than performance and job security orientation (Briscoe and Hall, 2006).” (based on: Wong et al., 2017, p. 280).	Protean oriented are inclined more towards learning and employability rather than job security.	Protean Attitude
“Gubler <i>et al.</i> (2013, p. 34) redefined protean career concepts by including two additional crucial aspects of identity and adaptability.”(based on: Wong et al., 2017, p. 281).	Protean oriented people are highly adaptive.	Protean Attitude Professional Identity
“For employees who have a strong protean career orientation, owing to their proactivity in career planning, they are likely to experience occupational success and have more accomplishments throughout their careers (Baruch, 2014), which then boost and sustain their self-efficacy. They are eager to interact and learn from their supervisor and colleagues as well as to seek positive feedback and encouragement from them (Gubler et al., 2014). Earlier research has found that individuals with a strong protean career orientation obtain more instrumental and socioemotional support via	Goal setting Facilitate learning Protean attitude strengthens occupational commitment via career success and accomplishments. Protean attitude enhances self-efficacy via mastery experience. Protean attitude enhances the mentoring relation through the	Protean Attitude PLD Goal Setting

their social networks (Gasteiger, 2007; Grimland, Vigoda-Gadot, & Baruch, 2011). As they perceive more personal control and autonomy (Hall, 2002), they tend to experience positive affect and feel less anxiety. Drenzo, Greenhaus, and Weer (2015) reported that a protean career orientation enables individuals to develop more psychological capital (in which self-efficacy is one of its components). Taking the above arguments together, we expect employees with a strong protean career orientation will possess a high level of self-efficacy. Previous studies have provided evidence for a positive relationship between these two constructs (Baruch, 2014; Baruch, Bell, & Gray, 2005).” (based on: Ngo & Hui, 2018, p. 429)	eagerness of the mentee to learn more	
“The COR assumes that individuals who acquire resources are better able to obtain other resources in the future; that is, resources generate additional resources, thereby creating a resource “gain spiral” (Hobfoll, 2002).” (based on: Drenzo et al., 2015, p. 540).	conservation of resources perspective- spiral gain the ability to acquire resources leads to further resource acquisition. Goal setting. Facilitate learning.	Protean Attitude PLD Goal Setting
“The protean individuals value career success in terms of psychological-related factors, such as the degree of job satisfaction, self-actualization, personal accomplishment and sense of self-fulfilment (Hall and Chandler, 2005).” (based on: Wong & Rasdi, 2015, p. 411).	Protean oriented individuals assess their success by their degree of job satisfaction, fulfilling their dreams.	Protean Attitude
“Similarly, Lent et al. (1994) argued that goal is a ubiquitous component of career decision-making theories, and career plans, aspirations, and choices are embedded in essential goal mechanisms.” (based on: Jiang, 2016, p. 53).	Understanding and discussing reasons to pursue and to stay in STEM that are based on aspirations, wishes and love are part of goal setting process.	Goal Setting
“Bandura (1986) found that the attainment of challenging goals (in relation to self-set standard) creates self-satisfaction and most likely encourages career interest development. The career goal setting should be compatible with personal values, talents, interests and preferred lifestyle which are most likely to satisfy present and future career. The attainment of the KPI requirement shows a sense of achievement, self-fulfilment and motivation, which is related to the value-driven dimension of the protean career development” (based on: Wong & Rasdi, 2015, p. 413).	Being able to achieve a set goal gives the person a sense of accomplishment and fulfillment which is part of value-driven protean attitude. The goals set initially would be compatible with desires and wishes based on personal values. this enhances the PA.	Goal Setting Protean Attitude

Appendix G

Informed Consent (Mentee)

This is an invitation to participate in a research on females in STEM (Science, technology, engineering, and mathematics) industries. I am Lama Blaique, a PhD- Business Management candidate at the British University in Dubai and I am conducting this research as part of my dissertation.

You were chosen as a potential candidate in this study because you are a female, has a STEM degree, has been working in STEM industry following graduation, and has or had a mentor at some point in your career.

This study attempts to understand the effects of mentoring and coping self-efficacy on the occupational commitment of females who are working in STEM related industries. The study tries to understand how some females are able to succeed and commit to occupations in these industries while many others are failing to do so.

You are requested to be interviewed for around an hour and a half, and with your approval the interview will be digitally recorded.

Confidentiality Measures:

1. The information provided by you during the interview will be dealt with utmost confidentiality. Access to this information is only available to the researcher and the dissertation faculty for analysis purposes.
2. Your name and identity will be kept anonymous throughout the whole research phases.
3. You will have the chance to review the interview transcripts and to remove any comment or answer you feel may have a negative implication on your career.
4. Your participation is totally voluntary, and you can withdraw from the study at any time. There will be no consequences if you choose not to participate.

Benefits:

This research aims to come forward with useful recommendations for career counsellors, educators, mentors, and organizational leaders in terms of attaining and retaining minority females in STEM industries. Thus, making it less challenging for female, like yourself, to further succeed in these domains of work.

If you have any additional questions regarding this research, you may contact the researcher Lama Blaique at 2016156002@student.buid.ac.ae or the Dean of Research and Chair of the Ethics Committee Professor Ashly Pinnington at ashly.pinnington@buid.ac.ae. You will be given a copy of this form for your own records.

____ I agree to participate in this research.

____ I agree to have the interview digitally recorded.

Participant's Name and Signature: _____ Date: _____

Appendix H

Informed Consent (Mentor)

This is an invitation to participate in a research on females in STEM (Science, technology, engineering, and mathematics) industries. I am Lama Blaique, a PhD- Business Management candidate at the British University in Dubai and I am conducting this research as part of my dissertation.

You are being contacted because Ms. _____ identified you as her mentor.

This study attempts to understand the effect of mentoring and coping self-efficacy on the occupational commitment of females who are working in STEM related industries. The study tries to understand how some females are able to succeed and commit to occupations in these industries while many others are failing to do so.

You are requested to be interviewed for around an hour and a half, and with your approval the interview will be digitally recorded.

Confidentiality Measures:

1. The information provided by you during the interview will be dealt with utmost confidentiality. Access to this information is only available to the researcher and the dissertation faculty for analysis purposes.
2. Your name and identity will be kept anonymous throughout the whole research phases.
3. You will have the chance to review the interview transcripts and to remove any comment or answer you feel may have a negative implication on your career.
4. Your participation is totally voluntary, and you can withdraw from the study at any time. There will be no consequences if you choose not to participate.

Benefits:

This research aims to come forward with useful recommendations for mentors in terms of retaining minority females in STEM industries. Thus, making it less challenging for females to further succeed in these domains of work.

If you have any additional questions regarding this research, you may contact the researcher Lama Blaique at 2016156002@student.buid.ac.ae or the Dean of Research and Chair of the Ethics Committee Professor Ashly Pinnington at ashly.pinnington@buid.ac.ae. You will be given a copy of this form for your own records.

____ I agree to participate in this research.

____ I agree to have the interview digitally recorded.

Mentor's Name: _____

Date: _____

Mentor's Signature: _____

Appendix I

Normality Test: Skewness and Kurtosis

CSE Items	Skewness	Kurtosis
1	-1.053	1.131
2	-0.998	0.896
3	-1.134	1.273
4	-0.578	-0.481
5	-0.586	-0.278
6	-0.810	0.863
7	-0.396	-0.231
8	-1.435	2.938
9	-0.957	0.304
10	-1.262	1.375
11	-0.703	-0.052
12	-0.617	-0.214
13	-0.331	-0.655
14	-0.374	-0.607
15	-0.414	-0.554
16	-0.272	-0.782
17	-0.353	-0.570
18	-0.681	-0.221
19	-0.536	-0.635
20	-0.545	-0.338
21	-1.208	0.892
22	-0.630	-0.268
23	-0.908	-0.004
24	-0.368	-0.866
25	-0.695	-0.194
26	-0.040	-0.996

GSE Items	Skewness	Kurtosis
1	-0.565	-0.141
2	-0.848	0.093
3	-0.737	-0.074
4	-0.618	-0.221
5	0.774	0.178
6	-1.492	2.613
7	-0.948	0.596

OCC Items	Skewness	Kurtosis
1	-1.314	1.973
2	-1.001	-0.337
3	-1.751	3.576
4	-1.907	2.845
5	-1.057	-0.165
6	-1.555	2.608
7	-0.538	-0.604
8	-0.368	-0.798
9	-0.310	-0.914
10	-0.006	-1.223
11	-0.027	-0.878
12	-0.327	-0.888
13	-0.936	0.125
14	-0.370	-1.005
15	-0.362	-1.140
16	-0.198	-1.033
17	-0.067	-1.149
18	0.175	-1.029

PAT Items	Skewness	Kurtosis
1	-0.718	-0.151
2	-1.015	0.831
3	-0.865	0.367
4	-1.306	1.681
5	-1.083	0.782
6	0.971	0.464
7	-0.938	0.791
8	-1.107	0.715
9	0.531	0.444
10	-0.618	-0.187
11	-1.050	0.702
12	-1.217	0.961
13	-0.489	-0.364
14	-0.624	-0.518

PLD Items	Skewness	Kurtosis
1	-1.062	1.182
2	-1.168	1.778
3	-0.945	1.047
4	0.895	0.691
5	-1.143	1.039
6	-0.937	0.801

7	-0.809	0.145
8	-1.063	1.070
9	0.982	0.784
10	0.746	0.001
11	-1.185	0.785
12	-1.083	1.322

MEF Items	Skewness	Kurtosis
1	-0.768	-0.018
2	-0.915	0.507
3	-0.654	-0.03
4	-0.029	1.368
5	-0.66	-0.427
6	-0.468	-0.712
7	-0.442	-0.505
8	-0.987	0.408
9	-1.275	1.282

QUM Items	Skewness	Kurtosis
1	-0.782	0.131
2	-0.861	0.274
3	-0.765	0.212
4	-0.934	0.672
5	-1.022	0.646

Appendix J

Bootstrapping Test Result for Model B Mediator

Model : 4
 Y : OCC
 X : CSE
 M : GSE

Sample
 Size: 375

OUTCOME VARIABLE:

GSE

Model Summary

R	R-sq	MSE	F	df1	df2	p
.3490	.1218	.6159	51.7452	1.0000	373.0000	.0000

Model

	coeff	se	t	p	LLCI	ULCI
constant	2.5334	.1894	13.3792	.0000	2.1611	2.9058
CSE	.1883	.0262	7.1934	.0000	.1368	.2398

Standardized coefficients

coeff
CSE .3490

OUTCOME VARIABLE:

OCC

Model Summary

R	R-sq	MSE	F	df1	df2	p
.3390	.1149	.5294	24.1447	2.0000	372.0000	.0000

Model

	coeff	se	t	p	LLCI	ULCI
constant	4.6787	.2135	21.9091	.0000	4.2588	5.0986
CSE	.0347	.0259	1.3392	.1813	-.0162	.0856

GSE	.2843	.0480	5.9225	.0000	.1899	.3787
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Standardized coefficients

	coeff
CSE	.0697
GSE	.3083

***** TOTAL EFFECT MODEL *****

OUTCOME VARIABLE:

OCC

Model Summary

R	R-sq	MSE	F	df1	df2	p
.1773	.0314	.5777	12.1072	1.0000	373.0000	.0006

Model

	coeff	se	t	p	LLCI	ULCI
constant	5.3989	.1834	29.4401	.0000	5.0383	5.7595
CSE	.0882	.0253	3.4795	.0006	.0384	.1381

Standardized coefficients

	coeff
CSE	.1773

***** TOTAL, DIRECT, AND INDIRECT EFFECTS OF X ON Y *****

Total effect of X on Y

Effect	se	t	p	LLCI	ULCI	c_ps	c_cs
.0882	.0253	3.4795	.0006	.0384	.1381	.1144	.1773

Direct effect of X on Y

Effect	se	t	p	LLCI	ULCI	c'_ps	c'_cs
.0347	.0259	1.3392	.1813	-.0162	.0856	.0450	.0697

Indirect effect(s) of X on Y:

	Effect	BootSE	BootLLCI	BootULCI
GSE	.0535	.0128	.0302	.0799

Partially standardized indirect effect(s) of X on Y:

	Effect	BootSE	BootLLCI	BootULCI
GSE	.0694	.0163	.0396	.1016

Completely standardized indirect effect(s) of X on Y:

	Effect	BootSE	BootLLCI	BootULCI
GSE	.1076	.0257	.0606	.1597

***** ANALYSIS NOTES AND ERRORS *****

Level of confidence for all confidence intervals in output:

95.0000

Number of bootstrap samples for percentile bootstrap confidence intervals:

5000