THE ROLE OF EMPOWERMENT IN BREAKING CAREER BARRIERS – A STUDY OF MIDDLE MANAGEMENT FEMALE ENGINEERS IN MALAYSIAN MANUFACTURING SECTOR

Parameswary Muthiah

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School of Architecture, Computing & Engineering, University of East London

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ABSTRACT

This thesis investigated the role of empowerment in breaking career progression barriers limiting middle-level Malaysian female engineers. The study examined the moderating effect of empowerment factors on the relationship between career barriers and career progression. A theoretical and empirical literature review informed the design of a conceptual framework for the study. Malaysia's engineering sector lacks empowerment research. Pragmatism and the mixed-method design were adopted. Cross-sectional primary data were collected using survey and structured interview methods, by way of questionnaires and interview guides with confirmed validity and reliability. In all, 120 middle-level female engineers responded to the questionnaires, while 20 middle - level female engineers participated in structured interviews. Subsequently, 20 respondents including HR managers and male and female managerial engineers participated in a validation exercise. Descriptive statistics, a correlation model, and a hierarchical regression model were used to analyse the quantitative data, while thematic analysis was utilised to analyse the qualitative data. Both quantitative and qualitative data affirmed gender stereotyping; work-life balance; technical skills limitation; negative perception; and misogynistic management as key career barriers, whilst the qualitative data identified artificial intelligence as a supplementary career barrier. Structural, Psychological, and Self-efficacy empowerment were affirmed as empowerment forces that could break the career barriers facing female engineers. The research offers new insights into the role of AI and spiritual empowerment as barriers and enablers. Findings showed that all empowerment factors are effective in addressing career barriers, with some being more impactful. Based on these findings, recommendations are provided for policymakers, HR managers, and engineers to foster an empowering environment. Overall, this research offers a practical framework for evaluating empowerment strategies to support female engineers' career progression in Malaysia.

DECLARATION

I affirm that this thesis is solely the outcome of my efforts and has not been presented, in full or in part, for any other degree or qualification at any other university or institution. Except where specifically credited, there are no academic materials published or authored by others included in this thesis. All sources and information utilized in this research have been accurately referenced and cited. I certify that the work showcased in this thesis is my original contribution to the engineering field and any assistance received during this research has been appropriately acknowledged.

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LIST OF ABBREVIATIONS

GS – Gender Stereotyping

WLB – Work-Life Balance

TSL – Technical Skills Limitation

NP – Negative Perceptions

MM – Misogynistic Management

CP – Career Progression

CMB – Common Method Bias

EFA – Exploratory Factor Analysis

KMO – Kaiser-Meyer-Olkin

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DEDICATION

This PhD thesis is dedicated to my nephew and niece, whose unwavering support inspired me to persevere during the most arduous periods of my journey. I also extend my gratitude to my brother and sister-in-law for their encouragement at critical junctures.

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CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

This study examines the role of empowerment as a force in breaking career barriers among middle-level female engineers in Malaysia. For a scientific understanding of this phenomenon, the researcher investigates the career barriers limiting the effective participation of Malaysian middle-level women in engineering. Beyond the career barriers, the study unmasks current empowerment regimes and how they can pave the way for the effective participation of middle-level Malaysian women in engineering.

The European Foundation for the Improvement of Living and Working Conditions (2019) reported that for the past few decades' women employees have been increasing in huge numbers, but they faced major issues in their career development. The foundation further states that women employees are experiencing both horizontal and vertical isolation.

In terms of leadership roles, gender discrimination rooted in stereotypes remains prevalent, despite numerous policies aimed at promoting gender equality in recent decades. As of 2020, women occupy merely 29 percent of senior management roles worldwide (IBR, 2020). According to the World Economic Forum (2017), there exists an average gender gap of 32.0 percent in four main areas: 'Economic Participation and Opportunity,' 'Educational Attainment,' 'Health and Survival,' and 'Political Empowerment.' This marks a modest rise from the average gender gap of 31.7 percent noted in earlier years (Tabassum and Nayak, 2021).

Acker (2012) contends that, despite substantial advancements in gender equity in education and the increasing participation of women in traditionally male-dominated professions, women remain underrepresented in top leadership positions across affluent, industrialized nations. The United Kingdom, in particular, demonstrates a poor record concerning workplace gender equality, as noted by Conley and Page (2018) and Glassdoor (2016). Glassdoor (2016) reports that the UK ranks 11th out of 18 European countries in the gender equality league table.

Women encounter a variety of obstacles in their pursuit of success in their selected careers, particularly in rigid fields like engineering, where they often have to assert their presence in

accordance with male-centric criteria (Thurasamy et al., 2011). Globally, women engineers are significantly underrepresented (Ronen and Pines, 2008). As a result, the limited number of women in this field face intricate forms of gender-based disadvantages across multiple areas, including sexual harassment, discrimination, opportunities for personal growth, networking, the glass ceiling, work-life balance, and career advancement. In the engineering profession, the prevailing perception among both men and women remains that it is predominantly a male domain (Ismail and Ibrahim, 2008).

Dainty and Lingard (2006) emphasise the importance of site-based technical and managerial roles for career progression; however, women remain underrepresented in the engineering industry. Du (2005), in a study presented at the 3rd European Gender and ICT Symposium in Manchester, examined the interplay between gender, learning theories, and engineering. The findings indicated unequal access to participation in scientific and engineering communities for men and women, with the social perception and culture of engineering remaining predominantly masculine. Similarly, Phipps (2012) observed that the professional identity of engineers is largely associated with men, perpetuating the expectation that engineers are male and leaving few female role models for aspiring women in the field.

Faulkner (2009) describes the "invisibility paradox" faced by women engineers, wherein they are simultaneously highly visible as women yet invisible as engineers, highlighting a neglect of their contributions. Literature also reveals that women engineers often face differential treatment, such as limited hands-on opportunities and exclusion from certain tasks on the plant floor (Horgan, 1989; Morrison and Von Glinow, 1990). An empirical study of women engineers in the construction industry identified challenges including bias, segregation, and discrimination, often with the complicity of peers (Johari et al., 2013).

Several studies provide evidence of deliberate efforts by men to obstruct women from entering the engineering profession, suggesting that such barriers are socially constructed rather than rooted in biological or economic factors. If women inherently lacked the skills or qualities needed for success in engineering, such efforts would be unnecessary (Johari et al., 2013; Tabassum and Nayak, 2021). Furthermore, Canel et al. (2000) argue that there is no definitive scientific evidence to suggest that male engineers think or design differently from their female counterparts.

Gender stereotyping involves assumptions about the actual or perceived behaviours of men and women (Papa and Natalie, 1989). Gender influences and regulates what is deemed feminine or masculine in behaviours, products, technologies, environments, and knowledge. These attitudes are not static but vary significantly across cultures and contexts (West and Zimmerman, 1987). West and Zimmerman (1987) conceptualize gender as a social construct reflecting institutionalized power dynamics and hierarchies of domination and subordination. Gender involves the active or passive management of behaviour according to normative expectations, with performance in specific roles often judged through the lens of gender (Kilu, 2017). Feminist scholars have highlighted that patriarchal framework shape organizational contexts, thereby reinforcing gendered status relations and values (Taylor and Miller, 1994). Research frequently points to implicit agreements within organizations that exclude women from certain roles. Acker (1990) identified four mechanisms through which organizations reproduce gender norms, often portraying the ideal employee as someone highly mobile, flexible, job-oriented, and unencumbered by external responsibilities—qualities more readily associated with male workers.

While gender operates at both interactional and institutional levels, the global gender division of labour reflects entrenched disparities. Women are often assigned primary responsibilities such as caregiving and emotional labour, while men are privileged with access to resources like money, power, and opportunities for growth (Kilu, 2017; Apusiga, 1987). Leadership assessments in many organizations have been criticized for perpetuating discrimination against women due to the absence of clear strategies and processes (Conley and Page, 2018). Gender-biased evaluations often underestimate women's capabilities, a challenge that could be addressed through empowerment initiatives.

Empowerment refers to enhancing individuals' self-efficacy by identifying and eliminating conditions that perpetuate powerlessness (Conger and Kanungo, 1988). It enables individuals to gain control over their lives and participate democratically within their communities (Rappaport, 1987). In organisational contexts, empowerment involves granting employees the authority and resources needed to make decisions, take responsibility for outcomes, and demonstrate their capabilities (Aghazamani and Hunt, 2017). Hechanova et al. (2006) view empowerment as an organisational strategy to decentralize power and decision-making. Ahearne et al. (2005) describe it as a practice of delegating responsibility down the hierarchy, granting employees greater autonomy in their primary tasks. For this study, female

empowerment is conceptualized as fostering women's sense of self-worth, enhancing their ability to make independent choices, and enabling them to influence social change for themselves and others.

1.2 Contextual Background

The Malaysian Economy

Malaysia has achieved substantial progress in diversifying its economy, leveraging its natural resources, and reaching significant developmental milestones. As a sovereign nation, Malaysia exemplifies visionary leadership and a steadfast commitment to economic prosperity (Malaysia Budget, 2017). Since gaining independence in 1957, Malaysia has evolved from an economy focused on agriculture and commodities to one that emphasises strong manufacturing and service sectors, becoming a prominent global exporter of electrical products, components, and parts. A report from the World Bank points out that Malaysia has a highly open economy, consistently achieving a trade-to-GDP ratio greater than 130 percent since 2010. This openness has been crucial in generating jobs and increasing income, with around 40 percent of employment in Malaysia tied to export activities.

Following the Asian financial crisis of 1997–1998, Malaysia has shown considerable economic resilience, maintaining an average annual growth rate of 5.4 percent since 2010. The country is on track to advance from an upper-middle-income to a high-income economy by 2024. Furthermore, Malaysia continues to be a major global producer and exporter of palm oil, which is vital for economic development and job creation (World Bank Report, 2019).

Malaysia's Economic Growth

Projections by the Malaysian Investment Development Authority (MIDA, 2024) suggest that Malaysia's economic growth will surpass that of its regional peers and developed nations over the next two years. Key growth drivers include robust GDP growth, progress toward net-zero emissions, trade performance, and the expansion of the digital economy. Resilient domestic expenditure and improving external demand underpin this positive outlook, with GDP growth forecasted at 4.9 percent in 2024. Growth will be driven by steady household spending, supported by continued employment and wage increases, as well as improved tourist arrivals and spending.

Investment activity will benefit from advancements in multi-year private and public projects, the implementation of catalytic initiatives outlined in national master plans, and increased realisation of approved investments (MIDA, 2024). In the first quarter of 2024, Malaysia's economy grew by 4.2 percent, fuelled by increased private spending and a rebound in exports. Household expenditures rose, supported by ongoing growth in employment and wages, while both the private and public sectors contributed to investment through their capital spending. Exports improved as external demand increased.

Growth was widespread across sectors, with a notable recovery in the manufacturing sector, particularly in both the electrical and electronic (E&E) and non-E&E industries. Meanwhile, the services sector also showed significant growth, driven by retail trade and the transport and storage sectors. When adjusted for seasonal variations, the economy saw a quarter-on-quarter growth of 1.4 percent.

Malaysia’s Industrialisation

Engineering has been a cornerstone of Malaysia's industrialization and economic development. Over the past two decades, the nation has pursued developed-country status, requiring over 200,000 engineers to meet its industrial goals. However, as of 2020, only 70,000 engineers were registered with the Malaysian Engineering Society (Malaysia Budget Statement, 2020). Malaysia's industrialization, guided by the "Look East Policy" of the 1980s, has significantly contributed to economic growth, with substantial expansion in the manufacturing sector, particularly in electronics, electrical appliances, automobiles, and textiles.

Employment trends in Malaysia reflect the broader structural transformations in its economy. The country has transitioned from an agrarian-based economy to one driven by industrial and service sectors. From the 1970s to the early 2000s, industrial employment expanded significantly, while the services sector concurrently grew to support industrial activities. Since 2000, the share of employment in the industrial sector has stabilized, while the services sector continues to grow and remains a key driver of employment.

Malaysia’s Petroleum and Natural Gas

Malaysia’s oil and gas (O&G) sector has experienced remarkable growth over the past century, beginning with the drilling of its first oil well in Miri, Sarawak, in 1910. Initial production was modest at 83 barrels per day (bbls/d), but output increased significantly to 15,000 bbls/d within

two decades. Shell was the sole operator during these early developments. Today, Malaysia is a major hub for the global O&G industry, with over 400 oil and gas fields. The country holds the second-largest reserves in Asia and ranks as the world's third-largest exporter of liquefied natural gas (MIDA, 2024).

Malaysia's Socio-Cultural Context

Women constitute 50 percent of Malaysia's population but face significant discrimination, particularly in decision-making processes across various sectors, including education, leadership, politics, the corporate world, and entrepreneurship (Suleman and Rahman, 2020). Globally, the top three challenges faced by women are sexual harassment, sexual violence, and physical violence. In Malaysia, these issues persist, with the additional concern of the sexualization of women and girls in the media being a critical equality issue (Lim et al., 2019). Gender stereotyping and balancing work with caregiving responsibilities are more pressing issues for Malaysian women compared to the global average. Furthermore, limited support for pregnant women and new mothers, as well as the underrepresentation of women in leadership roles, remain significant challenges. These issues are among the top ten equality concerns identified in Malaysia (Lim et al., 2019).

Malaysian women find themselves wrestling with a complex situation as they navigate the demands of contemporary life while also competing with traditional expectations. This struggle is compounded by a lack of societal recognition, making decision-making particularly challenging. While some women are now part of the workforce, there remains an expectation for them to fulfil familial duties and adhere to the conventional image of Malaysian women, which often emphasises submissiveness and responsibility (Suleman et al., 2020).

Moreover, the portrayal of Malaysian women often leans towards a negative stereotype, which is echoed in various international gender equality assessments (Lawless et al., 2021). Reports from the World Economic Forum highlight that Malaysia ranks quite low compared to many other nations on the Global Gender Gap Index. This ranking is informed by statistical comparisons that examine male and female ratios across several sectors, including education, economic participation, political involvement, and health outcomes (Sharma and Soederberg, 2020).

Overall, women in Malaysia face significant undervaluation in multiple facets of society. The roles and status assigned to women reflect a longstanding history of gender inequality and discrimination, which continues to manifest in modern times (Suleman et al., 2020). In Malaysia, patriarchal values are prevalent, characterised by beliefs and practices that prioritise male authority. There is a societal preference for sons over daughters, with parents favouring male children as future heirs and sources of security in old age (Musa and Husin, 2018). In Malay society, issues of gender equity—such as property rights, emotional support, and gender neutrality—are significantly lacking. Cultural norms in Malaysia reveal a disparity in wealth and property transfer, favouring the paternal lineage over the maternal (Suleman and Mohamed, 2019).

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Patriarchy describes a societal structure where men predominantly hold authority and control, occupying key roles in political leadership, moral guidance, social advantages, and property ownership. In Malaysia, as in many other nations, this system is deeply ingrained due to longstanding cultural traditions, religious beliefs, and societal expectations. Across various Malaysian ethnic groups such as Malay, Indian, and Chinese communities, traditional gender roles remain prominent. Men are generally seen as the main financial providers and leaders within both family units and society at large, whereas women are often expected to focus primarily on caregiving and household responsibilities. Family structures frequently follow a hierarchy where elder males make most decisions. This setup often restricts women's ability to pursue ambitious career goals or leadership positions due to clearly defined roles and expectations.

In many Malaysian households, particularly those with rural or conservative backgrounds, there is a strong preference for male children, especially sons, which impacts both family interactions and wider social norms related to gender. Sons are typically favoured as the carriers

of the family name, inheritors of property, and successors to family businesses. This perpetuates the belief that men have privileged access to economic resources and social standing. From early childhood, girls are often encouraged to adopt nurturing and supportive roles, seen as helpers to male family members rather than as independent individuals with equal rights to leadership or wealth. Such socialisation influences perceptions about suitable career paths for women, often steering them away from leadership ambitions.

How Patriarchy and Male Heir Preference Create Barriers in Women's Careers:

These cultural beliefs translate into both visible and hidden challenges for women in their professional journeys:

Restricted Leadership Opportunities: Due to entrenched patriarchal norms, men are frequently preferred for high-level management roles, particularly in sectors like manufacturing, engineering, and technology. Women may be viewed as less dedicated because of expected family duties.

Conflict Between Work and Family Roles: The societal pressure on women to prioritise domestic care limits their availability and flexibility for career advancement. Employers may hold biases against women who are mothers or who have caregiving responsibilities.

Gender Stereotypes and Bias: Female professionals often confront prejudices questioning their competence, leadership capabilities, and emotional steadiness. The preference for male heirs reinforces the notion that men are natural leaders, causing women's career goals to be undervalued.

Limited Access to Networks and Mentors: Patriarchal cultures tend to favour male-dominated professional circles, restricting women's opportunities to gain mentorship and sponsorship, which are essential for career growth.

Unequal Investment in Education: In certain families, more resources are devoted to educating sons, viewed as a better long-term investment. This limits women's access to qualifications and experience needed for leadership roles.

Despite the global movement towards women's empowerment, it has led to some negative consequences for women in Malaysia. Women in full-time jobs often face additional domestic responsibilities once they finish their formal work. After completing their professional duties, they are expected to manage household tasks (Suleman and Rahman, 2020). In this context, women's roles tend to be oriented more towards family responsibilities rather than personal aspirations. Many women find themselves having to choose between their careers and familial

obligations, often feeling compelled to prioritize their family duties and tasks traditionally associated with women.

Many nations, including Malaysia, have implemented legal frameworks such as the Convention on the Elimination of Discrimination Against Women (CEDAW) to combat gender discrimination. However, comprehensive solutions to this issue remain elusive. Women in Malaysia, as well as in other communities, continue to experience differential treatment compared to men. Malay women, in particular, are often relegated to specific roles that are characterized as challenging and assertive (Lim et al., 2019).

The Engineering Environment

Engineering management addresses three critical aspects: supporting team members, managing execution and coordination across teams, and reflecting on and evolving organisational processes as they scale. Sharma and Soederberg (2020) highlight that the current engineering environment is increasingly challenging, with issues such as growing technical complexity and competitive pressures. Consequently, modern managers must effectively confront these challenges in handling complex tasks and projects. To achieve this, they must develop an understanding of how technical, organisational, and behavioural factors interact to create productive engineering teams (Suleman and Mohamed, 2019).

As engineers advance in their careers, they are expected to utilize engineering management and leadership tools more extensively, with some becoming specialised management engineers (Ipenz, 2015). Initially, engineers manage their own work and professionalism as independent practitioners. Over time, they take on responsibilities for managing others' work within projects and organisations, often transitioning to roles as technology or team leaders. While some engineers remain in these positions, others progress to oversee entire business units or organizations, taking on responsibilities for governance and strategic direction. This career progression necessitates the continuous development of a dynamic set of professional skills. Shoura and Singh (1998) assert that motivation theory can help determine whether engineering management effectively balances individual engineers' developmental needs with organizational goals.

Despite the engineering sector's significant contribution to Malaysia's economy, coupled with high wages and rapid employment growth, the underrepresentation of women in engineering remains a concern (Johari et al., 2013; Lim et al., 2019). Policymakers note that this

underrepresentation limits the technical workforce by failing to harness the creative potential of women. In response, the Malaysian government has committed to gender equality through initiatives such as education parity, equal employment opportunities, and anti-discrimination policies. However, workplace discrimination persists, particularly at managerial levels (Peshave and Gupta, 2017). This calls for further investigation into how empowerment strategies can mitigate career barriers and enable female engineers to advance to senior roles within the engineering industry.

1.3 Purpose of Study

The engineering profession has long been recognised as one of the most male-dominated fields. Numerous studies have documented this gender disparity across countries, including the United States (Reardon, 2004; SWE, 2004). Women constitute approximately 26% of the engineering workforce in U.K (SWE 2021). Females in engineering fields are notably underrepresented. For example, although women make up more than half of the population in the United States and represent 47% of the total workforce, they represent only 7.7% of those employed in engineering and science disciplines. The majority of the women tend to work in other areas such as healthcare, support roles, and education (SWE 2021).

Despite focused efforts to recruit and retain women in engineering over recent decades, their representation remains alarmingly low (Mentor Net, 2019). This underrepresentation denies women opportunities to acquire valuable skills, pursue rewarding careers, contribute to knowledge and innovation, and achieve financial independence and economic equality. Empirical studies have highlighted that women engineers in construction and related industries face challenges such as partiality, segregation, and peer discrimination (Johari et al., 2013), reinforcing gender stereotypes that associate such industries with men (Ismail and Ibrahim, 2018). Leadership assessments within organisations have also been criticized for being discriminatory and biased, often due to unclear strategies and evaluation processes (Suleman and Mohamed, 2019).

This study aims to explore how empowerment strategies can address career barriers faced by middle-level female engineers in Malaysia. Specifically, it will investigate the barriers hindering their career progression, examine the relationship between these barriers and their career advancement, and propose strategies to mitigate these challenges. By integrating empowerment approaches and best practices from other countries, the study seeks to enable middle-level female engineers to contribute effectively to their organizations and Malaysia's economy.

1.4 Statement of the Problem

The literature consistently indicates that women face significant challenges in advancing their careers, particularly in male-dominated fields such as engineering, where success criteria are often shaped by men (Thurasamy et al., 2011). Studies also highlight the global underrepresentation of women in engineering (Ronen and Pines, 2008). According to the European Foundation for the Improvement of Living and Working Conditions (2019), while female workforce participation has grown significantly, women still encounter substantial obstacles to career advancement. Those who enter the engineering field often face multifaceted gender-based disadvantages, including sexual harassment, discrimination, limited opportunities for personal development, restricted networking, the glass ceiling, work-family balance challenges, and reduced career mobility (Tabassum and Nayak, 2021).

Engineering has traditionally been perceived as a male domain by both genders (Ismail and Ibrahim, 2018). In Malaysia, although more women are entering the profession, mid-career female engineers continue to face barriers to advancing into senior roles. Gender stereotypes, work-life balance challenges, and slow career progression are key factors. According to the Board of Engineers Malaysia, while 26 percent of engineering graduates are women, only 6 percent achieve professional engineer status.

Despite the Malaysian government's initiatives to promote gender equality—such as ensuring educational parity, providing equal employment opportunities, and enforcing anti-discrimination policies—workplace discrimination persists, particularly in managerial positions (Peshave and Gupta, 2017). This is particularly concerning in engineering and technical sectors, which are vital to Malaysia's economy. The continued underrepresentation of women in these fields limits the nation's ability to fully leverage its technical workforce (Johari et al., 2013).

Furthermore, despite the growing number of women with science, engineering, and technology (SET) degrees, approximately 70 percent are not employed in roles that utilise these skills (Ministry of Women, Family, and Community Development, Malaysia, 2020), representing a significant economic loss. Although many countries, including Malaysia, have witnessed a rise in women entering engineering roles (Dean and Fleckenstein, 2007; Burke, 2007; Powell et al., 2007), gender disparities persist. Successful examples of women excelling in engineering

highlight the potential for greater inclusivity (Evett, 1996; Ismail and Rasdi, 2006; Ismail and Ibrahim, 2008; Buse et al., 2017).

In Malaysia, middle -level female engineer managers face numerous challenges, including gender stereotypes, work-life imbalance, and limited career advancement opportunities. These barriers must be addressed urgently to maximize the contributions of female engineers and support the country's economic development. This study seeks to examine these challenges and propose actionable interventions to foster gender equity in Malaysia's engineering workforce.

1.5 Research Gap

Existing Research Gap

Inarguably, However, the geographical context of such works is mostly limited to Europe, the United States, and Australia, among others. Studies on Asia are limited, and worryingly, studies on Malaysia are very scarce. This research attempts to set the stage for a contemporary study in this deficit area.

Empowerment studies concerning women in engineering are very limited. For instance, while the concept of psychological empowerment has been studied extensively, the significance of structural empowerment in relation to work engagement has not been as thoroughly examined. Research on this topic is primarily found within the context of healthcare environments (Laschinger and Finegan, 2005). The interplay between structural empowerment and career progression for female empowerment is very limited in the literature (Monje-Amor *et al,* 2021). Besides, so far, no study has examined the effectiveness of structural empowerment as a tool that could be applied to break career progression barriers among female engineers in Malaysia.

Previous MPhil Study by the Author

The previous MPhil study by the author, investigated career barriers amongst middle-level women engineers in manufacturing organisations in Malaysia and how empowerment could be used as a management and motivational force to promote female engineers' career progression to top management level. This context was described as under-researched, with regards to female engineers' career barriers and empowerment studies. The work utilised a mix of qualitative and quantitative data sets to understand the complex phenomenon of empowerment

as a force in breaking career barriers among middle-level female engineers in Malaysian manufacturing sector. This choice paved the way for utilisation of multiple sources of data collection including surveys and individual interviews. The findings revealed perception, gender stereotyping, work life balance, and glass ceiling as key barriers to career progression of middle-level female engineers in Malaysia. Similarly, traits and behaviour (consisting of psychological, structural, and motivational empowerment), recruitment process, and mentoring were found to be empowerment tools for breaking career barriers. Furthermore, the findings revealed that perception, gender stereotype, and glass ceiling had a significant relationship with career progression, suggesting that these key barriers impeded career progression of female engineers in Malaysia. However, work life balance had no significant relationship with career progression, meaning work life balance would not be playing any significant role in the career progression of female engineers in Malaysia. Lastly, it was found that only empowerment regimes (traits and behaviour) among the three identified empowerment tools had significant predictive effect on career progression.

The qualitative data results showed a clear lack of national and organizational policies, control of degree of autonomy and responsibility for decision -making in operations. Also, lack of trust of competency, trust for middle-level female engineers to execute given tasks, non-existence of organized motivational packages such as reward systems, promotions, training and obstacles to climbing the career ladder or career progression pathways. The qualitative results provided insights into the importance of delegating authority by division and sharing of task to subordinates, reducing workload, enhancing subordinates' ability, talent, and initiative skills, and strengthening communication, supervision, and mentoring skills. Despite the usefulness of the MPhil study, it had several limitations that warranted a further study to address them. Some of the career barriers identified overlapped but were not merged before their examination. Other career barriers lacked clear distinction. For instance, whilst perception can be positive or negative, the MPhil study did not indicate precisely and clearly that perception was being considered in the negative sense. There was no sufficient empirical literature to justify the identification of the barriers and how they could relate to progression in the context of Malaysia female engineers. Besides, the MPhil study was limited in analysis and was not robust enough.

1.6 Research Objectives

The main aim of this research was to investigate the role of empowerment as a moderator on the relationship between career barriers and career progression among Malaysian middle-level female engineers. Specifically, this study sought to achieve the following research objectives:

1. To identify career barriers confronting middle-level female engineers in Malaysia.
2. To ascertain empowerment factors that can be used as tools in breaking career barriers of middle-level female engineers in Malaysia.
3. To assess the relationship between career barriers and career progression.
4. To examine the moderating effect of empowerment on the relationship between career barriers and career progression.
5. To develop a model that illustrates the efficacy of empowerment as a tool to break career barriers for career progression among female engineers in Malaysia.

1.7 Research Questions

The following research questions were formulated to guide the data collection for this study.

1. What are the career barriers confronting middle-level female engineers in Malaysia?
2. What empowerment factors can be used as tools in breaking the career barriers of middle-level female engineers in Malaysia?
3. What is the relationship between career barriers and career progression?
4. What is the moderating effect of empowerment on the relationship between career barriers and career progression?
5. What model can illustrate the efficacy of empowerment as a tool to break career barriers for career progression among female engineers in Malaysia?

1.8 Research Hypotheses

The following hypotheses were set to test the effect of the independent variable (career barriers) on the dependent variable (career progression) based on each group of the independent

variable. The potential moderating effect of empowerment (structural, psychological, and self-efficacy) was also hypothesised accordingly.

Null hypothesis = H_0 and Research hypothesis = H_1

Hypothesis 1

H_0: Gender Stereotyping has no significantly negative relationship with female engineers' career progression.

H_1: Gender Stereotyping has a significantly negative relationship with female engineers' career progression.

Hypothesis 2

H_0: Work-Life balance has no significantly positive relationship with female engineers' career progression

H_1: Work-Life balance has a significantly positive relationship with female engineers' career progression

Hypothesis 3

H_0: Technical Skills Limitation has no significantly negative relationship with female engineers' career progression.

H_1: Technical Skills Limitation has a significantly negative relationship with female engineers' career progression.

Hypothesis 4

H_0: Negative Perception has no significantly negative relationship with female engineers' career progression.

H_1: Negative Perception has a significantly negative relationship with female engineers' career progression.

Hypothesis 5

H_0: Misogynistic Management has no significantly negative relationship with female engineers' career progression.

H_1: Misogynistic Management has a significantly negative relationship with female engineers' career progression.

Hypothesis 6

H6a: Structural empowerment will moderate the relationship between gender stereotyping and female engineers' career progression.

H6b: Structural empowerment will moderate the relationship between work-life balance and female engineers' career progression.

H6c: Structural empowerment will moderate the relationship between technical skills limitation and female engineers' career progression.

H6d: Structural empowerment will moderate the relationship between perception and female engineers' career progression.

H6e: Structural empowerment will moderate the relationship between misogynistic management and female engineers' career progression.

Hypothesis 7

H7a: Psychological empowerment will moderate the relationship between gender stereotyping and female engineers' career progression.

H7b: Psychological empowerment will moderate the relationship between work life balance and female engineers' career progression.

H7c: Psychological empowerment will moderate the relationship between technical skills limitation and female engineers' career progression.

H7d: Psychological empowerment will moderate the relationship between perception and female engineers' career progression.

H7e: Psychological empowerment will moderate the relationship between misogynistic management and female engineers' career progression.

Hypothesis 8

H8a: Self-efficacy will moderate the relationship between gender stereotyping and female engineers' career progression.

H8b: Self-efficacy will moderate the relationship between work-life balance and female engineers' career progression.

H8c: Self-efficacy will moderate the relationship between technical skills limitation and engineers' female career progression.

H8d: Self-efficacy will moderate the relationship between perception and female engineers' career progression.

H8e: Self-efficacy will moderate the relationship between misogynistic management and female engineers' career progression.

1.9 Significance of the Study

Sustainability, diversity, and inclusiveness are key themes in contemporary management, particularly in the promotion of women in engineering. To ensure the engineering profession remains sustainable and relevant, it is essential to include women in its workforce. A diverse and inclusive engineering sector offers a competitive advantage, particularly in a rapidly changing global landscape where markets evolve swiftly. A workforce that reflects the structure of these new markets can adapt more effectively to dynamic environments. Benefits such as increased innovation, improved adaptability to change, enhanced talent acquisition, and tools for addressing shifting market demands are among the many positive outcomes of prioritizing sustainability, diversity, and inclusiveness in management.

This study investigates the role of empowerment as a mechanism for overcoming career barriers faced by middle-level female engineer managers in Malaysia. Empowerment within organizations serves as a powerful motivator for productivity, and in engineering, it plays a pivotal role in driving economic growth and enhancing the quality of life for citizens. There is a critical relationship between empowerment, engineering productivity, and national economic development that warrants exploration and improvement. This study highlights the challenges experienced by middle-level female engineers in Malaysia, emphasising empowerment as a strategy to address these barriers. By tackling these challenges, Malaysia can unlock the full potential of its workforce, fostering innovation and contributing to national development. Empowering women in engineering is not only a matter of achieving gender equality but also a strategic step toward cultivating a diverse, resilient, and thriving economy.

Engineering is integral to Malaysia's industrial sector, particularly in manufacturing, which accounted for 36.8 percent of the country's GDP in 2022 and employed 62 percent of the labour force during the same period. By examining the barriers hindering the career progression of middle-level female engineers in Malaysia and drawing on best practices from other countries, this study provides recommendations to empower Malaysian women engineers. Empowerment will enable these professionals to make meaningful contributions to their organisations and industries, thereby enhancing overall economic performance.

The study offers practical recommendations for various stakeholders, including the Malaysian government. As a matter of policy, the government should adopt and implement gender equality measures in public sector recruitment. This approach would exemplify "leadership by example," encouraging the private sector to follow suit in targeting women for recruitment and retention. Such initiatives will pave the way for a more inclusive and equitable engineering workforce in Malaysia, strengthening the nation's industrial and economic capacity.

Furthermore, this research is a scientific contribution to the literature on empowerment regimes/models and their effects in breaking down career barriers among middle-level female engineers. This study generated new insights into gender issues within engineering organizations in Malaysia.

1.10 Scope of Study

The context of the study is Malaysia where the researcher originates and has lived and worked for several years. The researcher has deep insight into the area of investigation. The study focuses on empowerment as an organisational tool to break career barriers among female engineers. In light of the barriers faced by middle-level female engineers in Malaysia, the moderating role of empowerment was investigated. Precisely, this study investigated how middle-level managerial female engineers could be empowered to progress in their careers without any hindrance. The goal was to develop a model that illustrates the efficacy of empowerment as a catalyst to promote career progression among middle-level female engineers in managerial positions.

The research was a cross-sectional study. Middle level female engineer managers within manufacturing organisations in Malaysia were the target population. Additionally, the researcher interacted with CEOs and Human Resource Managers of Engineering organizations and professional groups, including male engineers for relevant information. Best practices in developed countries have also been benchmarked. This has yielded credible conclusions to aid in making effective recommendations to female engineers, engineering organisations, the government of Malaysia, and other stakeholders.

1.11 Definition of Key Concepts

Gender

In this study, *gender* refers to the socially constructed characteristics, roles, and behaviours associated with being a woman, man, girl, or boy within a specific societal context. It encompasses the norms, expectations, and relationships that shape identity and expression. Gender is understood as a set of cultural attributes that influence the social behaviour of women and men and govern their interactions. This concept highlights the cultural and societal factors that shape attitudes toward men and women, behaviours influenced by gender, and stereotypical perceptions of masculinity and femininity. Such an approach reframes the discussion of gender issues from a purely biological perspective to one grounded in social and cultural dynamics (Fraser, 2018).

Career Barriers

Career barriers are conceptualized as obstacles or hindrances that impede an individual's ability to progress or succeed in their chosen career path. These barriers can be structural, social, or personal, and they affect individuals differently based on their circumstances and contexts. Career barriers are described as "the challenges and obstacles that individuals perceive or experience as hindrances to their career advancement and success, including organizational, interpersonal, and personal factors" (O'Neil, Hopkins, and Bilimoria, 2008). Career barriers are "contextual influences that can impede individuals' career choices and development, including factors such as discrimination, lack of resources, and support systems" (Lent *et al,* 2000).

Gender Stereotyping

Gender stereotyping involves generalized and often inaccurate beliefs about the characteristics, attributes, and roles that men and women are assumed to possess or perform. These stereotypes can result in biased judgments and unequal treatment in various areas of life. As defined by Eagly and Wood (2013), gender stereotypes are "culturally shared beliefs about the attributes of men and women, including traits, roles, and behaviours, which can result in biased judgments and expectations." Similarly, Heilman (2012) describes gender stereotyping as "beliefs about the characteristics, attributes, and behaviours of males and females that are often inaccurate and may lead to prejudicial treatment."

Work-Life Balance

Work-life balance is the state individuals aim for to harmonise their professional duties with their personal life activities, ensuring that neither side overly disrupts the other. Achieving this balance is crucial for fostering overall well-being, improving job satisfaction, and maintaining productivity. It is characterised as "a condition of well-being that enables a person to successfully juggle various responsibilities at work, home, and in the community, while promoting physical, emotional, family, and community health without encountering excessive stress or negative effects" (Kossek and Lautsch, 2018). Moreover, work-life balance refers to an individual's subjective understanding that their professional commitments and personal interests can coexist harmoniously, fostering personal growth in accordance with their present life goals. This definition is attributed to Kalliath and Brough (2008).

Technical Skills Limitation

Technical skill limitations refer to the constraints and deficiencies in an individual's technical abilities that hinder their effectiveness and performance in their professional roles. These limitations can affect the capacity to use specific tools, technologies, or methodologies required for job tasks and career advancement. Technical skill limitations are described as "the gaps between the technical competencies required for effective job performance and the current skill levels of employees, often exacerbated by fast-paced technological advancements and insufficient skills training" (Felstead *et al.,* 2013). In another sense, technical skill limitations are used to mean "the deficits in employees' technical capabilities that restrict their ability to perform job-specific tasks effectively, often due to inadequate training, experience, or rapidly evolving technological requirements" (De Grip and Sauermann, 2012).

Negative Perception

Negative perception refers to the unfavourable and often biased views or attitudes that individuals hold toward people, objects, or situations, which can detrimentally influence behaviour and decision-making. Negative perception refers to "the unfavourable evaluations and judgments that people form about individuals or groups, typically based on stereotypes and biases, which can impact social interactions and professional opportunities" (Cuddy *et al.,* 2011). Negative perception also means "the adverse attitudes and stereotypical beliefs that individuals hold about others, often leading to prejudiced behaviour and discriminatory practices" (Fiske, 2012).

Misogynistic Management

Misogynistic management refers to leadership practices and organizational cultures that exhibit prejudice, discrimination, or hostility toward women, often manifesting through biased decision-making, inequitable treatment, and the perpetuation of gender-based stereotypes in the workplace. Misogynistic management is defined as "leadership behaviours and organizational practices that systematically undermine, devalue, and marginalise women, reflecting deeply ingrained gender biases and discriminatory attitudes" (Ford and Harding, 2018). Misogynistic management is also used to mean "organisational practices and managerial behaviours that exhibit and reinforce negative attitudes and beliefs about women, leading to inequitable treatment and barriers to women's advancement" (Paustian-Underdahl *et al.,* 2014)

Empowerment

Empowerment is fundamentally about enhancing individuals' confidence in their capacity to reach their objectives within a workplace. This is achieved by identifying and addressing the elements that generate feelings of powerlessness (Conger and Kanungo, 1988). Furthermore, empowerment enables individuals to take charge of their own lives and participate actively within their communities (Rappaport, 1987).

Structural Empowerment pertains to ensuring that employees have access to essential resources, information, support, and opportunities that foster both personal and professional development within an organization (Kanter, 1993). It also relates to how an organisation's social framework facilitates employees in acquiring information, assistance, resources, and avenues for career growth (Laschinger et al., 2001).

On the other hand, Psychological Empowerment refers to a collection of mental states that are necessary for individuals to experience a sense of autonomy and control in their workplace. This concept encompasses feelings of independence, competence, influence, and the importance of one's contribution. According to Conger and Kanungo (1988), psychological empowerment is described as "a process that strengthens the self-efficacy of members within an organisation by recognizing and removing obstacles to empowerment." Building on this idea, Spreitzer (1995) characterizes it as "a motivational framework defined by four essential beliefs: meaning, competence, self-determination, and impact, which reflect an individual's active engagement in their work."

Self-efficacy, in this context, refers to the belief in one's ability to carry out actions needed to meet defined performance objectives. It is indicative of a person's confidence in navigating motivation, behaviour, and social contexts. Gist (1987) describes self-efficacy as "an individual's belief in their capability to effectively carry out a given task or tasks." Likewise, Bandura (1997) articulates it as "the belief in one's own ability to mobilise the necessary motivation, cognitive resources, and actions to tackle the demands of a situation.

Thesis Structure

Chapter 1: Introduction

This chapter outlines the research context, presenting the study's background, purpose, problem statement, research gap, objectives, research questions, significance, scope, and the organization of the thesis.

Chapter 2: Literature Review

This chapter explores relevant literature, including theoretical frameworks such as the empowerment theory, glass ceiling theory, and social exchange theory. It delves into contemporary debates and provides a conceptual background for the study, with a particular focus on empowerment and gender-related issues.

Chapter 3: Hypotheses Development and Framework

Based on the reviewed literature, this chapter formulates the research hypotheses and develops a conceptual framework to guide the study.

Chapter 4: Methodology

This chapter presents the philosophical and technical underpinnings of the research, detailing the strategy for investigating the research problem and collecting data. It justifies the adoption of a mixed-methods approach and explains the reliability, validity, and ethical considerations. Methods of qualitative and quantitative analysis are outlined, alongside their practitioner relevance.

Chapter 5: Findings and Analyses

This chapter provides a comprehensive analysis of the research findings. Quantitative results are presented and analysed in the first section, qualitative findings in the second, and a comparative discussion of both methodologies in the third.

Chapter 6: Discussion

This chapter discusses the findings in relation to the literature reviewed in Chapter 2, structured around the research objectives. It bridges the findings and implications of the study, laying the groundwork for conclusions.

Chapter 7: Summary, Conclusions, and Recommendations

The final chapter summarizes the research, presents factual and conceptual conclusions, and revises the conceptual framework. It outlines the study's contributions to knowledge, implications, reflections, practical recommendations, limitations, and suggestions for future research.

Chapter Summary

This opening chapter establishes the context and rationale for the study. It introduces the thesis, outlines the research background, and articulates the purpose, problem statement, research gap, objectives, and questions. Key concepts are defined, and the thesis structure is summarised. The next chapter, Chapter 2, provides the conceptual background for the study.

CHAPTER TWO

LITERATURE REVIEW

2.1 Chapter Introduction

The preceding chapter established the foundation for this study by introducing the concepts of career barriers and empowerment. It also outlined the purpose of the study, the research problem, the identified research gap, objectives, and research questions. This chapter builds upon that foundation by providing a detailed conceptual framework for the study, drawing on a comprehensive review of literature related to career barriers, empowerment, career progression, and associated theoretical concepts. The review examines the study variables, theoretical underpinnings, and empirical research that illuminate the interrelationships among career barriers, empowerment, and career progression. Alongside this analysis, relevant hypotheses are proposed, culminating in the development of a conceptual framework.

2.2 Theoretical Underpinnings

2.2.1 Social Exchange Theory

Social Exchange Theory (SET) is the principal theoretical framework underpinning this study, given its applicability to the investigated issues. SET is one of the most influential paradigms for understanding workplace behaviour, with origins tracing back to the early 20th century (e.g., Malinowski, 1922; Mauss, 1925). It identifies four key principles of social behaviour:

1. Reinforcement tools: SET identifies the rewards, benefits, and resources that motivate individuals to engage in social interactions.
2. Rationality of actors: The theory posits that individuals weigh the costs and benefits of social exchanges to make rational decisions.
3. Motivation: Individuals are motivated to maximise rewards and minimise costs in social relationships.
4. Cost-benefit analysis: Individuals are more likely to engage in social exchanges when perceived rewards outweigh associated costs (Cropanzano et al., 2016).

In the context of structural empowerment, SET helps explain interactions between employees and supervisors or managers. For instance, an employee who perceives their supervisor as providing essential resources and support may reciprocate through positive workplace

interactions, potentially enhancing job satisfaction and motivation (Echebiri, 2020). SET has been applied across various social contexts, including interpersonal relationships, organisational dynamics, and broader societal structures. Its principles offer a lens for understanding why individuals initiate, maintain, or terminate relationships based on the perceived balance of costs and rewards.

Key concepts derived from SET, including reciprocity, rewards and costs, comparison levels, equity, and power dynamics, provide a nuanced understanding of workplace interactions and their implications:

- Reciprocity: Central to SET, this concept refers to the expectation that positive actions will be reciprocated with positive outcomes. For instance, to what extent might middle level female engineer managers in Malaysia expect recognition and support in return for their organizational contributions?
- Rewards and Costs: Individuals engage in exchanges to maximise benefits, such as favourable working conditions, while minimising costs, such as emotional or time investment. Are middle level female engineer managers rewarded equitably compared to their male colleagues for similar efforts?
- Comparison Level: Individuals assess relationships by comparing actual outcomes with expectations. Do middle level female engineer managers perceive outcomes as aligned with their expectations when compared to their male counterparts?
- Equity: Equity theory emphasizes fairness in exchanges, suggesting individuals seek balance between contributions and benefits. Do Malaysian middle level female engineer managers perceive workplace systems as equitable?
- Power and Dependence: The balance of power influences satisfaction within relationships. To what extent do middle level female engineer managers feel empowered to influence workplace dynamics?

SET has also been linked to empowerment concepts such as success, incentives, and the minimization of diminishing returns (Jiang et al., 2011; Dewettinck and Van Ameijde, 2011; Kim and Kim, 2013), offering valuable insights into the relationships between workplace settings and individual behaviours.

2.2.2 Glass Ceiling Theory

The Glass Ceiling Theory highlights systemic barriers preventing certain groups, particularly women and minorities, from ascending to top leadership positions (Tabassum and Nayak, 2021). Popularised in the 1980s, the term "glass ceiling" refers to invisible barriers that hinder professional advancement, initially focusing on gender but now encompassing race and ethnicity (Cotter et al., 2001).

Research underscores the persistence of the glass ceiling in limiting women's advancement, particularly in male-dominated fields like engineering. These barriers include discriminatory organizational cultures, gender stereotypes, and lack of access to mentorship or professional networks (Mooney and Ryan, 2008; Enache et al., 2011). The patriarchal structure of society reinforces these obstacles by restricting women's access to power and leadership roles (Collinson and Hearn, 2000).

Key aspects of the glass ceiling include:

- Stereotypes: Gendered assumptions about leadership capabilities hinder women's advancement (Heilman, 2001; Eagly and Karau, 2002).
- Organizational Culture: Male-dominated environments often lack policies promoting diversity, perpetuating bias and exclusion (Oakley, 2000; Ely et al., 2011).
- Networking and Mentorship: Limited access to professional networks and mentors exacerbates the challenges women face in achieving leadership positions (Ibarra, 1993; Ragins and Kram, 2007).

The implications of the glass ceiling extend beyond individual career dissatisfaction to broader organizational outcomes, as companies with diverse leadership tend to exhibit superior financial performance and innovation (Hunt et al., 2015). Addressing the glass ceiling is therefore not only an equity issue but also a strategic business necessity.

Strategies to dismantle the glass ceiling include:

1. Mentorship Programs: Providing structured mentorship and sponsorship opportunities to support women and minorities in their career progression (Ibarra et al., 2010).
2. Inclusive Policies: Implementing flexible work arrangements, parental leave, and diversity training to create equitable workplace environments (Kossek et al., 2006).
3. Transparent Processes: Establishing clear criteria for promotions and evaluations to mitigate bias (Babcock and Laschever, 2003).

4. Leadership Development: Investing in programs that prepare women and minorities for leadership roles, ensuring a pipeline of diverse talent (McKinsey and Company, 2018).

Tabassum and Nayak (2021) argue that dismantling patriarchal structures is essential to breaking the glass ceiling. Persistent assumptions that leadership roles are inherently male must be challenged to foster equity and opportunity for women in male-dominated industries such as engineering. This research explores the causes of career barriers for women, using the Glass Ceiling Theory as a framework to propose actionable solutions.

2.2.3 Empowerment Theory

Empowerment is characterised as "the process of acquiring control over significant events and results that matter to a person or group" (Fawcett et al., 1994). This conceptualization acknowledges that empowerment varies across individuals, settings, and time (Zimmerman, 2000). Ahearne et al. (2005) described empowerment as the delegation of responsibilities by management, enabling employees to participate in decision-making regarding their work tasks. Similarly, Riniwati (2011) emphasised that empowerment is a process granting workers greater autonomy and authority in decisions related to their work. Conger and Kanungo (1988) characterised empowerment as enhancing employees' self-efficacy by removing conditions that create powerlessness. Despite its theoretical and practical significance, empowerment is a complex, dynamic concept that defies singular operationalization (Aghazamani and Hunt, 2017).

In the organisational context, empowerment is frequently framed as managerial actions that redistribute power and decision-making authority (Hechanova et al., 2006; Joo et al., 2019). Ahearne et al. (2005) highlighted that empowerment involves hierarchical delegation to enable employees to exercise authority in executing primary tasks. Frequently associated with motivational management approaches (Aghazamani and Hunt, 2017), empowerment is increasingly relevant as organisations seek employees who demonstrate initiative and creative responses to job challenges (Joo et al., 2019). Research indicates that empowered employees exhibit greater job satisfaction, commitment, and productivity (Orgambídez-Ramos and Borrego-Alés, 2014). However, empowerment initiatives do not always yield desired outcomes (Siegall and Gardner, 2000), necessitating further exploration of organizational factors that enhance empowerment.

Gender equality is defined as the "the lack of concealed inequalities among individuals of different genders regarding their access to opportunities, resources, services, advantages, decision-making capabilities, authority, and influence" (OECD, 2011). Women empowerment, essential for achieving gender equality, encompasses women's self-worth, strategic life control, and equitable societal participation (Kabeer, 2012). Empowerment has been linked to increased job satisfaction, motivation, and organisational loyalty (Mullins and Peacock, 1991). Work motivation comprises intrinsic factors, driven by internal rewards, and extrinsic factors, driven by external incentives such as monetary rewards or avoidance of threats (Herzberg, 2003; Cameron and Pierce, 2002).

2.2.3.1 Structural Empowerment

Structural empowerment pertains to the organisational frameworks that enable employees to reach their work objectives by providing them with opportunities, information, resources, and assistance (Kanter, 1977). This concept includes the organisational measures that support employees in excelling at their jobs and has been associated with various positive results, including job satisfaction (Wong and Laschinger, 2013), organisational commitment (Smith et al., 2010), as well as decreases in job stress and burnout among nursing professionals (Laschinger et al., 2013).

Structural empowerment emphasises the redistribution of authority in organisations by flattening hierarchies also known as managerial empowerment. This approach allows lower-level employees to make decisions through established policies and structures (Conrad, 2017; Seibert et al., 2011). Kanter (1993) emphasises the importance of structural elements, particularly power, which he describes as the "capacity to mobilise resources to achieve objectives." This aspect of power is essential in influencing how employees feel and act at work. For power to be truly impactful, it is vital that staff have access to necessary information, support, resources, and opportunities. These elements collectively form the foundation of what is known as structural empowerment (Greco et al., 2006; Laschinger et al., 2001, 2004).

Formal power arises from job attributes such as flexibility, creativity, and visibility, whereas informal power is based on social ties and networks (Kanter, 1993; Laschinger et al., 2001, 2004). A robust combination of both formal and informal power enhances access to empowerment structures, facilitating significant work outcomes. Structural empowerment is realized through four fundamental components:

1. Access to opportunities, enabling growth and skill development within the organization.
2. Access to resources, including financial means, materials, time, and supplies necessary for work.
3. Access to information, such as technical knowledge and organisational policies.
4. Access to support, through feedback and guidance from supervisors, peers, and subordinates.

According to Kanter (1993), managers must create conditions conducive to effective work by ensuring employees have access to these components. Employees perceiving such access report greater empowerment and job satisfaction (Greco et al., 2006; Mendoza-Sierra et al., 2013; Wong and Laschinger, 2013).

Structural empowerment has been shown to promote innovative behaviours (Hebenstreit, 2012; Dan et al., 2018) and positively influence job satisfaction, particularly when employees have opportunities for professional development (Laschinger et al., 2004; Lautizi et al., 2009). However, critics argue that structural empowerment often overlooks employees' cognitive perceptions. Spreitzer and Doneson (2005) noted instances where employees did not feel empowered despite access to structural factors, emphasising the importance of subjective perceptions in empowerment. True empowerment occurs when individuals perceive themselves as empowered (Greasley et al., 2008).

Empowering workplace structures not only facilitate employees' fulfilment of job responsibilities but also encourage collaborative decision-making and idea generation (Kesting and Ulhoi, 2010). An ideal organisational structure for empowerment allows employees to propose changes while enabling management to delegate authority appropriately. Studies consistently demonstrate the relationship between structural empowerment and job satisfaction, affirming its significance for both individual and organisational outcomes (Wong and Laschinger, 2013; Lautizi et al., 2009).

2.2.3.2 Psychological Empowerment

Psychological empowerment is conceptualized as an employee's perception of their sense of empowerment in the workplace (Dee et al., 2003). Conger and Kanungo (1988) were among

the first scholars to advance the psychological empowerment perspective, building on Bandura's concept of self-competence and self-capability. Bandura (1982) defines self-capability as the ability to undertake actions necessary to manage prospective situations. Spreitzer (1995) further explains psychological empowerment as an individual's perception of their ability to define their role in the workplace. This perspective emphasises empowerment as a subjective construct, reflecting an employee's perceived sense of influence and autonomy (Conger and Kanungo, 1988; Spreitzer et al., 1997).

Unlike structural empowerment, which focuses on the distribution of authority and resources (Spreitzer and Doneson, 2008), psychological empowerment emphasises individual satisfaction and the cognitive and emotional aspects of empowerment, independent of managerial practices (Spreitzer et al., 1997; Dewettinck and Ameijde, 2011). Koberg et al. (1999) argue for the integration of structural and psychological perspectives in empowerment studies, emphasising that structural aspects address the distribution of power, while psychological aspects focus on individual perceptions and attitudes toward empowerment.

Conger and Kanungo (1988) assert that the empowerment process enhances an individual's self-efficacy, the belief in one's ability to achieve desired outcomes. They argue that empowerment extends beyond delegation to include personal responsibility, decentralized decision-making, and self-efficacy (Thorlakson and Robert, 1996; Herrenkohl et al., 1999; Ritter et al., 2014).

2.2.3.2.1 Self-Efficacy

Self-efficacy, as defined by Bandura (1977), is an individual's belief in their ability to perform tasks successfully. This concept is central to psychological empowerment, as it reflects employees' confidence in their capacity to fulfil empowered roles effectively (Heslin, 1999). High self-efficacy fosters proactive behaviour, perseverance in overcoming challenges, and enhanced performance, while low self-efficacy often results in avoidance behaviours, limiting opportunities for skill acquisition and competency development (Holdsworth, 2007).

The development of self-efficacy is influenced by personal experiences of success and failure. Success enhances self-efficacy, while failure diminishes it (Bandura, 1997). This relationship underscores the importance of individual achievements in shaping psychological

empowerment, as it reflects an employee's perceived ability to influence their performance (Spreitzer, 1995).

Kanter (1993), in his ethnographic study of American corporations, observes that individuals with formal and informal power tend to feel empowered. Formal power arises from organisational roles and authority, while informal power stems from social relationships and alliances within the organisation. Kanter (1993) highlights that powerlessness inhibits access to essential resources, information, support, and opportunities. Zimmerman complements this view, stating that psychological empowerment is characterized by an individual's willingness to engage in activities and belief in their competence and efficacy. Similarly, Ozer and Bandura (1990) posit that empowerment reflects an individual's confidence in their efficiency.

2.3 Career Progression in Engineering

Career progression in engineering is a critical research area due to its implications for technological innovation and economic growth. Understanding the factors influencing career advancement is essential for developing strategies that enhance engineers' professional satisfaction and career development (Seibert *et al.,* 2018). Career progression involves advancing in one's career through skill acquisition, knowledge development, and undertaking more challenging roles. It may include promotions, lateral movements, or entrepreneurial endeavours (Calinaud *et al.,* 2021).

Educational qualifications significantly impact career progression in engineering. Engineers with advanced degrees or certifications often have better career prospects. Jones et al. (2018) found that engineers with master's or doctoral degrees are more likely to attain senior positions. Continuous learning is equally important, as participation in professional development programs correlates with greater career satisfaction and advancement (Anderson and Boud, 2019). Mentorship and professional networking also play vital roles in career development. Mentorship provides guidance and skill development opportunities, while networking enhances access to job opportunities and resources (Ragins and Kram, 2020; Seibert et al., 2018). However, gender disparities persist in engineering, hindering career progression for women. Women often face barriers such as gender bias, limited mentorship opportunities, and work-life balance challenges (Fouad et al., 2017; Hunt, 2016). Addressing these issues is essential for achieving equitable career development in the field.

Organisational culture significantly influences engineering career progression. Companies with inclusive environments and flexible work policies are more successful in fostering employee satisfaction and career advancement (Ely and Thomas, 2021). Structured career development programs, including training and leadership initiatives, also enhance career growth and employee engagement (Garavan et al., 2019).

2.4 Career Barriers in Engineering

Career barriers are defined as obstacles that hinder individuals from achieving their career goals (Maskell-Pretz and Hopkins, 1997). Swanson and Woitke (1997) describe career barriers as events or conditions, either internal or external, that impede career progress. Internal barriers include personal factors such as lack of ability or motivation, while external barriers encompass systemic issues such as discrimination, financial constraints, and family responsibilities (Cast, 2018).

Breaking career barriers requires addressing systemic issues, including those related to gender, race, and organizational culture (Calinaud et al., 2021). Effective strategies must focus on fostering inclusive environments, eliminating bias, and providing equal opportunities for career advancement.

The barriers to career progression faced by female engineers have been the focus of extensive research and analysis. Despite significant strides toward gender equality, women in engineering continue to encounter unique challenges that impede their professional growth. A summary of the key career barriers identified in the literature is provided below (Lent et al., 2000; Creed et al., 2004; McWhirter et al., 2007; Calinaud et al., 2021; Cast, 2018; Bosak et al., 2017; Tabassum and Nayak, 2021):

1. Underrepresentation: Women are persistently underrepresented in engineering, which results in a lack of role models and mentors. This underrepresentation often contributes to feelings of isolation and limits opportunities for professional networking.
2. Stereotypes and Bias: Pervasive gender stereotypes and biases influence how female engineers are perceived in the workplace. Such preconceived notions about women's capabilities may lead to lower expectations and constrained opportunities for career advancement.

3. Work-Life Balance: Managing work and personal life poses challenges for many professionals, but these are particularly pronounced for women in engineering, especially those balancing family responsibilities. Gendered assumptions about roles often influence perceptions of commitment and dedication.
4. Lack of Mentorship: The scarcity of female mentors within the engineering profession compounds the challenges faced by women. Mentorship is critical for professional development, and its absence can hinder skill-building and confidence.
5. Implicit Bias in Hiring and Promotions: Research highlights that unconscious biases significantly impact hiring and promotion decisions, reducing opportunities for female engineers to advance. Addressing these biases is essential for fostering equitable evaluation practices.
6. Hostile Work Environment: Reports of hostile or unwelcoming workplace environments—including harassment, microaggressions, and discrimination—have been highlighted by some female engineers. Such experiences negatively affect job satisfaction and overall well-being, creating additional barriers to career progression.
7. Limited Access to Opportunities: Women often face restricted access to high-visibility projects, leadership roles, and professional development opportunities, which hinders their ability to demonstrate their capabilities and contribute meaningfully to their organizations.
8. Lack of Recognition: Female engineers frequently struggle to gain recognition for their contributions. The lack of visibility can impede career advancement, as acknowledgment is vital for upward mobility in professional settings.
9. Inflexible Organisational Structures: Rigid organisational policies may not accommodate the diverse needs of employees, particularly female engineers who require flexible work arrangements to manage family responsibilities.
10. Insufficient Support for Career Transitions: Women re-entering the workforce after career breaks—often due to family obligations—encounter significant challenges. Limited support for career transitions inhibits their ability to resume and advance their careers.

The barriers identified, including gender stereotyping, challenges in achieving work-life balance, negative perceptions, technical skill gaps, and misogynistic management practices, are extensively documented in the literature (Bosak et al., 2017; Cast, 2018). Gender stereotyping refers to assumptions about the behaviour or capabilities of individuals based on

gender (Papa and Natalie, 1989). Work-life balance challenges arise when women struggle to manage familial and professional roles (Ann and James, 2002). Negative perceptions often manifest as biases about women's physical capabilities in engineering (Kolade and Kehinde, 2013). Technical skill gaps denote deficiencies in specialised knowledge required for specific tasks (Kucharčíková et al., 2018). Misogynistic management refers to organisational practices that perpetuate patriarchal norms and inhibit gender equity (Manne, 2017). These barriers are explored in greater depth in subsequent sections.

2.15 Alignment of Research Objectives and Literature Review

Establishing a clear link between the research objectives and the literature review is essential for demonstrating the relevance of the selected theoretical frameworks (Saunders et al., 2017). This connection facilitates the integration of the study's components and provides a foundation for the conceptual framework. Table 2.1 below illustrates the alignment between the research objectives outlined in Chapter 1 and the theoretical concepts reviewed in this chapter.

Table 2.1 Link Between Research Objectives & Literature Review

Research Objectives	**Theories & Concepts Reviewed**
Research Objective 1 To identify career barriers confronting middle-level female engineers in Malaysia.	Social Exchange Theory Glass Ceiling Theory Calinaud, *et al*., 2021. Cast, 2018; Bosak *et al*. 2017. Tabassum and Nayak (2021)
Research Objective 2 To ascertain empowerment factors that can be used as tools in breaking career barriers of middle-level female engineers in Malaysia.	Empowerment Theory Structural Empowerment (Kanta 1993) Psychological Empowerment (Conger & Kanungo, 1988) Self-Efficacy theory (Bandura)
Research Objective 3 To assess the relationship between career barriers and career progression.	Career Barriers (Cast, 2018) Career Progression (Calinaud et al, 2021) Social Exchange Theory Theory of Glass Ceiling Calinaud, *et al*., 2021. Bosak *et al*. 2017; Tabassum and Nayak (2021)
Research Objective 4 To examine the moderating effect of empowerment on the relationship between career barriers and career progression.	Empowerment Theory Structural Empowerment (Kanta 1993) Psychological Empowerment (Conger & Kanungo, 1988) Self-Efficacy theory (Bandura) Career Progression (Calinaud et al, 2021)

	Social Exchange Theory Theory of Glass Ceiling Calinaud, *et al*., 2021. Cast, 2018; Bosak *et al*. 2017; Tabassum and Nayak (2021)
Research Objective 5 To develop a model that illustrates the efficacy of empowerment as a tool to break career barriers for career progression among female engineers in Malaysia.	All the above theories have been combined in formulating the study's model.

2.16 Chapter Summary

This chapter has established a robust conceptual foundation for the study. The literature review synthesized existing research to present a balanced discussion of the challenges and opportunities related to female engineers' career progression. By exploring theoretical perspectives and key themes, this chapter laid the groundwork for the formulation of hypotheses and the development of a conceptual model to guide the study. The next chapter, Chapter 3, will focus on the development of hypotheses and conceptual framework which will underpin the research.

CHAPTER THREE

DEVELOPING HYPOTHESES AND CONCEPTUAL FRAMEWORK

3.0 Chapter Introduction

Chapter 2 provided the conceptual foundation for this study by reviewing key theoretical and empirical literature on Social Exchange Theory, Glass Ceiling Theory, and Empowerment Theory. The chapter also explored concepts related to Structural Empowerment, Psychological Empowerment, Self-Efficacy, Career Progression, and Career Progression Barriers. Building on this foundation, the present chapter formulates a set of hypotheses to inform the development of the conceptual framework underpinning the study.

3.1 Gender Stereotyping and Career Progression

Stereotypes are generalised beliefs about groups that are applied to individuals based solely on their group membership. Gender stereotypes, in particular, refer to generalised assumptions about the attributes of men and women (Chirwa and Lukamba, 2016; Ngoepe, 2021). Stereotypes can provide a convincing explanation for why women are underrepresented, and men are overrepresented in top leadership roles and STEM fields. These explanations often attribute gender disparities to the presumed dispositions of men and women (Vyas-Doorgapersad and Bangani, 2020).

Globally, gender-discriminatory behaviours and attitudes toward women in leadership positions remain a significant concern (United Nations Women, 2018; Amnesty International, 2020). Recent studies reveal that working women, particularly female managers, continue to face various forms of discrimination, including sexual harassment, patriarchal norms, gender-based leadership discrimination, bullying, hostile treatment, incivility, humiliation, degradation, and negative labelling (Khwela et al., 2020; Statistics South Africa, 2020; Ngoepe, 2021). Chirwa and Lukamba (2016) argue that men often discriminate against women in leadership roles due to the internalisation of stereotypes that portray women as inferior. Similarly, Funk (2019) found that male leaders, who dominate senior leadership positions, often perceive feminine traits as incongruent with effective leadership qualities, further perpetuating gender-based discrimination.

Papa and Natalie (1989) conceptualize gender stereotyping as the assumptions about actual or perceived behaviours of men and women. Examining the impact of gender stereotyping on the career progression of women engineers is crucial. Empirical evidence from women engineers in the construction industry highlights challenges such as partiality, segregation, and discriminatory peer support, which stem from the stereotype that the construction industry is unsuitable for women (Johari et al., 2013; Ismail and Ibrahim, 2008).

Leadership assessments in many organisations are often biased and discriminatory due to the absence of clear strategies and standardised assessment processes (Ngoepe, 2021). This bias frequently results in the undervaluation of women's competencies, limiting their progression into senior roles. A study by Statistics South Africa (2020) revealed that the lack of systematic benchmarks and transparent evaluation processes leads to gender-biased promotion decisions, thereby preventing women from advancing to higher positions. Such practices reinforce gender stereotypes and perpetuate disparities in career progression. Ngoepe (2021) further asserts that women's credentials and performance are frequently undervalued in these contexts.
Although numerous gender-related obstacles and biases have reduced over time, gender stereotypes remain prevalent and still impede women's advancement in their careers (Tabassum and Nayak, 2021). These stereotypes shape managerial actions and workplace standards, frequently reinforcing patriarchal norms within organisational culture. Tabassum and Nayak (2021) suggest that gender stereotypes are reinforced through media, social interactions, educational institutions, and leisure activities, leading to discrimination against women. They also point out that current management practices frequently do not critically incorporate insights from gender studies, which could foster more gender-neutral and supportive managerial strategies.

Gender stereotyping in South Africa's public sector is evident in recruitment and promotion practices that continue to reflect traditional gender biases (Khwela et al., 2020). Women's leadership abilities are often undervalued or overlooked, contributing to their underrepresentation in senior public management roles (Vyas-Doorgapersad and Bangani, 2020). Studies indicate that human resource personnel and public managers frequently favour male candidates for leadership positions, reflecting entrenched stereotypes about women's unsuitability for leadership (Nhlapo and Vyas-Doorgapersad, 2016; Khwela et al., 2020). Such biases perpetuate gender inequalities and hinder the advancement of women into senior management positions.

The persistence of stereotypical attitudes—that women should not lead or dominate men—remains a significant barrier in many organisations (Vyas-Doorgapersad, 2015). Men often bring these biases into the workplace, resisting female leadership and failing to support women's professional development (Thobejane and Thobejane, 2017). This discrimination, often perpetuated by male-dominated leadership structures, underscores the difficulty of dismantling traditional gender stereotypes within organisational hierarchies.

Shiraki et al. (2021) suggest that female managers are likely to experience psychological stress stemming from unequal working relationships and the constant need to prove their competencies. While it is essential for women to demonstrate their professional abilities, the psychological strain caused by sexist attitudes adversely affects their career advancement, productivity, job satisfaction, commitment, and innovative potential (Ramohai, 2019).

Based on this discussion, the following hypothesis is proposed:
H1: Gender stereotyping has a significantly negative relationship with the career progression of female engineers.

3.2 Work-Life Balance and Career Progression

Work-life balance is formally defined as engagement in both work and non-work roles in a manner that yields comparable levels of satisfaction across these domains (Fisher et al., 2009). It involves the equitable allocation of time and psychological resources between work and non-work life, resulting in meaningful satisfaction in both spheres (Greenhaus et al., 2003).
According to Ann and James (2002), barriers to work-life balance arise when individuals, particularly women, face challenges in harmonising family responsibilities with career demands. Research indicates that despite professional commitments, women often retain their traditional roles as primary caregivers, which impedes their ability to fully dedicate themselves to organisational expectations (Ramohai, 2019). Ann and James (2002) observed that women with children seldom occupy senior hierarchical positions. A study by Miller (2004) on women engineers highlighted that they often dedicate 12–14 hours daily to work, struggling to balance family and career commitments.

Empirical evidence suggests that inadequate engagement in critical life domains negatively impacts overall life satisfaction (Michaels et al., 2018). Individuals who withdraw from essential social roles, such as work and family, often display low levels of energy and intrinsic

motivation, leading to disengagement from societal participation and reduced life satisfaction. Engagement across multiple life domains is, therefore, an essential dimension of work-life balance (Michaels et al., 2018).

Greenhaus et al. (2003) further address the implications of disengagement and alienation, distinguishing between positive and negative work-life balance. Positive balance involves substantial time investment and engagement in both work and family roles, fostering enhanced quality of life. In contrast, negative balance arises from limited commitment to these roles, resulting in diminished life satisfaction. Research consistently demonstrates that work-life balance, when characterised by active engagement in social roles, enhances behavioural outcomes such as life satisfaction (Michaels et al., 2018; Ramohai, 2019).

A crucial aspect of attaining a healthy balance between work and personal life is minimising the conflicts that arise between professional duties and personal obligations. Research indicates that achieving a satisfactory work-life balance is more likely when there is minimal role conflict (Greenhaus and Beutell, 1985; Rau and Hyland, 2002). Role conflict happens when obligations in one area clash with those in another, creating difficulties in meeting the expectations of both spheres (Greenhaus and Beutell, 1985). This clash is particularly evident in the relationship between work and family since their respective demands often do not align well (Fisher et al., 2009; Ramohai, 2019).

The equilibrium between professional responsibilities and personal pursuits is recognised as a vital component of personal well-being, influencing aspects like health, family happiness, and overall life satisfaction (Keyes, 2002). Studies highlight that an improved work-life balance can enhance organisational performance, increase employee satisfaction, and bolster commitment to the workplace (Allen et al., 2000). However, there remains a gap in understanding the direct link between work-life balance and career advancement, especially concerning female engineers. This research aims to explore whether maintaining a proper work-life balance significantly influences the professional growth of women in engineering roles.

H2: Work-life balance has a significantly positive relationship with female engineers' career progression.

3.3 Technical Skills Limitation and Career Progression

Technical skills refer to abilities and competencies acquired through systematic and sustained effort, enabling individuals to effectively perform specialised tasks or roles involving ideas, objects, or people (Kucharčíková et al., 2018). Often termed "hard skills," these capabilities are specific to particular fields and differ from soft skills, which can be developed and refined over time. Technical skills span diverse industries, including information technology, data analysis, and engineering, with specific requirements varying by role while retaining a core of specialised expertise (Hitka et al., 2017; Kucharčíková et al., 2018).

Kucharčíková et al. (2018) identified several critical technical skills sought by managers, including:

- Proficiency in programming languages such as SQL, HTML, Java, and C++.
- Knowledge of bookkeeping, billing, and telecommunications.
- Competence in data marketing and maintenance.
- Skills in content creation and editing.
- Expertise in project planning, budgeting, and risk management; and
- Understanding of physical and cyber security.

Additionally, technical skills encompass problem-solving, decision-making under pressure, leadership, delegation, time management, networking, and effective communication (Hitka et al., 2018). The concept of hybrid skills, defined as a combination of technical and non-technical (e.g., business) competencies, has gained prominence. Hybrid managers are described as professionals who possess strong technical expertise alongside business acumen, enabling them to bridge technical and managerial domains (Lorincová et al., 2018). The cultivation of such skills depends on individual characteristics and is influenced by organisational culture and motivational factors (Kucharčíková et al., 2018a, 2018b).

Technical skills enable individuals to address complex problems, execute specialized tasks, and contribute uniquely within their field. These skills are particularly critical in disciplines such as mathematics, science, information technology, and mechanics (Lorincová et al., 2018). Anecdotal evidence suggests that female engineers often face challenges in acquiring the technical skills necessary for managerial roles, limiting their career progression. However,

there is a paucity of empirical research examining how technical skills limitations specifically hinder the advancement of female engineers, particularly in the context of Malaysia.
Addressing this gap is crucial for informing policy reforms and promoting gender equity in engineering and related fields. This study, therefore, investigates the extent to which technical skills limitations impede the career progression of female engineers.

H3: Technical skills limitation has a significantly negative relationship with female engineers' career progression.

3.4 Negative Perception and Career Progression

Kolade and Kehinde (2013) assert that prevailing perceptions suggest women are physically less capable of competing in the engineering sector, a bias embedded within organisational structures. Moreover, certain organisational policies are perceived as unfavourable, limiting career development opportunities for women engineers. Heilman (2001) argues that competence and experience alone are insufficient for women engineers to advance in their careers. Gender discrimination, fuelled by negative perceptions of female workers, contributes to the slow progression of women in the field (Madegwa, 2011).
Unconscious bias significantly impacts perceptions of women's competence and leadership potential. Managers and colleagues may unintentionally favour male employees for promotions and challenging assignments, based on the assumption that men are better suited for leadership roles (Lopes, 2019). Such biases can undermine women's confidence, discouraging them from pursuing leadership positions or advocating for their career advancement (Mavin et al., 2017). Additionally, societal expectations regarding work-life balance reinforce perceptions that women are primarily responsible for caregiving, which can lead to assumptions about their lack of career commitment and hinder their advancement (Greenhaus et al., 2003). Negative perceptions of certain industries or positions as male-dominated further restrict networking opportunities and access to mentorship for women (Lopes, 2019).

Lopes (2019) also highlights the role of patriarchy in perpetuating the subordination of women, noting that blaming patriarchal structures alone is incomplete. Some women inadvertently reinforce patriarchal practices by failing to support the leadership advancement of other women, often negatively evaluating female managers (Mavin et al., 2017; SABPP, 2019). These behaviours are deeply influenced by societal norms rooted in patriarchy (Mavin et al., 2017). Professional women may undervalue themselves and other women as leaders due to

entrenched stereotypes that associate effective leadership with masculinity (Hoyt and Murphy, 2016). Without deliberate efforts to challenge these internalised biases, working women across professions will continue to face misogyny and limited career progression.

Dehlin and Galliher (2019) emphasise the harmful effects of misogyny and internalised sexist beliefs, including low self-esteem, anxiety, depression, and diminished aspirations for leadership roles (Srivastava et al., 2017; Szymanski et al., 2009). Notable examples include the 2016 U.S. presidential election, where internalised misogyny and sexist attitudes were suggested as factors contributing to Hillary Clinton's defeat to Donald Trump (Blair, 2017). Additionally, a study of G7 countries and others like India, Nigeria, and Kenya demonstrated persistent mistrust in female leadership (The Reykjavik Index for Leadership, 2021). Negative perceptions, therefore, perpetuate gender bias in workplaces, restricting women's career advancement. Based on these findings, the following hypothesis is proposed:

H4: Negative Perception has a significantly negative relationship with female engineers' career progression.

3.5 Misogynistic Management and Career Progression

Misogyny refers to the ongoing expression of hatred and disdain for women by men (Srivastava Chaudhury et al., 2017). According to Manne (2017), misogyny encompasses practices and structures designed to enforce patriarchal norms and punish non-compliance. Misogynistic behaviours include the oppression, exploitation, and subjugation of women, often manifested through resentment, intimidation, and degradation (Stalker, 2001). Beyond interpersonal animosity, misogyny has evolved into a systemic issue, contributing to social inequalities experienced by women due to their gender and hierarchical positioning (Manne, 2017).

In workplaces, misogyny is evident through gender discrimination, preference for male leadership, sexual harassment, questioning of female managers' skills, and undervaluation of women's contributions in meetings (Ramohai, 2019; Srivastava Chaudhury et al., 2017; Khwela et al., 2020). Women aspiring to leadership roles are often labelled as overly ambitious, unfeminine, or socially deviant (Mwale and Dodo, 2017; Mavin et al., 2017). Such behaviours perpetuate stereotypes, including the enduring "think-management-think-male" attitude identified by Schein (1973) and reinforced by Tabassum and Nayak (2021).

Misogyny often targets successful women perceived as threats to male-dominated leadership structures (Coetzee and Moosa, 2020). Hanyane and Ahiante (2022) explored the effects of

misogyny on women's leadership in South Africa, identifying distrust in female leadership, psychological distress, and reduced aspirations for senior positions as key outcomes. These findings align with previous research showing that misogynistic behaviours are used to maintain male dominance and frustrate women's career progression (Ngoepe, 2021; Kipkosgei, 2021).

Globally, misogyny remains a significant barrier to women's leadership and career progression, despite legal protections against gender discrimination (Rokka, 2021). Psychological distress, stemming from patriarchal and gender-unequal workplace environments, undermines women's leadership potential (Bereng and Mutekwe, 2021; Khwela et al., 2020). This study hypothesizes the following:

H5: Misogynistic Management has a significantly negative relationship with female engineers' career progression.

3.6 Empowerment and Career Progression

In organisational contexts, empowerment is defined as granting employees the authority and resources necessary to make decisions and perform effectively, ultimately enhancing productivity. Empowerment involves improving skills, providing motivation, and allowing employees to take responsibility for their actions (Hechanova et al., 2006). Ahearne et al. (2005) describe empowerment as the delegation of responsibility, enabling employees to make decisions regarding their primary tasks.

Women's empowerment is conceptualised as fostering self-worth, autonomy, and the ability to influence social change for themselves and others. Gender equality, defined as the absence of disparities in opportunities, resources, and decision-making based on gender, is a critical component of empowerment (OECD, 2011). Kabeer (2012) highlights that empowerment involves reshaping societal norms to enable women to exercise strategic control over their lives and participate equally with men in societal transformation.

Empowerment is fundamental to addressing gender inequalities and advancing women's career progression.

3.7 Structural Empowerment and Career Progression

Ahearne et al. (2005) define empowerment as the delegation of responsibilities by management, enabling employees to make decisions regarding their work tasks. Similarly, Riniwati (2011) views empowerment as a process that grants greater autonomy and decision-

making authority to workers in matters related to their roles. The traditional concept of empowerment, often referred to as the structural approach, has been explored under various terminologies, including role empowerment and relational approaches to empowerment. Kanter (1977) emphasises that employees' work attitudes and behaviours are significantly influenced by structural factors within their work environment, with power being a critical structural element shaping organisational behaviours and attitudes. This perspective is supported by Laschinger et al. (2001) and Loughman et al. (2009).

Despite its utility, the structural empowerment framework has faced criticism. Tuuli and Rowlinson (2009) argue that it fails to account for the cognitive and experiential dimensions of those being empowered. Thomas and Velthouse (1990), Spreitzer (1995), and Chan et al. (2008) critique this approach for overlooking the lived experiences of employees. Spreitzer (1995) notes that management practices are not the sole determinants of empowerment, as employees may or may not feel empowered even when granted access to power, knowledge, information, and rewards (Spreitzer and Doneson, 2005). Conversely, employees without these features may still perceive themselves as empowered. Siegall and Gardner (2000) reinforce this argument, emphasizing that true empowerment must incorporate the perspectives of those being empowered. Greasley et al. (2008) further assert that empowerment occurs only when individuals perceive themselves as empowered, aligning with Dee et al. (2003), who describe empowerment as an employee's self-perception of their empowerment.

Based on this discussion, the following hypotheses are proposed:

H6a: Structural empowerment will moderate the relationship between gender stereotyping and female engineers' career progression.

H6b: Structural empowerment will moderate the relationship between work-life balance and female engineers' career progression.

H6c: Structural empowerment will moderate the relationship between technical skills limitation and female engineers' career progression.

H6d: Structural empowerment will moderate the relationship between negative perception and female engineers' career progression.

H6e: Structural empowerment will moderate the relationship between misogynistic management and female engineers' career progression.

3.8 Psychological Empowerment and Career Progression

The limitations of structural empowerment have led to the emergence of a second perspective, psychological empowerment. According to Dee et al. (2003), psychological empowerment is reflected in employees' attitudes and their ability to perceive themselves as empowered. It is a multidimensional construct that significantly influences employee motivation, satisfaction, and performance. Psychological empowerment represents intrinsic motivation derived from employees' sense of control, competence, meaning, and impact in their work (Thomas and Velthouse, 1990).

Koberg et al. (1999) suggest that studies on empowerment should integrate both structural and psychological perspectives. While structural empowerment emphasises authority, resources, and power distribution, psychological empowerment focuses on employees' cognitions and perceptions, which are crucial to fostering their sense of behavioural and psychological investment in work. Spreitzer and Doneson (2008) argue that the structural approach prioritises management strategies, while psychological empowerment emphasizes individual satisfaction and intrinsic motivation (Spreitzer et al., 1997; Dewettinck and Ameijde, 2011).

Conger and Kanungo's (1988) work built on Bandura's (1982) theory of self-efficacy, which is the belief in one's ability to handle complex challenges. Research by Spreitzer (1995) shows that psychological empowerment at work stems from an individual's self-perception and their ability to define their role. The key factors that influence psychological empowerment include the nature of one's job, such as the level of autonomy, feedback, and task significance (Hackman and Oldham, 1976). Furthermore, a supportive work environment that promotes trust, teamwork, and open communication can also contribute to psychological empowerment (Spreitzer, 1996).

Leadership style plays a pivotal role in psychological empowerment. Empowering leadership behaviours—such as granting autonomy, encouraging participation, and offering support—strengthen employees' sense of empowerment (Zhang and Bartol, 2010). Transformational leadership, which inspires employees to achieve higher goals, is also positively linked to psychological empowerment (Avolio et al., 2004). Organisations can foster psychological empowerment by investing in leadership development programs and cultivating a culture that values employee contributions (Amundsen and Martinsen, 2014).

Psychological empowerment has several positive outcomes. Empowered employees exhibit higher job satisfaction, better performance (Spreitzer, 1995; Seibert et al., 2004), and greater organizational commitment (Joo and Shim, 2010). They are more proactive, innovative, and

resilient to stress, thereby contributing to lower turnover rates and enhanced retention of top talent (Spreitzer, 1996). Based on these considerations, the following hypotheses are proposed:

H7a: Psychological empowerment will moderate the relationship between gender stereotyping and female engineers' career progression.

H7b: Psychological empowerment will moderate the relationship between work-life balance and female engineers' career progression.

H7c: Psychological empowerment will moderate the relationship between technical skills limitation and female engineers' career progression.

H7d: Psychological empowerment will moderate the relationship between negative perception and female engineers' career progression.

H7e: Psychological empowerment will moderate the relationship between misogynistic management and female engineers' career progression.

3.9 Self-Efficacy and Career Progression

Self-efficacy, as conceptualised by Bandura (1977), refers to an individual's belief in their ability to successfully execute a task. It plays a crucial role in the empowerment process, influencing employees' confidence in their capacity to perform empowered roles (Heslin, 1999). According to a United Nations Women (2018) study in South Africa, many female managers exhibit low self-confidence due to denigrating behaviours from male colleagues, which hinders their progression into senior leadership roles.

Respondents in the study highlighted that some female managers at mid-level positions refrain from applying for senior leadership roles due to self-doubt, fear of failure, and societal gender expectations. These findings align with Koca et al. (2011), who argue that even highly qualified women often underestimate their capabilities and may defer to male candidates for leadership roles. Mathipa and Tsoka (2001) further note that organisational interpretations of women's reluctance to apply for leadership positions are often misattributed to a lack of confidence rather than systemic misogyny.

Addressing misogynistic workplace cultures and promoting gender equity can significantly enhance women's self-confidence and aspirations for leadership advancement. Female

managers often face a plethora of challenges, including distrust in their leadership abilities, psychological distress, and diminished career ambitions, as a result of systemic sexism and misogynistic behaviours (Seo and Huang, 2017). These challenges contribute to lower self-confidence, reducing women's likelihood of pursuing senior leadership roles (Martínez-Vivar, 2019).

High self-efficacy encourages individuals to persist in challenging situations, whereas low self-efficacy leads to avoidance behaviours, depriving individuals of opportunities to acquire necessary skills and competencies (Holdsworth, 2007). Positive experiences, such as successful task completion, foster self-efficacy and psychological empowerment (Bandura, 1997). Conversely, repeated failures undermine self-efficacy, diminishing employees' motivation and career aspirations (Ghufran and Risnawita, 2012). Based on these insights, the following hypotheses are proposed:

H8a: Self-efficacy will moderate the relationship between gender stereotyping and female engineers' career progression.

H8b: Self-efficacy will moderate the relationship between work-life balance and female engineers' career progression.

H8c: Self-efficacy will moderate the relationship between technical skills limitation and female engineers' career progression.

H8d: Self-efficacy will moderate the relationship between negative perception and female engineers' career progression.

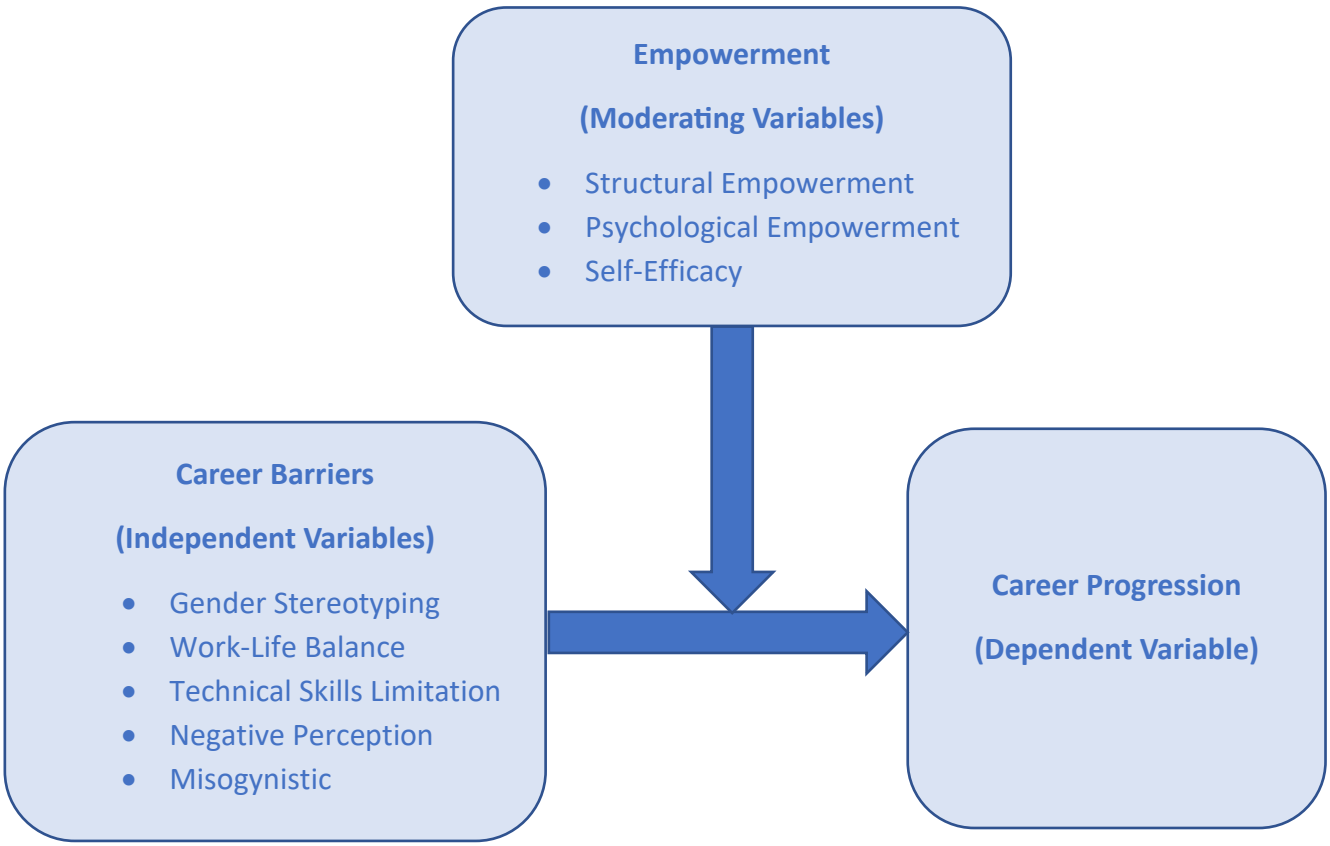
H8e: Self-efficacy will moderate the relationship between misogynistic management and female engineers' career progression.

3.10 Conceptual Framework

Drawing from the previously mentioned hypotheses, the conceptual framework illustrated in Figure 3.1 is designed to showcase the connections between the independent variables—Gender Stereotyping, Work-Life Balance, Technical Skills Limitation, Perception, and Misogynistic Management—and the dependent variable, Career Progression. Additionally, it highlights the moderating influences of empowerment, which includes Structural Empowerment, Psychological Empowerment, and Self-Efficacy. It is hypothesised that the career barriers will negatively impact career progression among female engineers in Malaysia. However, the moderating influence of empowerment is expected to mitigate the negative

effects of these barriers, thereby enhancing female engineers' career progression. Figure 3.1 visually represents the relationships articulated in the research hypotheses. Hypotheses H1 to H5 address the career barriers, while H6 to H10 focus on the moderating effects of empowerment.

Figure 3.1: Barriers to Female Engineers' Career Progression and Empowerment Model



Author's conceptualization, 2024

3.11 Chapter Summary

Based on reviewing relevant theoretical and empirical literature in Chapter 2, this chapter has developed a set of 10 (ten) hypotheses on which basis the conceptual framework has been designed to underpin the study. The hypotheses are summarized below. The next Chapter, Chapter 4 focuses on the methodology for the study.

Table 3:1 Summary of Hypotheses

Hypotheses	
H1	Gender Stereotyping negatively relates to Career Progression
H2	Work-life Balance positively relates to Career Progression
H3	Technical Skills Limitation negatively relates to Career Progression
H4	Negative Perception negatively relates to Career Progression
H5	Misogynistic Management negatively relates to Career Progression
H6a	Structural Empowerment moderates Gender Stereotyping and Career Progression
H6b	Psychological Empowerment moderates Gender Stereotyping and Career Progression
H6c	Self-efficacy Empowerment moderates Gender Stereotyping and Career Progression
H7a	Structural Empowerment moderates Work-life Balance and Career Progression
H7b	Psychological Empowerment moderates Work-life Balance and Career Progression
H7c	Self-efficacy Empowerment moderates Work-life Balance and Career Progression
H8a	Structural Empowerment moderates Technical Skills Limitation and Career Progression
H8b	Psychological Empowerment moderates Technical Skills Limitation and Career Progression
H8c	Self-efficacy Empowerment moderates Technical Skills Limitation and Career Progression
H9a	Structural Empowerment moderates Negative Perception and Career Progression
H9b	Psychological Empowerment moderates Negative Perception and Career Progression
H9c	Self-efficacy Empowerment moderates Negative Perception and Career Progression
H10a	Structural Empowerment moderates Misogynistic Management and Career Progression
H10b	Psychological Empowerment moderates Misogynistic Management and Career Progression
H10c	Self-efficacy Empowerment moderates Misogynistic Management and Career Progression

Author's computation, 2024

CHAPTER FOUR

METHODOLOGY

4.1 Chapter Introduction

In the preceding chapter, theoretical, conceptual, and empirical literature reviews were conducted, culminating in the development of a conceptual framework to guide the current investigation. This chapter establishes the philosophical and methodological foundation of the thesis and outlines the strategy adopted to conduct the research. It addresses the methodology employed to achieve the research objectives and answer the research questions introduced in Chapter One.

The chapter begins by summarising the research strategy, thereby providing a foundation for the methodological approach. It further elaborates on the philosophical perspectives underpinning both qualitative and quantitative methodologies, leading to the justification for adopting a mixed-methods approach. Following this, the chapter details the various research techniques utilized to ensure the collection and analysis of valid and reliable qualitative and quantitative data. Ethical considerations pertinent to the research are also discussed. The chapter concludes with a focus on the practical relevance of the research to practitioners.

4.2 Recap of the Research Strategy

Research methodology has been defined by Cooper and Schindler (2014) to denote the general approach that assists researchers in carrying out a research project. In the same vein, Saunders et al. (2016) consider research methodology to be the theory of how research should be conducted. Thus, research methodology provides the guiding principles that demonstrate how a particular study can be systematically conducted to address a research problem (Ragab and Arisha, 2018). Research methodology therefore can be construed as the blueprint that guides a researcher on the research journey in terms of the research approach, research design, and tools for collecting and analysing data (Sarantakos, 2013).

This section revisits the purpose of the research, along with the research objectives and questions, as well as the scope and context outlined in Chapter One. The aim is to refocus attention on the core essence of the research and to validate the research design presented in this chapter.

4.2.1 Purpose of Study

The engineering field has been notably recognised as one of the most male-dominated professions. Various studies have shown that this disparity is prevalent in many regions worldwide, including the USA (Reardon, 2004; SWE, 2004), the UK (Engineering UK, 2010a, 2010b), and India (Pareek, 2007). Women have consistently been underrepresented in engineering and often find themselves in the minority. Numerous studies have documented this gender disparity across countries, including U.K the women constitute approximately 26% of the engineering workforce in U.K (SWE 2021). Females in engineering fields are notably underrepresented. For example, although women make up more than half of the population in the United States and they represent 47% of the total workforce, but only 7.7% represent of those employed in engineering and science disciplines. The majority of the women tend to work in other areas such as healthcare, support roles, and education (SWE 2021). MentorNet (2019) points out that even with efforts made to recruit and retain women in engineering over the past decades, their representation remains dismally low in both engineering and related scientific fields. This lack of representation poses significant issues, preventing women from accessing opportunities that would allow them to enhance their skills and knowledge in fulfilling and innovative careers, explore new areas, create new solutions, and achieve financial independence and economic fairness (MentorNet, 2019).

An empirical study conducted on some women engineers working in the construction industry found that they have been facing issues such as partiality, segregation, and discrimination regarding support from peers (Johari *et al.,* 2013). This is an example of the gender stereotype that the construction industry is not meant for women (Ismail and Ibrahim, 2008). Most Organisations' leadership assessments have been reported to be discriminatory and prejudiced due to the lack of clear strategies and assessment processes (Heilman, 2021). It is believed that the limitation of women in the higher hierarchy is due to a gender bias evaluation.

The purpose of this study, therefore, is to investigate how career barriers of middle-level female engineers in Malaysia can be broken, using empowerment strategies, to enable female engineers to achieve career progression to contribute towards the performance of their organisations and the economy of Malaysia. This will be achieved by identifying the barriers that impede the career progress of middle-level female engineers in Malaysia, and an examination of the relationship between the career barriers and their career progression. The

study will examine the moderating effect of empowerment on this relationship and then proceed to make conclusions and recommendations.

4.2.2 Research Objectives

The main aim of this research is to investigate the role of empowerment as a moderator on the relationship between career barriers and career progression among Malaysian middle-level female engineers.

Specifically, this study seeks to achieve the following research objectives:

1. To identify career barriers confronting middle-level female engineers in Malaysia.
2. To ascertain empowerment factors that can be used as tools in breaking career barriers of middle-level female engineers in Malaysia.
3. To assess the relationship between career barriers and career progression.
4. To examine the moderating effect of empowerment on the relationship between career barriers and career progression.
5. To develop a model that illustrates the efficacy of empowerment as a tool to break career barriers for career progression among female engineers in Malaysia.

4.2.3 Research Questions

The following research questions were formulated to guide the data collection for this study.

1. What are the career barriers confronting middle-level female engineers in Malaysia?
2. What empowerment factors can be used as tools in breaking the career barriers of middle-level female engineers in Malaysia?
3. What is the relationship between career barriers and career progression?
4. What is the moderating effect of empowerment on the relationship between career barriers and career progression?
5. What model can illustrate the efficacy of empowerment as a tool to break career barriers for career progression among female engineers in Malaysia?

4.2.4 Research Hypotheses

The following hypotheses were set to test the effect of the independent variable (career barriers) on the dependent variable (career progression) based on each group of the independent variable. The potential moderating effect of empowerment (structural, psychological, and self-efficacy) was also hypothesized. Null hypothesis = H_0 and Research hypothesis = H_1

Hypothesis 1

H_0: Gender Stereotyping has no significantly negative relationship with female engineers' career progression.

H_1: Gender Stereotyping has a significantly negative relationship with female engineers' career progression.

Hypothesis 2

H_0: Work-Life balance has no significantly positive relationship with female engineers' career progression

H_1: Work-Life balance has a significantly positive relationship with female engineers' career progression

Hypothesis 3

H_0: Technical Skills Limitation has no significantly negative relationship with female engineers' career progression.

H_1: Technical Skills Limitation has a significantly negative relationship with female engineers' career progression.

Hypothesis 4

H_0: Negative Perception has no significantly negative relationship with female engineers' career progression.

H_1: Negative Perception has a significantly negative relationship with female engineers' career progression.

Hypothesis 5

H_0: Misogynistic Management has a significantly negative relationship with female engineers' career progression.

H_1: Misogynistic Management has a significantly negative relationship with female engineers' career progression.

Hypothesis 6

H6a: Structural empowerment will moderate the relationship between gender stereotyping and female engineers' career progression.
H6b: Structural empowerment will moderate the relationship between work-life balance and female engineers' career progression.
H6c: Structural empowerment will moderate the relationship between technical skills limitation and female engineers' career progression.
H6d: Structural empowerment will moderate the relationship between perception and female engineers' career progression.
H6e: Structural empowerment will moderate the relationship between misogynistic management and female engineers' career progression.

Hypothesis 7

H7a: Psychological empowerment will moderate the relationship between gender stereotyping and female engineers' career progression.
H7b: Psychological empowerment will moderate the relationship between work life balance and female engineers' career progression.
H7c: Psychological empowerment will moderate the relationship between technical skills limitation and female engineers' career progression.
H7d: Psychological empowerment will moderate the relationship between perception and female engineers' career progression.
H7e: Psychological empowerment will moderate the relationship between misogynistic management and female engineers' career progression.

Hypothesis 8

H8a: Self-efficacy will moderate the relationship between gender stereotyping and female engineers' career progression.
H8b: Self-efficacy will moderate the relationship between work-life balance and female engineers' career progression.
H8c: Self-efficacy will moderate the relationship between technical skills limitation and engineers' female career progression.
H8d: Self-efficacy will moderate the relationship between perception and female engineers' career progression.
H8e: Self-efficacy will moderate the relationship between misogynistic management and female engineers' career progression.

4.2.4 Scope of Study

The study was conducted in the researcher's place of origin, which is Malaysia, where he resided and worked for many years. The focal point of the research was seeing empowerment as an organisational tool, examining how it can be implemented to help female engineers abolish career barriers. The aim was to create a model that showcases the advantage of empowerment to help female engineers in managerial positions to excel in their career.

A cross-sectional study was conducted in this research. The target population was Malaysian middle level female engineers that were working within manufacturing organisations. Human Resource Managers, CEOs of engineering organisations were contacted as well as other needed professional groups for data. There was the benchmarking of the most optimum practices found in developed countries. This thereby gave credibility to the conclusions drawn to give the Malaysian Government, other stakeholders and engineering companies and female engineers valuable and effective recommendations.

4.2.6 Context of Study

The Malaysian manufacturing and engineering sector serves as the study's background. From humble origins, Malaysia has evolved into a sovereign nation that embodies visionary leadership and unwavering resolve in the pursuit of wealth by successfully diversifying its economy, utilising its natural resources, and accomplishing noteworthy milestones (Malaysia Budget, 2017). Following its independence in 1957, Malaysia's economy has evolved from being mostly dependent on commodities and agriculture to being fuelled by thriving manufacturing and service industries. The nation is becoming a major exporter of electrical appliances, parts, and components worldwide.

A 2019 World Bank report states that Malaysia is regarded as having a very open economy and has maintained a trade-to-GDP ratio above 130 percent since 2010. This transparency has been essential in creating job opportunities and promoting income growth, with exports accounting for about 40% of Malaysian jobs. Notwithstanding the difficulties brought on by the 1997–1998 Asian financial crisis, Malaysia's economy has continued its upward trend, averaging 5.4% growth since 2010. By 2024, the nation is expected to move from an upper middle-income to a high-income economy. Additionally, Malaysia continues to rank among the top producers and exporters of palm oil worldwide, which significantly boosts employment and the country's economy (World Bank Report, 2019).

In spite of the fact that more women are pursuing engineering degrees in Malaysia, middle-level female engineers still face obstacles to career advancement and higher positions within the company structure. Barriers including gender stereotypes, work-life balance, and delayed growth are some of the factors contributing to the perception that women are weaker. Only 6% of Malaysia's female graduate engineering population are professional engineers among total percentage of 26% female engineers in Malaysia, according to data from the Board of Engineers in Malaysia (2022). About 70% of women with degrees in science, engineering, and technology were not employed in fields that required these skills, despite the rise in the number of women in technical jobs (Ministry of Women, Family, and Community Development, Malaysia, 2020). This resulted in a substantial loss for Malaysia's economy. From the standpoint of the policymaker, Malaysia's technical workforce may suffer if the creative energies that women may possess are not harnessed (Johari et al., 2013). The lack of women in these fields in Malaysia's economy, combined with the quick growth of job prospects, is still perplexing given the engineering and technical sectors' significant contributions and high salaries (Ford and Harding, 2018).

Through equal educational opportunities, equal employment opportunities, and the implementation of anti-discriminatory laws and policies, the Malaysian government has demonstrated a strong commitment to achieving gender equality. Discrimination against women in the workplace, particularly at the managerial level, continues in spite of these initiatives (Peshave and Gupta, 2017). Despite the fact that more women are pursuing engineering degrees in Malaysia, middle-level female engineers still face obstacles to career advancement and higher positions within the company management structure. Work-life balance, gender stereotypes, and sluggish progress are some of the obstacles contributing to this reality in Malaysia. For the sake of the Malaysian economy, this needs to be looked into and addressed immediately.

4.3 Research Philosophy

The ideological stance that researchers take toward the social context they are trying to study is known as research philosophy (Saunders et al., 2019). As they entail basic presumptions about how the world is viewed, philosophical issues are essential to the idea of study design. According to Easterby-Smith et al. (2004) and Saunders et al. (2016), these presumptions serve as the cornerstone of the research strategy and guide the choice of techniques utilised to carry it out. The researcher's philosophical decisions affect the study's overall expectations and

perspective, as well as how the research is organised and how data is collected and analysed (Berg, 2004). In order to contextualize the study process and technique, the following philosophical views were taken into consideration.

The four most prevalent philosophical tenets: positivism, realism, pragmatism, and post - positivism are put out by Saunders et al. (2019). These assumptions can be divided into three main categories: ontology, axiology, and epistemology. Ontology refers to the beliefs regarding the essence of reality; it encompasses the individual's belief system that shapes their understanding of what is real or factual. Axiology pertains to the significance of values and ethics during the research process, addressing how researchers confront their own values as well as those of the individuals involved in the study. Finally, epistemology deals with the nature of knowledge itself, exploring what is regarded as credible, acceptable, and valid knowledge, along with the methods through which this knowledge is conveyed to others.

For simplicity, the four philosophical presumptions are mostly used to explain these paradigms (Burrell and Morgan, 2016). Therefore, the researcher provides a brief explanation of each of the four philosophical presumptions pertaining to this study in the paragraphs that follow.

4.3.1 Positivism

The fundamental idea of positivism is that the social world is an independent entity whose properties should be quantified objectively as opposed to subjectively through intuition, contemplation, or sensation (Saunders et al., 2016). Easterby-Smith et al. (2004, p. 28) cite the French philosopher Auguste Comte (1853) as the first to articulate this viewpoint when he stated: "Since Bacon's time, all good intellects have repeated that there can be no real knowledge but that which is based on observed facts."

There are two presumptions in Comte's remark. There are two main assumptions: the ontological one that reality is objective and external, and the epistemological one that knowledge is only meaningful if it is grounded in observations of this external reality. The fact that the study is conducted in a value-free manner is another crucial aspect of the positivist method. The researcher is assumed to be impartial and neither influenced nor be influenced by the research topic (Remenyi *et al.,* 1998; Bell, 2005).

4.3.2 Interpretivism

The epistemology of interpretivism, often known as phenomenology, holds that the researcher needs to comprehend how people differ in their functions as social actors. It highlights the

distinction between studying people and studying items. The fundamental tenet of phenomenology is that reality and the social world are socially produced rather than objective or external (Easterby-Smith *et al.,* 2000). Interpretivism holds that reality exists in people's imaginations rather than in physical objects, which is the complete opposite of positivism from an epistemological standpoint. Therefore, people's perceptions, interpretations, and sense of the world around them are all that can be understood about reality and the outside world. According to this theory, reality is dynamic and subject to change based on people's experiences and social surroundings (Burrel and Morgan, 1997). Its nominalist ontology holds that the social world is made up of concepts, names, labels, and other terms that are used to characterise, negotiate, and make sense of the outside world rather than having any actual, tangible structure. The qualitative methodological research methodology is based on interpretivism (Shotter, 1993; Saunders *et al.,* 2016).

4.3.3 Social Constructionism

The idea that 'reality' is socially produced and given meaning by humans rather than objective and external is the basis of the new paradigm that philosophers developed in the latter half of the 20th century, primarily in response to positivism's application to the social sciences.
One of the schools of thought known as interpretive methodologies is social constructionism (Habermas, 1970). The concept of social constructionism centres on how individuals interpret the world, particularly when communicating their experiences to others through language. According to this perspective, individuals, not objective nor outside forces, define reality. Therefore, the social scientist's job should be to understand the various constructions and meanings that individuals make of their experiences rather than to collect data and quantify the frequency of particular patterns (Watzlawick, 1984; Shotter, 1993). People's thoughts and feelings, both individually and collectively, should be the main focus, and their verbal and nonverbal communication styles should be carefully considered. Therefore, rather than looking for outside factors and underlying laws to explain people's behaviour, one should attempt to comprehend and explain why people have diverse experiences (Easterby-Smith *et al.,* 2000).

4.3.4 Post-Positivism

Referencing the earlier research of Schwartz and Ogilvy (1979), Lincoln (1985) contended that the naturalistic paradigm has emerged as a result of the post-positivist paradigm shift that the world is currently experiencing. According to this paradigm, the universe is holographic,

participatory, and pluralistic. According to Guba (1985), this idea is predicated on the idea that everything is interrelated, resembling a huge network of interference patterns, with each component holding knowledge about the entire. It is implied that the naturalistic paradigm sees the world as an unpredictable, linear realm devoid of clear cause-and-effect links (Lincoln, 1985). As a result, the naturalistic paradigm of inquiry is founded on a number of axioms that stand in stark contrast to the positivist tradition's earlier definition of inquiry (Guba, 1985). Above all, the ontological premise is that one's perception of reality depends on how one or more people construct and perceive the universe. The naturalistic paradigm acknowledges the significance of the respondent's subjective experiences. Therefore, it is assumed that any construction is an attempt by the respondent to make sense of reality, and that this sense will depend on the information at hand; if this knowledge changes, so too may the construction.

As it acknowledges that any given phenomenon can be viewed from a variety of perspectives (Lincoln, 1985; Guba, 1985; Schwartz and Ogilvy, 1979), this implies that the posture of pure objectivity is an illusion and that the posture of perspective (Schwartz and Ogilvy, 1979) may be 120 more appropriate.

4.3.5 Pragmatism

According to pragmatic theory, the research question itself is the most important consideration when selecting a research philosophy; certain issues may lend themselves better to a particular technique than others (Saunders et al., 2016). The pragmatism view that both philosophies can be successfully combined is supported when a research topic does not explicitly state the adoption of either positivist or interpretivist philosophy (Silverman, 1998; Saunders et al., 2016). Tashakkori and Teddlie (1998) propose that researchers should view philosophical perspectives as existing on a spectrum instead of as completely opposing viewpoints. They argue that pragmatism is particularly appealing because it helps scholars avoid what they consider unproductive debates concerning concepts such as reality and truth. From their viewpoint, researchers should focus on topics that genuinely interest them and hold personal significance, explore various methodologies that they find suitable, and apply their findings in ways that lead to beneficial outcomes aligned with their personal values (Tashakkori and Teddlie, 1998, p. 22).

4.3.6 Implications of the Philosophical Differences

Significantly distinct research methodologies are required by positivism and interpretivism. By first identifying the constituent parts of a phenomenon and then elucidating the phenomenon in terms of constructs and the connections among them, positivist epistemology seeks to comprehend a social context. Thus, a more quantitative approach is included in this viewpoint. In order to promote replication, the positivist researcher is likely to employ a highly structured technique. Additionally, quantitative findings that are amenable to statistical analysis will be the focus (Cavaye, 1996; Gill and Johnson, 2002). The interpretive approach, however, aims at understanding a phenomenon from the participant's point of view, who is directly involved with the phenomenon. This perspective therefore involves the qualitative approach (Malhotra and Birks, 2000; Bell, 2005). It would be simple to make the mistake of believing that one study methodology is "better" than another. Different tasks are what each is "better" at. Which is "better" as always depends on the study issue or questions being addressed (Saunders et al., 2016). In practice, research rarely cleanly fits into a single philosophical field. The practice of research entails many compromises between these two extreme viewpoints, despite the obvious contrast between positivist and interpretivist worldviews and the stark disagreements among researchers regarding the merits of various methodologies (Tashakkori and Teddlie, 1998; Easterby-Smith et al., 2004). Perhaps reflecting the stance of realism, business and management research frequently combines positivist and interpretivist viewpoints (Saunders *et al.,* 2016).

4.3.7 The Author's Philosophical Position

The idea of research design is based on philosophical considerations. Important presumptions about how people view the world are embodied in the chosen research philosophy. According to Easterby-Smith et al. (2004) and Saunders et al. (2007), these presumptions serve as the foundation for the research strategy and have an impact on the choice of techniques employed to carry it out. The researcher's philosophical decisions affect how the study is organised, how data is gathered and analysed, and how the investigation is oriented and anticipated overall (Berg, 2004). The author took the following philosophical stances in order to put the investigation's approach and process into context.

Given the multifaceted nature of the study issue, which suggested the viability of combining positivist and interpretivist philosophies, the author used pragmatism as an epistemological stance (Saunders et al., 2016). It is also thought that pragmatism is intuitively appealing (Tashakkori and Teddlie, 1998). The author recognised the intrinsic complexity, diversity, and

unpredictability of issues pertaining to career barriers, career advancement, and empowerment. This required incorporating various methodology, like qualitative approaches, in addition to a primarily positivist viewpoint (Carson and Coviello, 1995; Hill and McGowan, 1999).

Examining the connections between career obstacles and advancement, evaluating the moderating impact of empowerment, and testing hypotheses were all crucial components of the study that also adhered to a positivist methodology. The pragmatic approach, which considers both positivist and interpretivist traditions, was judged to be the most suitable for this investigation in light of these factors.

4.4 Research Design

A research design, as described by Leedy (1997), outlines a plan that provides an overarching structure for collecting data. MacMillan and Schumacher (2001) further explain that it serves as a method for selecting participants, determining locations, and identifying data collection techniques to effectively tackle the research topic or questions. They go on to say that the goal of a sound study design is to guarantee that the findings are regarded as trustworthy. A research design is a comprehensive plan that outlines the techniques and steps for gathering data for social science study and evaluating the information that is required (William, 1988). It follows that a study's research design identifies the purpose of the investigation and the kinds of data that will be needed.

Saunders *et al.* (2019) divides research designs into three categories: strategy or technique (survey, case study, quasi study, observation, sequence, etc.); approach (quantitative, qualitative, and mixed method); and purpose (exploratory, explanatory, and descriptive). The classifications selected for this study have been justified, and a brief explanation of each is provided below.

4.4.1 Research Purpose

A study that delves extensively into a phenomenon in order to gain comprehensive information is referred to as exploratory research. When little is known about a phenomenon, this kind of inquiry is usually appropriate (Akhtar, 2016). Because exploratory research is adaptable and flexible, it can be used to investigate areas that are unknown or have limited knowledge (Saunders *et al.,* 2016). Conversely, explanatory research proves that independent and dependent variables are causally related (Saunders *et al.,* 2016). Regardless of whether

controls, moderators, or mediators are included, this research investigates how independent variables influence one or more dependent variables. In contrast, descriptive research focuses on capturing and articulating specific events or the connections between variables—including both independent and dependent types—using either broad or precise terminology (Saunders et al., 2016). This type of research provides a comprehensive portrayal of individuals, events, or circumstances (Siedlecki, 2020). It is particularly effective at addressing questions framed as "what," "how," and "why" (Bickman and Rog, 1998; Hilton, 2018).

According to the research questions and objectives, this study is a descriptive investigation. Descriptive research style is better suited than exploratory and explanatory research methods since the study's goal is to examine the relationship between professional barriers and career advancement, including the moderating influence of empowerment. Since the researcher's goal is to explain the phenomenon in order to offer enough information for the study of professional hurdles, advancement, and empowerment, this study is not exploratory in nature. Similarly, an explanatory design was inappropriate because the goal of this study is not to establish or explain causal links between the variables under investigation (career barriers and career progression).

4.4.2 Research Strategy

A sequential design was chosen as the approach. In a sequential design, a number of studies or phases are conducted, each building on the one before it, and the outcomes of each phase are used to inform the design of the subsequent phase (George, 2023). Researchers can improve their study questions or hypotheses, create and test new tools or methods, gather and analyse data iteratively, and adjust to new themes or discoveries thanks to this approach (Creswell and Creswell, 2018). Usually, a mixed-method study uses it. It boosts validity and reliability, better comprehension of the phenomena, improves data quality, and permits flexibility and adaptability in the study procedure (George, 2023).

Convergent parallel design (collecting both qualitative and quantitative data simultaneously), exploratory sequential design (using qualitative findings to inform quantitative data), explanatory sequential design (explaining quantitative findings using qualitative data), and embedded design (using one type of data, either qualitative or quantitative, to be secondary to the other) are common sequential design types in mixed-method studies (George, 2023). The explanatory sequential design was chosen for this study because the researcher wanted to use qualitative data to explain the quantitative findings. The researcher used this approach by first gathering quantitative data on all study objectives and then statistically analysing the data.

Subsequently, semi-structured interviews were used to gather qualitative data in order to clarify and offer more profound insights into the quantitative findings.

4.4.3 Research Approach

The objectives, scope, and depth required for addressing a research question determine the research methodology for any study (Bryman, 2016). Different studies adopt various research methods. Creswell (2014) describes research methodology as a systematic plan that details the specific actions taken to collect, analyse, and interpret data. There are three primary research methodologies: the mixed-method approach that combines various tools to examine the relationships between variables and explore current issues; the qualitative approach that aims to understand human challenges from specific situations to broader contexts; and the quantitative approach that utilises instruments to test hypotheses and theories through extensive data sets to identify relationships among variables. A mixed-method approach includes both quantitative and qualitative techniques within a single investigation (Creswell, 2014). The following sections will detail the methods used in this study.

4.4.3.1 Quantitative Approach

Quantitative research involves the collection of data in a numerical format and its analysis through mathematical methods, particularly statistical techniques, to clarify a problem or phenomenon (Aliaga and Gunderson, 2002). The process of collecting and converting data into numerical values for statistical analysis and conclusions is referred to as quantitative research (Hilton, 2018). According to Williams (2011), who elaborates on the aforementioned definitions, quantitative research starts with stating an issue or problem, formulating a hypothesis or research question, starting a literature review, and statistically assessing the data acquired. In this research specifically, alongside the qualitative approach, quantitative research approach is also being applied. This strategy was the most suitable since the researcher's goal was to clarify the connection between professional obstacles, empowerment, and career advancement (Saunders et al., 2009). By employing a quantitative technique, the researcher was able to gather numerical data independently and do statistical analysis to examine the connections between the dependent variable (career progression), the moderator (empowerment), and the independent variables (career barriers).

Quantitative research methods allow for more sample sizes to be used to make generalisations on the larger population, hence saving more money rather than doing a full study which would

be expensive (Holton and Burnett 1997). Another strength is that it provides quantifiable data high in reliability which allows it to be generalizable to the larger population (Silverman, 1998). A significant drawback of the quantitative approach, however, is its propensity to decontextualize human behaviour, which separates events from their actual circumstances and ignores the impact of variables not included in the research model (Bell, 2005). The perceived orderliness, linearity, and lack of attention to resource restrictions of quantitative research methodologies have also drawn criticism. When used for exploratory reasons, they are less successful. Researchers are unable to address missing important questionnaire items, clear up ambiguities, or correct question misinterpretations once data collecting has started. Moreover, it is frequently believed that quantitative research is insufficient to address the intrinsic distinctions between people and the natural science objects under study (Gable, 1994; Silverman, 1998; Saunders *et al.,* 2009).

4.4.3.2 Qualitative Approach

Van Maanen (1983) defines qualitative research as a collection of interpretive methods aimed at describing, decoding, and understanding the meanings behind various naturally occurring phenomena in the social realm, rather than focusing on their frequency. This research approach enables a more profound exploration of human experiences, allowing researchers to gain deep insights into the significance of individuals lived experiences, ultimately yielding valuable information.

Finding significance and gaining insight into a particular occurrence are given top priority in a qualitative investigation. This is due to the fact that interpreting actions or occurrences requires a thorough explanation of the surrounding context and an awareness of the viewpoints of people who either influence or are influenced by the phenomenon (Tillal et al., 2002; Goulding, 2005; Bell, 2005).

Typically, qualitative research involves intimate or prolonged engagement with a "field" or living situation. These situations are frequently "banal" or "regular," reflecting the day-to-day activities of people, communities, organisations, and societies (Miles and Huberman, 1994; Amaratunga et al., 2002). Rich descriptions of complex phenomena, the tracking of unusual or unique events, the illumination of the experience and interpretation of events by actors with widely disparate stakes and roles, the giving of voice to those whose opinions are rarely heard, the development of theories through preliminary investigations, the generation and testing of

hypotheses, and the pursuit of explanations are all made possible by qualitative research (Bradley, Curry, and Devers, 2007).

A qualitative method honours the opinions of particular research participants and places significance on what may be learnt from their individual experiences, as opposed to depending on huge sample numbers to eliminate bias as in a quantitative study (Silverman, 1998). According to Gordon and Langmaid (1988), qualitative research works best in circumstances that would deepen understanding, broaden knowledge, clarify the true problems, produce a hypothesis, identify a variety of behaviours, attitudes, and behaviours, and establish discrete behavioural groupings. Goulding (2005) highlights that qualitative research facilitates the development of theories, provides trustworthy insights, and enhances informed decision-making. However, there are instances where individuals might be hesitant or unable to respond to specific inquiries. Additionally, some may choose not to provide truthful answers to questions that could infringe upon their privacy, cause them embarrassment, or negatively impact their self-esteem or societal standing. Consequently, relying on quantitative approaches to collect data from participants may not always be practical or appropriate (Malhotra, 2000).

Tillal et al. (2002) list a number of controversial problems with qualitative research from a negative standpoint. First, it is questioned if the researcher is unable to understand events from the subject's perspective. Second, because qualitative research methods are critiqued for lacking theoretical components, there may be a weak connection between theory and research. Thirdly, the degree to which qualitative findings may be extrapolated outside of a specific example is considered to be constrained by the external validity of qualitative research. Furthermore, gathering and analysing qualitative data might take a lot of time and effort (Bell, 2005).

Since the researcher wanted to comprehend and characterize the connection between professional hurdles, empowerment, and career advancement, the qualitative research approach was chosen for this study (Saunders et al., 2009). According to Gordon and Langmaid (1988), the application of the qualitative approach would improve comprehension, broaden knowledge, elucidate the true problems, identify a variety of behaviours, attitudes, and actions, and establish discrete behavioural groups. Using the qualitative approach would help the researcher generate theory, obtain reliable insights, and make effective decisions regarding career advancement, career obstacles, and empowerment. Adopting it on its own without taking the

quantitative approach into account, would not be beneficial. The qualitative and quantitative approaches had to be used in tandem to triangulate the results.

4.4.3.3 Mixed-Method Approach

Johnson and Onwuegbuzie (2004) characterize mixed-method research as the integration of various approaches to address research questions. In contrast, Greene et al. (1989) define mixed methods as involving at least one quantitative method (aimed at gathering numerical data) along with one qualitative method (focused on collecting descriptive data). A broader definition is provided by Greene et al. (2005), who view mixed methods as "an approach to social inquiry that entails the planned use of two or more distinct types of data collection methods and, less frequently, varying inquiry designs within a single study" (p. 274). The differences among these definitions highlight the importance of effectively balancing quantitative and qualitative data in research. Additionally, Campbell and Fiske (1959) introduced the idea of triangulation, which refers to the use of multiple methods as part of a validation process. The concept of triangulation was later expanded to indicate that quantitative and qualitative data should work in tandem (Hanson et al., 2005). The insights gleaned from quantitative methods can guide researchers on how to implement qualitative approaches, allowing them to engage with participants for deeper explanations regarding their survey responses.

Quantitative research often fails to capture the complete context in which the data was collected, whereas qualitative research is susceptible to biases and cannot be analysed statistically or generalized. In contrast, a mixed-methods approach offers a solution to these limitations by facilitating both exploration and analysis within a single study. This approach allowed the researcher to utilise a variety of tools to collect thorough and detailed data.

The results obtained give a very broad view of the problem being researched (Giddings and Grant, 2006; Andrew and Halcomb, 2008). By having observations and statistical analysis included in the results, validation is made within the study. This provides further confirmation and reinforcement for the findings. Thus, a mixed-method approach is assumed to be the most applicable research design, since it delivers the best research outcome by curing the weakness in both quantitative and qualitative studies. The mixed-method approach also uses a combination of inductive and deductive reasoning and the use of both words and numbers in

communicating research outcomes would meet the needs of a wider audience. Ultimately, it helps to minimise the researcher's personal biases.

However, a mixed-method approach has its weaknesses. Researchers have criticised the approach as an extension of positivism to the detriment of qualitative methodologies (Giddings, 2006). Collecting qualitative and quantitative data also takes a lot of time, effort, and resources and is complex. The sections on data collection outline how the mixed-method approach was implemented by the researcher. This involved the collection of quantitative data followed by the collection of qualitative data. The quantitative data was initially collected to establish and test relationships, supplemented by the collection of qualitative data for insight and understanding of the relationships.

4.5 Quantitative Data Collection

4.5.1 Population

The population of the study consisted of all female engineers in the manufacturing sector in Malaysia. The target population of interest included middle-level female engineers of four (4) selected divisions within the manufacturing sector of Malaysia, namely: Electronics companies, Shipyard companies, medical equipment manufacturing company, Leather companies, Food and beverage companies, and Electronics which constitute the main manufacturing hub of Malaysia and have been operating for more than 30 years.

4.5.2 Sampling

The study adopted the purposive sampling method to select the manufacturing organisations. A non-probability sampling technique is usually adopted when the total population is unknown to the researcher intends to purposively choose the research participants (Saunders *et al.,* 2009). Purposive sampling is a method that enables researchers to identify respondents who possess valuable insights and are also willing to take part in the study (Etikan et al., 2016). In this instance, a homogeneous purposive sampling approach was employed for both qualitative and quantitative methods to ensure that all selected participants shared comparable demographic traits. This sampling technique was considered suitable for obtaining the right engineers who could contribute precise, dependable, and comprehensive information. A summary of the sample units chosen for the research can be found in Table 4.1 below:

4.5.3 Sample Size

The choice of sample size depends on factors such as budget, available time, accessibility to potential participants, intended analysis methods, and the necessary level of precision and accuracy (deVaus, 2001). Krejcie and Morgan (1970) propose a 'Determining Sample Size for Research Activities. This has been widely utilised in social science studies. Subsequently, relying on Krejcie and Morgan's (1970) criteria, Research Advisors (2006) also propose a required sample size for a given population, and the level of confidence and margin of error (degree of accuracy) that come with it. This has been tabulated and widely recommended by scholars. Once the population size is estimated or known, the researcher(s) can choose a sample size using the table.

The estimated total number of female engineers in Malaysia is 29,220. Among them, 2,440 occupy engineering managerial positions, and they were the target (Board of Engineering Malaysia 2022). Following the guidelines provided by Research Advisors (2006) and considering a target population of 2,440 managerial engineers, the researcher determined a sample size of 330, aiming for a 95% confidence level with a 5% margin of error. This sample size selection aligns with Saunders et al. (2007), who suggest that a 95% confidence level is typically ideal as it indicates that at least 95% of the samples should adequately represent the population's characteristics, while the 5% margin of error reflects the accuracy of the population estimates. However, due to factors such as participant reluctance and unavailability, the sample size was conveniently reduced to 150, following the criteria for non-probability sampling as outlined by Patton (2002). Of the 150 samples, 120 completed questionnaires were successfully collected from respondents, representing 80% of the sample size. Consequently, adhering to Tabachnick *et al.* (2001) rule of thumb requiring at least 65% valid responses, the researcher moved forward with the data analysis.

Table 4.1 Sample Units/ Sample sizes for the Quantitative Study

Manufacturing Companies	**PES-Sdn.Bhd Medical Equipment**	**PES - Food Processing**	**Puncak Sdn.Bhd Leather Rubber**	**Boustead Naval Shipyard Sdn.Bhd**								Total
				Electrical	Piping & Mechanical	Erection & Assembly	Steel Fabrication	Tech Service	Bofors Asia	Aero Service	Electronics& Technologies	
No. of Participants	13	12	14	16	14	13	8	18	15	9	18	150

4.5.4 Data Collection Instrument

A questionnaire was utilised as a tool for gathering quantitative information. This method is cost-effective, straightforward, and adaptable, allowing for prompt and efficient data collection from a wide audience. Additionally, it promotes the independence and impartiality of the data collection process, which supports scientific evaluation and the potential for predictive analysis (Ader and Mellenbergh, 2008). The questionnaire included modified items from prior research pertinent to the study variables, such as career obstacles, empowerment, and professional advancement. The original questions were adjusted to align with the study's objectives. Respondents encountered closed-ended questions using a five-point Likert scale, ranging from strongly agree (1) to strongly disagree (5). The initial section gathered demographic data about the respondents, including their age categories, job titles, and experience levels. The next section focused on identifying career barriers, covering topics like perceptions, gender stereotypes, work-life balance, limitations in technical skills, and experiences with misogynistic management. The third section concentrated on empowerment indicators such as structural, psychological and self-efficacy. Finally, the last section looked into career progression. A copy of the instrument can be found in Appendix II.

4.5.5 Validity and Reliability of the Instrument

The validity and reliability of the research instrument were rigorously assessed through a series of tests to ensure its appropriateness and robustness. First, content validity and predictive validity tests were conducted to confirm the instrument's validity. To evaluate content validity, the researcher submitted the draft questionnaire to a panel comprising lecturers, researchers, and practitioners specialising in engineering and quantitative methods. Content validity ensures that the instrument effectively measures what it is intended to measure (Dawson, 2009). While initial feedback varied, the researcher synthesised the inputs to achieve consensus and ultimately obtained content validity approval from all consulted experts. Based on this confirmation, the researcher proceeded with a pilot test, which enabled the assessment of predictive validity. The predictive validity test helps to ascertain whether the instrument could accurately predict the intended outcomes (Thomas, 2006). Inter-construct correlation was employed for this purpose, and the results indicated that the instrument demonstrated satisfactory predictive validity. These findings are presented in detail in Chapter Five of this study.

The reliability of the instrument was determined using Cronbach's alpha coefficients, a standard measure for assessing internal consistency (Field, 2009). Cronbach's alpha evaluates the extent to which the items within a scale are consistent, thereby ensuring the reliability of the instrument for generating accurate and relevant findings for decision-making. To compute the reliability coefficients, the Statistical Package for Social Science (SPSS), version 26, was utilised. The results of the reliability analysis demonstrated that all scales namely, gender stereotyping, work-life balance, technical skills limitation, negative perception, misogynistic management, and career progression exceeded the prescribed Cronbach's alpha threshold of 0.70 (Field, 2009). This confirms that the instrument is reliable and internally consistent. The detailed results of the reliability tests are also presented in Chapter Five of this study.

4.5.6 Data Collection Method and Procedure

This research made use of survey method to collect primary source data. A survey method is most appropriately used in quantitative research to collect numeric data. Since this study is mixed-method research and requires both quantitative and qualitative primary data, a survey method is most appropriate to utilise a questionnaire to collect the quantitative data. The survey method promotes the objectivity of the respondents by reducing the researcher's interference (Hilton, 2018). Accordingly, a questionnaire was designed to collect the data from the sample. At the initial stage, the researcher carried out a pilot test on fifteen (15) respondents (representing 10 percent of the sample size) to clarify any ambiguity that would be identified in some of the questions or items. The respondents were not selected for the main survey. The pilot test results were used to further refine the instrument by way of corrections and resolving a few omissions. The results were also used to address the problem of non-response bias, thereby increasing response accuracy and rate. Consequently, the pilot test was used to confirm the validity and reliability of the instrument before the main survey.

To initiate the study, the researcher obtained an introductory letter and ethical clearance from the Department of Ethical committee at the University of East London (Appendix I-UREC Approval Letter). This allowed the researcher to seek permission from the management of the selected organisations within the study area, thereby facilitating site access and confirming the researcher's status as a PhD candidate. Following this, the researcher arranged meetings with potential participants to clarify the study's objectives and to build rapport, which ultimately helped in scheduling survey times and interviews according to participants' availability.

Data collection was conducted via a Google Form link specifically created for the respondents, which was sent out individually. This phase lasted approximately two months, during which the researcher actively ensured participation by regularly following up and sending reminders through messages and occasional phone calls to enhance the response rate.

After completing the survey, the researcher returned to the study site to conduct interviews with the participants. Prior to data collection, rapport was established, and personal appointments were arranged with each interviewee. The interview process took two weeks and consisted of in-depth, personal discussions guided by a structured interview outline tailored to the study's aims. Each interview lasted between 20 to 30 minutes. Participants were reassured that their responses would solely be utilised for academic purposes, and they provided their verbal consent for the interviews to be recorded.

4.5.7 Data Analysis

Data analysis involves the systematic process of organising, purifying, transforming, and modelling data to uncover valuable insights, recommendations, conclusions, and to aid in decision-making (Ader and Mellenbergh, 2008). Therefore, the collected data underwent careful editing and coding, allowing the researcher to derive meaningful information. Editing was focused on rectifying mistakes and examining non-responses, accuracy, and correct answers, while coding was implemented to streamline data entry and enable thorough analysis (Ader and Mellenbergh, 2008). The researcher utilised SPSS version 26 to analyse the data. Descriptive statistical analysis was performed to present the results through metrics such as mean, standard deviation, skewness, and kurtosis, along with interpretations of those findings.

Additionally, correlation analysis was run to test the correlation between the independent variables (career barriers), moderators (empowerment indicators), and the dependent variable (career progression). It also showed the correlation matrix for the study variables (career barriers, empowerment indicators, and career progression). Furthermore, a hierarchical regression modeling was employed to test all the research hypotheses to establish the predictive effect of the career barriers on career progression, including the moderating effect of empowerment indicators. The results of the various analyses are shown in the next chapter. For the regression analysis, regression models were estimated.

A normality test was performed by evaluating skewness and kurtosis, following the guidelines provided by Tabachnick *et al.* (2001). The researcher aimed to verify if the data followed a normal distribution, which would help in selecting the appropriate analytical method. The outcomes of the normality test will be detailed in the subsequent chapter under the results and discussion section. Additionally, a correlation analysis was carried out to assess multicollinearity, based on Kennedy's (2008) recommendation that correlations among independent variables should not exceed 0.70. These findings are presented in the correlation

Regression model

To carry out the regression analysis, the following regression models were specified to test. Model 1 relates to the estimation of the career barriers without empowerment or any control. Model 2 relates to the estimation of the career barriers and empowerment dimensions as augmentation variables. Model 3 relates to the estimation of the career barriers and the interactive term of the career barriers and empowerment dimensions.

$CP = \alpha + \beta_1 GS_1 + \beta_2 WLB_2 + \beta_3 TSL_3 + \beta_4 NP_4 + \beta_5 MM_5 + \varepsilon$ ……………………………….1

$CP = \alpha + \beta_1 GS_1 + \beta_2 WLB_2 + \beta_3 TSL_3 + \beta_4 NP_4 + \beta_5 MM_5 + \beta_6 SE_6 + \beta_7 PE_7 + \beta_8 SEE_8 + \varepsilon$ ...2

$CP = \alpha + \beta_1 GS_1 + \beta_2 WLB_2 + \beta_3 TSL_3 + \beta_4 NP_4 + \beta_5 MM_5 + \beta_6 GS\_SE_6 + \beta_7 WLB\_SE_7 + \beta_8 TSL\_SE_8 + \beta_9 NP\_SE_9 + \beta_{10} MM\_SE_{10} + \varepsilon$ …………………...3

where: CP = dependent variable: Career Progression, GS = independent variable 1: Gender Stereotyping, WLB = independent variable 2: Work Life Balance, TSL = independent variable 3: Technical Skills Limitation, NP = independent variable 4: Negative Perception, MM = independent variable 5: Misogynistic Management, SE = moderator 1: Structural Empowerment, PE = moderator 2: Psychological Empowerment, SEE = moderator 3: Self-efficacy Empowerment, α = the intercept, β = the parameters or the regression coefficients, and ε = the error term.

4.6 Qualitative Data Collection

In the framework of the mixed-method approach used for the study, qualitative data was gathered as a second stage of data collection to offer in-depth comprehension and insight into the problems being studied**.**

4.6.1 Population

The same population for the quantitative aspect of the study was used under the qualitative approach. Female engineers in managerial positions in the manufacturing sector of Malaysia constituted the population with a target of middle-level female engineers from four subsectors of the manufacturing sector: Electronics companies, Shipyard companies, Leather companies, Medical equipment manufacturing company, Food and beverage companies and Electronics. Under the qualitative study, the target population included industry experts, heads of manufacturing companies, human resource experts, and female engineers in the Malaysian manufacturing sector.

4.6.2 Sampling

Sampling Method

To choose interview subjects, the purposive sampling technique was applied. The participants were selected based on their ability to respond to the questions and their knowledge (Bernard, 2017), as well as on their availability and willingness to participate in the study (Etikanet et al., 2016). According to Neuman (2000), when working with very small samples and when the researcher wants to choose cases that are especially instructive, the purposive sampling method may be employed. The researcher was primarily interested in survey participants who were willing to participate in the interview in order to get their opinions to better comprehend the survey results and validate the conceptual model.

Sample Units

Four sample units were identified for a semi-structured interview namely: industry experts, heads of manufacturing companies, human resource experts, and female engineers. Five (5) participants from each of the sample units were approached individually by the researcher and willingly granted recorded interviews.

Sample Size

In all, twenty (20) participants were selected for the interview. This number was considered adequate based on sample sizes adopted in previous similar investigations. The researcher followed the perspective that, unlike quantitative studies which often depend on large sample sizes to eliminate bias, a qualitative approach emphasises the significance of the insights provided by a small number of specific participants and the lessons that can be derived from their individual experiences (Silverman, 1998). It follows that a qualitative study does not emphasise a large sample size but rather the amount of information gathered (Malterud,

Siersma, and Guassora, 2016). Thus, 20 participants were considered reasonable to achieve data saturation (Fugard and Potts, 2015).

4.6.3 Data Collection Instrument

The interview was conducted using a semi-structured interview guide. Data is gathered using a semi-structured interview guide that focuses more on examining the "why" and comprehending the "what" and "how" (Saunders et al., 2016). While semi-structured interviews allow for engagement with people and allow for probing for more knowledge, they also offer the chance to track responses and acquire ordered explanations (Creswell, 2009) (Easterby-Smith et al., 2000).

To guarantee its applicability to the study, the interview guide was created using questions derived from the literature and connected to the research questions. In order to allow participants to freely express themselves and to allow the researcher to ask follow-up questions, the questions were made flexible. The researcher's literature analysis did not address all of the questions, so additional ones were posed in light of the participants' responses. You can find the interview guide in Appendix I.

4.6.4 Data Collection Method and Procedure

A qualitative approach was employed for data collection through interviews. This method is particularly effective for gaining insights into the operations of social institutions, discourses, and processes, as well as for capturing the individual experiences and viewpoints of the participants (Agonyo, 2018). Nevertheless, interviews come with certain drawbacks, primarily related to challenges in replicability. Additionally, the interview structure can be significantly affected by the social context (Edwards and Holland, 2013). When numerous individuals are interviewed over extended periods, the resulting volume of textual data can create complexities in analysis (Edwards and Holland, 2013).

Data collection involved scheduling interviews directly with participants over the span of one month. Each interview was conducted in a personal and thorough manner, guided by a set of questions developed in alignment with the study’s aims. Sessions typically lasted between 15 to 20 minutes. Participants were guaranteed confidentiality, with assurance that their input would solely be utilised for academic purposes, and they provided their verbal consent for the recordings**.**

4.6.5 Data Analysis

The qualitative data was analysed using thematic analysis, which is particularly common for interpreting interview data. This method entails recognising patterns within text-based data (Kusi, 2012). Initially, the researcher thoroughly reviewed the transcribed material to become well-acquainted with the content. Subsequently, distinct labels or codes were created to highlight and differentiate key aspects of the transcriptions. In the following phase, potential themes were explored and interpreted based on the identified patterns and similarities in the responses. These themes underwent further evaluation and refinement. Once adjusted, the themes were utilised in the analysis, helping to connect excerpts from the data with existing literature through analytic narratives. Although the analysis followed a sequential process, it was also somewhat cyclical, as the researcher occasionally revisited earlier stages to negotiate and validate themes, ensuring they were substantiated by relevant excerpts from the transcribed data.

4.7 Management of Research Bias and Ethical Issues

Interviews can be susceptible to bias due to the inherent nature of human interaction, as highlighted by Selltiz *et al*. (1976), who emphasised that interviewers' behaviours can influence respondents. Supporting this, Bell (2005) points out the ease with which bias can enter the research process, such as selectively including literature that reinforces a specific viewpoint or employing biased language that reflects strong feelings and leads to subjective interpretations of research outcomes.

The use of semi-structured interviews for collecting qualitative data in this study introduced the potential for interviewer bias. The researcher's comments, tone, or body language could unintentionally affect how participants answered the questions (Saunders *et al.,* 2009). To minimise this risk, the researcher was careful in phrasing questions and mindful of non-verbal cues to avoid suggesting any particular answer. Additionally, in addressing interpretive bias, the researcher maintained a critical perspective, remaining aware of the possibility of overemphasizing facts due to personal beliefs (Saunders *et al.,* 2009). All ethical standards for the research were rigorously upheld**.**

The data regulations set by the University of East London were adhered to in an ethical manner. All interviews followed the guidelines established by the Market Research Society. The relevant aspects of the Data Protection Act (2018) and the Human Rights Act (1998) were

respected. In line with ethical practices, respondents were offered non-monetary incentives. They received "made-in-UK" souvenirs as a token of appreciation for their participation in the survey. A few female engineers and targeted institutions opted out of the study at the last minute for personal reasons. The author aimed to encourage these individuals and institutions to rejoin the research, avoiding any aggressive tactics that would violate the Market Research Society's code of conduct, which emphasises the importance of voluntary cooperation from the public and businesses in research endeavours.

4.8 Implementation of Practitioner Relevance Concept

Practitioner relevance refers to the extent to which academic research provides meaningful insights and actionable solutions that can be effectively utilised by practitioners in their respective fields. According to Gulati (2007), relevant research must address real-world problems faced by practitioners and deliver practical recommendations and frameworks. One of the enduring challenges in research lies in bridging the gap between theory and practice. Van de Ven and Johnson (2006) attribute this disconnect to divergent priorities: academics often prioritize theoretical contributions, while practitioners seek immediate, applicable solutions. This misalignment can result in research that, although methodologically rigorous, lacks practical utility.

The debate concerning rigor versus relevance remains prominent among scholars in research and management disciplines. As Mentzer (2008) highlights, perspectives on this issue can be categorized into three distinct viewpoints. One group argues that relevance should take precedence to ensure that research does not become overly theoretical or detached from practice (Davis-Sramek and Fugate, 2007). In contrast, others emphasise the primacy of rigor, asserting that without methodological soundness, research findings may be unreliable or invalid (Flynn, 2008). A third perspective advocates for the simultaneous pursuit of both rigor and relevance to ensure that research is both credible and practically meaningful (Mentzer, 2008). This debate, which has persisted for decades in the social sciences, is likely to endure (Gulati, 2007; Kieser and Leiner, 2009).

To address practitioner relevance in this study, the framework proposed by Thomas and Tymon (1982) was adopted. Thomas and Tymon argue that conventional standards of methodological and scientific rigor, while essential for establishing research credibility, are insufficient as sole guidance mechanisms. They propose that such standards must be supplemented with explicit

criteria that address the practical utility of research. As a result, the authors identify five key elements—descriptive relevance, goal relevance, operational validity, non-obviousness, and timeliness—that align with the needs of practitioners and act as benchmarks for evaluating the pertinence of research within the field of organizational sciences. These elements were utilized in the context of this study in the following manner:

Descriptive Relevance

Descriptive relevance refers to the extent to which research findings accurately capture phenomena encountered by practitioners in their organisational settings. In this study, the research effectively captured key phenomena associated with female engineers' career progression barriers and explored how various forms of empowerment mitigate the impact of these barriers.

Goal Relevance

Goal relevance concerns the alignment of outcome variables in a theory with the objectives practitioners aim to influence. As stated in Chapter One, the overarching goal of female engineers is to achieve career progression to institutionally competitive and nationally significant levels. The study established that career barriers exert a negative influence on female engineers' career advancement. Importantly, it demonstrated the effectiveness of empowerment in mitigating these barriers and promoting career progression.

Operational Validity

Operational validity reflects the extent to which practitioners can implement the practical implications of a theory by manipulating its causal (or independent) variables. This research achieved operational validity by providing actionable and feasible recommendations to key stakeholders, including female engineers, manufacturing companies, and the Malaysian government. These recommendations outline strategies to manipulate causal variables, ensuring the implementation of effective empowerment measures to improve career progression outcomes for female engineers.

Non-Obviousness

Non-obviousness pertains to the degree to which a theory exceeds the complexity of common-sense explanations already employed by practitioners. This study provided novel insights and advanced knowledge, as elaborated in Chapter Six. For instance, it delineated the distinctions between career barriers, career progression, and various forms of empowerment. Furthermore, it identified empowerment as the most significant factor influencing the career advancement of

female engineers in Malaysia. Notably, the study revealed *spiritual empowerment* as a non-obvious and previously underexplored empowerment factor.

Timeliness

Timeliness refers to the availability of research findings in a timeframe that enables practitioners to address pressing challenges. To ensure timeliness, this study employed a cross-sectional research design rather than a longitudinal approach. Given the dynamic nature of the manufacturing sector, the study was conducted over a three-year period to produce findings and recommendations that remain immediately relevant for addressing the career advancement challenges faced by female engineers.

4.9 Chapter Summary

This chapter has established the philosophical and methodological foundations of the thesis by outlining the approaches employed to collect data for addressing the research questions. The chapter began with a restatement of the research aim and objectives, providing a contextual framework for the research design and methodological choices. A philosophical discussion on research methodology followed, leading to an adoption of a mixed-method approach for this study. The data collection techniques deemed suitable for the research were carefully selected, described, and justified. Additionally, the chapter addressed measures taken to mitigate research bias, uphold research ethics, and ensure practitioner relevance throughout the study. The subsequent chapter will present the research findings and their analysis.

CHAPTER FIVE

FINDINGS AND ANALYSIS

5.1 Introduction

This chapter presents the findings of the research and the data analysis. This chapter is divided into three main sections: quantitative findings, qualitative findings, and triangulation of quantitative and qualitative findings. Regarding the quantitative approach, the data have been analyzed to address the research questions and hypotheses. The results are presented in the following ways. First, the demographic characteristics of the respondents have been presented and interpreted. Secondly, the results of the reliability and validity tests have been presented and interpreted. Next, tests of normality and common method bias have been performed and reported. The fourth subsection captures the descriptive statistical results for the study variables. This is followed by the correlation matrix. Finally, the researcher deployed hierarchical regression analysis to test the hypotheses that explain the research model or conceptual framework. In terms of the qualitative findings, the data has been analysed using thematic analysis techniques supported by NVivo software. The results have been presented in the order of research objectives.

5.2 Quantitative Findings

5.2.1 Demographic Characteristics of Respondents

The demographic characteristics results cover gender, age groups of the respondents, marital status, highest level of education, and duration of working as an engineer or work experience. For this research report, the demographic characteristics results are summarized in Table 5.1 below.

The results confirm that 120 middle – level female engineers participated in the survey. This reflects the sample. Regarding age, 20 percent of the respondents were between 20 and 30 years, 30 percent fell between 31 and 40 years, 15 percent were between the ages of 50-59 years, and 35 percent were between 51 and 60 years. This signifies that the majority of the respondents are aged 51-60 years, approaching their retirement. It suggests further that this majority group would have more exposure to provide rich information on the phenomenon. Next, 20 percent of the respondents were single while 70 percent were married with 6 percent separated and divorced respectively. Again, 25 percent of the respondents held undergraduate degrees, and 75 percent held postgraduate degrees. Finally, the majority of the respondents (55

percent) had 10 years and above working experience, 25 percent had working experience between 5 and 9 years, and 20 percent had working experience between 1 and 4 years. This indicates that engineers with 10 years above experience fall within the sample frame and they were also available during the survey.

Table 5.1 Demographic Characteristics of Respondents

Characteristics	Frequency (120)	Percent
Gender		
Male	-	-
Female	120	100
Age		
20-30	24	20
31-40	36	30
41-50	18	15
51-60	42	35
Marital status		
Single	24	20
Married	84	70
Separated	6	5
Divorced	6	5
Educational level		
Undergraduate degree	30	25
Postgraduate degree	90	75
Duration of working		
1-4 years	24	20
5-9 years	30	25
Above 10 years	66	55

Author's computation (2024)

5.2.2 Missing Data Analysis

There are various ways of treating missing data such as the replace series mean, replace series median or mode, listwise and pairwise deletions, and the Expectation Maximisation algorithm (Brown, 2006). Listwise and pairwise deletions are the most common methods to address missing data as indicated by Peugh and Enders (2004). Listwise deletion is an approach to handling missing data. In this method, the entire data set was excluded from analysis if any single value was missing. The Listwise deletion affects the statistical power of the tests conducted as well as how problematic it is when the reason for missing data may not be random (Roth, 1994; Allison, 2001; Olinsky*et al.,* 2003). Pairwise deletion is a method that examines the variance-covariance matrix. In concept, pairwise deletion seems like it would be good

because it makes use of all available data but cannot compare analyses because the sample is different each time. Mean substitution is a statistical strategy wherein the mean of a variable, calculated from all available cases with valid data, is used to replace any missing values for that variable. However, this approach is widely regarded as the least effective among all possible strategies. Replacing missing values with the mean artificially reduces the variance of the variable and disrupts covariance and correlation estimates, thereby compromising the integrity of the data analysis (Graham, 2009). The missing data calculated were less than 5% (Brown, 2006), so this study used the Expectations Maximization (EM) algorithm for imputing missing values, and the pooled data were used for the analysis.

5.2.3 Reliability Analysis

Cronbach's alpha reliability was used to examine how reliable the instrument used for the study was. Checking the reliability of the instrument adopted aids and provides statistical confidence for the researcher to employ the instrument in answering and testing the formulated hypotheses. Cronbach's alpha was used to measure the internal consistency of the scales. It is expressed as a number between 0 and 1. Internal consistency describes the extent to which all the items in an instrument measure the same concept or construct. Cronbach's alpha of the individual items obtained should exceed the threshold of 0.70 (Field, 2015), for the instrument to be reliable for a study of this nature. Table 5.2 shows the results of the reliability analysis of the scales of the instrument. It can be observed that all the scales recorded Cronbach's alpha coefficients above the 0.70 prescribed threshold, illustrating that the instrument was strongly reliable for this study.

Table 5.2 Reliability Analysis Results

Scales	Cronbach's alpha
Gender stereotyping	0.72
Work life balance	0.70
Technical skills limitations	0.90
Negative perception	0.88
Misogynistic management	0.76
Structural empowerment	0.70
Psychological empowerment	0.81
Self-efficacy empowerment	0.73
Career progression	0.70

Author's computation (2024)

5.2.4 Test of Normality and Multicollinearity

It is important to conduct a normality test of the data to confirm whether the data is parametric or non-parametric. This is particularly essential as the researcher aimed to test a regression model. Thus, the type of statistical procedure to adopt depends on the outcome of the normality test. Statistical analyses including correlation, regression, t-tests, analysis of variance, and structural equation modeling which are named parametric tests, are built on the assumption that the data follows a normal distribution assuming that the populations from which the samples are taken are normally distributed (Field, 2015). Applying the rule of thumb by Tabachnick *et al.* (2001), the researcher used skewness and kurtosis to assess the normality of the data. According to Tabachnick *et al*. (2001), if the skewness and kurtosis fall within +1 and –1 then the data is normally distributed or parametric. This approach has been widely applied in social science studies (e.g., Puni *et al.,* 2021, Hilton *et al.,* 2023, Martins, 2023, etc.). This procedure is more appropriate because it has no limitation regardless of the sample size like other procedures such as Kolmogorov-Smirnov which applies to a sample size of less than 500 (Field, 2009; Hair *et al.,* 2010). Tabachnick *et al*.'s (2001) criteria also provide better power than the Lilliefors normality (Steinskog *et al.,* 2007). Given that the skewness and kurtosis for all the variables are between +1 and –1 (Table 5.8), it can be concluded that the data is normally distributed or parametric, hence a regression analysis can be carried out.

Given the data is normally distributed and the need for regression analysis, the researcher carried out a multicollinearity test to confirm if the group of independent variables was not highly correlated. Using Kennedy's (2008) rule of thumb on multicollinearity which says that the correlations among the independent variables should not be more than 0.70, it can be observed from Table 5.5 that there is no case of multicollinearity.

5.2.5 Common Method Bias

Common method bias (CMB) occurs when a measurement fails to measure the constructs it was meant to measure, thereby, creating an error in internal consistency (Podsakoff *et al.,* 2003). This research is a cross-sectional study, where data was collected from the same respondents at the same time or using the same technique for predictor and outcome variable (Heppner *et al.,* 2008), hence, to measure the bias, Harman's single factor was conducted to determine the extent of CMB in the data. If Harman's single factor explains more than 50% of the total variance, there is CMB in the data (Podsakoff *et al.,* 2003).

From Table 5.3 below, the single factor (total variance) extracted is 10.013 and it explains 19.3% of the total variance in the data. Given that the percentage of variance explained (19.3%) is less than 50%, CMB is not dominant in the data. It means that there is no variance or bias in the data coming from the cross-sectional survey. So, the data used is bias-free.

Table 5.3 Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	10.013	19.256	19.256	10.013	19.256	19.256
2	7.956	15.300	34.556			
3	5.939	11.420	45.977			
4	5.142	9.889	55.865			
5	4.575	8.798	64.663			
6	2.960	5.692	70.356			
7	2.626	5.049	75.405			
8	2.029	3.902	79.307			
9	1.850	3.557	82.864			
10	1.659	3.190	86.054			
11	1.340	2.578	88.632			
12	1.188	2.284	90.916			
13	1.009	1.941	92.857			
14	.980	1.885	94.742			
15	.681	1.310	96.053			
16	.654	1.258	97.311			
17	.504	.970	98.281			
18	.423	.814	99.095			
19	.272	.523	99.618			
20	.199	.382	100.000			
21	5.857	1.126	100.000			
22	4.464	8.585	100.000			
23	4.152	7.984	100.000			
24	3.671	7.059	100.000			
25	2.828	5.439	100.000			
26	2.679	5.151	100.000			
27	2.402	4.620	100.000			
28	2.015	3.875	100.000			
29	1.707	3.284	100.000			
30	1.443	2.774	100.000			
31	1.125	2.163	100.000			
32	8.808	1.694	100.000			

33	2.813	5.410	100.000			
34	2.118	4.074	100.000			
35	9.547	1.836	100.000			
36	5.296	1.019	100.000			
37	-4.549	-8.747	100.000			
38	-1.071	-2.060	100.000			
39	-1.983	-3.814	100.000			
40	-2.076	-3.991	100.000			
41	-3.544	-6.816	100.000			
42	-4.766	-9.165	100.000			
43	-6.535	-1.257	100.000			
44	-9.556	-1.838	100.000			
45	-1.133	-2.178	100.000			
46	-1.275	-2.451	100.000			
47	-1.518	-2.919	100.000			
48	-2.112	-4.061	100.000			
49	-2.537	-4.879	100.000			
50	-3.308	-6.362	100.000			
51	-3.594	-6.911	100.000			
52	-4.708	-9.054	100.000			

Extraction Method: Principal Component Analysis.
Author's computation (2024)

5.2.6 Exploratory Factor Analysis

Factor analysis is conducted with the understanding that measurable and observable variables can be reduced to fewer latent variables that share common variances and are unobservable, which is known as reducing dimensionality (Bartholomew *et al.,* 2011). Factor analysis is broadly divided into exploratory and confirmatory factor analysis. In this, the researcher conducted exploratory factor analysis (EFA).

DeCoster (1998) posits that EFA is applied when a researcher wants to find the number of factors influencing variables or the structure of a factor and to analyse which variables could be grouped. A basic hypothesis of EFA is that there are *m* common 'latent' factors to be discovered in the dataset, and the goal is to find the smallest number of common factors that will account for the correlations (Tabachnick and Fidell, 2012). The EFA employed the principal components analysis extraction approach with the varimax rotation method due to the adapted nature of the research instruments and also to examine the underlying factor structure of the study constructs. Since the researcher intended to examine the factor loadings of the

items measuring a single variable, varimax rotation is suitable. Varimax is an orthogonal rotation method, which means it maximizes the variance of the squared loadings for each factor, making the factor loadings more distinct and easier to interpret. Varimax also provides a clearer picture of how each item relates to the underlying factor. Since the items were measuring a single variable, the factors were likely to be highly correlated, and varimax helped to simplify the interpretation of the factor loadings. Thus, varimax helped to better understand how each item contributed to the single variable and aided in combining them into a composite variable.

The researcher followed the steps suggested by DeCoster (1998) when performing EFA. These procedure steps were provided as follows: collect measurements, obtain the correlation matrix, select the number of factors for inclusion, extract the initial set of factors, rotate factors to a final solution, interpret factor structure, and construct factor scores for further analysis. The factor scores were computed for each of the constructs utilising the Anderson-Rubin factor score method because it calculates standardized components (mean = 0, SD = 1) that are orthogonal to each other (uncorrelated). This makes it more appropriate to compute [sum] them together as a single construct or a composite variable to use in the regression model (DiStefano *et al.,* 2009). The standardization and orthogonalization helped to reduce the impact of scale differences between the original variables, made the components more comparable and easier to interpret, and improved the stability of the regression model. The factor scores, as computed into single constructs or composite variables, were utilized in the subsequent regression analysis.

Table 5.4 presents the factor loading matrix. It shows the factor loadings of each variable on each component. It also shows the strength and direction of the relationship between each variable and factor. It can be observed that variables are most important for each component.
It helps to interpret the components and understand which ones are loaded together to form a component. It also helps to understand the underlying structure of the data and to select the most representative variables for each factor. The factor scores were computed for each of the constructs utilising the Anderson-Rubin method because it calculates standardized components (mean = 0, SD = 1) that are orthogonal to each other (uncorrelated). This made it more appropriate to compute [sum] them together as a single construct or a composite variable to use in the regression model (DiStefano *et al.,* 2009). The standardization and orthogonalization helped to reduce the impact of scale differences between the original variables, made the

components more comparable and easier to interpret, and improved the stability of the regression model.

For gender stereotyping, 3 components were extracted. The determinant of the correlation matrix was 0.063, which was greater than 0.01. It meant that there was no presence of multicollinearity between the variables or terms measuring gender stereotyping. It also implied that there was no case of singularity, meaning none of the variables was perfectly correlated with another or there was no linear combination of variables. It suggested that the variables or items were relatively linearly independent, making factor analysis more suitable. Lastly, it indicates that scale differences were reduced by standardizing the variables or items.

Regarding work-life balance, 2 components were extracted, and the determinant of the correlation matrix was 0.612. This determinant is far from 0, meaning that there was no presence of multicollinearity between the variables or terms measuring work-life balance. It also indicates that there was no case of singularity, meaning none of the items was perfectly correlated with another or there was no linear combination of items. It suggests that the items or variables were relatively linearly independent, making factor analysis more suitable. Finally, it shows that scale differences were reduced by standardizing the items or factors.

In terms of technical skills limitation, 1 component was extracted, and the determinant of the correlation matrix was 0.195. This determinant was greater than 0.01, illustrating that there was no presence of multicollinearity between the variables or terms measuring technical skills limitation. It also indicated that there was no case of singularity, meaning neither of the items or components was perfectly correlated with another or there was no linear combination of items. It suggests that the items or variables were relatively linearly independent, making factor analysis more suitable. As a final point, it shows that scale differences were reduced by standardizing the items.

For negative perception, 1 component was extracted, and the determinant of the correlation matrix was 0.350. This determinant was far from 0, showing that there was no presence of multicollinearity in the variables or terms measuring negative perception. It also indicates that there was no case of singularity, meaning neither of the items or variables was perfectly correlated with another or there was no linear combination of items. It suggests that the items

or variables were relatively linearly independent, making factor analysis more suitable. As a final point, it shows that scale differences were reduced by standardizing the items.

Regarding misogynistic management, 3 components were extracted, and the determinant of the correlation matrix was 0.276. This determinant is far from 0, demonstrating that there was no presence of multicollinearity between the variables or terms measuring misogynistic management. It also indicates that there was no singularity, meaning none of the items or components was perfectly correlated with another or there was no linear combination of items. It suggests that the items or variables were relatively linearly independent, making factor analysis more suitable. Lastly, it shows that scale differences were reduced by standardizing the items or components.

Furthermore, 1 component was extracted for structural empowerment, with the determinant of the correlation matrix being 0.655. This determinant was far from 0, showing that there was no case of multicollinearity between the variables or terms measuring structural empowerment. It also shows that there was no singularity, meaning neither of the items or components was perfectly correlated with another or there was no linear combination of items. It implies that the items or variables were relatively linearly independent, making factor analysis more suitable. Finally, it proves that scale differences were reduced by standardizing the items or components.

Next, 2 components were extracted for psychological empowerment, and the determinant of the correlation matrix was 0.576. This determinant was far from 0, illustrating that there was no multicollinearity between the variables or terms measuring psychological empowerment. It also depicted that there was no case of singularity as none of the items or components was perfectly correlated with another or no linear combination of items. It further shows that the items or components were relatively linearly independent, making factor analysis more suitable. As a final point, it demonstrated that scale differences were reduced by standardizing the items or components.

Again, 2 components were extracted for self-efficacy empowerment, and the determinant of the correlation matrix was 0.125. This determinant was greater than 0.01, indicating that there was no presence of multicollinearity between the variables or terms measuring self-efficacy empowerment. It also implied that there was no case of singularity as none of the items or

variables was perfectly correlated with another or no linear combination of items. It further shows that the items or variables were relatively linearly independent, making factor analysis more suitable. As a final point, it suggests that scale differences were reduced by standardizing the items or components.

Finally, 2 components were extracted for career progression, and the determinant of the correlation matrix was 0.318. This determinant is greater than 0.01, meaning that there is no presence of multicollinearity between the variables or terms measuring career progression. It also means that there was no case of singularity as none of the items or variables was perfectly correlated with another or no linear combination of items. It further shows that the items or variables were relatively linearly independent, making factor analysis more suitable. As a final point, it suggests that scale differences are reduced by standardizing the items or components.

Table 5.4 Factor Loading Matrix

Factors	**Components**			**Determinant of correlation matrix**
	1	**2**	**3**	
GS 1	.596	.559	-.280	
GS 2	.783	.251	-.425	
GS 3	.892	-.001	-.015	
GS 4	.277	.383	.592	
GS 5	-.591	.709	-.185	
GS 6	-.502	.559	.173	
GS 7	.551	.119	.593	
GS: 3 components extracted				**.063**
WLB 1	-.608	.036		
WLB 2	.820	.103		
WLB 3	.830	-.223		
WLB 4	.125	.981		
WLB: 2 components extracted				**.612**
TSL 1	.884			
TSL 3	.939			
TSL 4	.832			
TSL: 1 component extracted				**.195**
NP 1	-.471			
NP 5	.926			
NP 6	.911			
NP: 1 component extracted				**.350**
MM 1	.836	-.324	.051	
MM 2	.035	-.073	.946	

MM 3	.792	.171	.044	
MM 4	-.308	.790	.352	
MM 5	.460	.704	-.304	
MM 6	.733	.078	.188	
MM: 3 components extracted				**.276**
SE 4	.891			
SE 5	.891			
SE: 1 component extracted				**.655**
PE 1	-.674	.262		
PE 2	.774	-.042		
PE 3	.003	.792		
PE 4	.809	.030		
PE 5	.256	.712		
PE: 2 components extracted				**.576**
SEE 1	.848	.032		
SEE 2	.895	.316		
SEE 3	.844	.148		
SEE 4	-.166	.873		
SEE 5	.562	-.518		
SEE: 2 components extracted				**.125**
CP 1	.898	-.050		
CP 5	.752	.284		
CP 6	.192	.919		
CP 8	.793	-.372		
CP: 2 components extracted				**.318**

Extraction Method: Principal Component Analysis.

Table 5.5 shows the Kaiser-Meyer-Olkin (KMO), which measures the sampling adequacy (Kaiser 1970), and Bartlett's Test of Sphericity. Kaiser-Meyer-Olkin (KMO) ranges from 0 to 1 and represents the proportion of variance in the data that is suitable for factor analysis, while Bartlett's Test of Sphericity uses chi-square which is interpreted based on the significant level. Netemeyer *et al.* (2003) posits that a Kaiser-Meyer-Olkin (KMO) above 0.60 to 0.70 is adequate for analyzing factor analysis results. However, renowned research methods scholars such as Tabachnick and Fidell (2007) recommend that a Kaiser-Meyer-Olkin (KMO)above 0.50 is suitable for factor analysis. It is also necessary that the chi-square output must be significant. It should be significantly less or equal to ($p < 0.5$), because it shows the matrix is not an identity matrix (Tabachnick and Fidell, 2007).

Table 5.5 shows the outcome of factor analyses of nine (9) constructs of the study. It can be observed that all the Kaiser-Meyer-Olkin (KMOs) were above 0.50 and the chi-squares were significant. It means that the sampling was adequate and applicable for factor analysis (Hair *et al.,* 1998). It further indicates that the data had a strong structure, and the factor analysis (principal component analysis) effectively reduced the dimensionality while retaining valuable information. Therefore, the nine (9) constructs were suitable for the factor analysis to be conducted.

Table 5.5 Kaiser-Meyer-Olkin and Bartlett's Test

Gender Stereotyping	KMO measure of sampling adequacy.		.522
	Bartlett's Test of Sphericity	Approx. Chi-Square	320.961
		df	21
		Sig.	.000
Work-life Balance	KMO measure of sampling adequacy.		.547
	Bartlett's Test of Sphericity	Approx. Chi-Square	57.408
		df	6
		Sig.	.000
Technical Skills Limitation	KMO measure of sampling adequacy.		.660
	Bartlett's Test of Sphericity	Approx. Chi-Square	191.580
		df	3
		Sig.	.000
Negative Perception	KMO measure of sampling adequacy.		.537
	Bartlett's Test of Sphericity	Approx. Chi-Square	123.146
		df	3
		Sig.	.000
Misogynistic Management	KMO measure of sampling adequacy.		.539
	Bartlett's Test of Sphericity	Approx. Chi-Square	149.504
		df	15
		Sig.	.000
Structural Empowerment	KMO measure of sampling adequacy.		.500
	Bartlett's Test of Sphericity	Approx. Chi-Square	49.765
		df	1
		Sig.	.000
Psychological Empowerment	KMO measure of sampling adequacy.		.525
	Bartlett's Test of Sphericity	Approx. Chi-Square	64.339
		df	10
		Sig.	.000

Self-efficacy Empowerment	KMO measure of sampling adequacy.		.607
	Bartlett's Test of Sphericity	Approx. Chi-Square	242.011
		Df	10
		Sig.	.000
Career Progression	KMO measure of sampling adequacy.		.571
	Bartlett's Test of Sphericity	Approx. Chi-Square	133.599
		Df	10
		Sig.	.000

Author's computation, 2024

Table 5.6 Communalities

Factors	Initial	Extraction
Gender Stereotyping 1	1.000	.745
Gender Stereotyping 2	1.000	.856
Gender Stereotyping 3	1.000	.796
Gender Stereotyping 4	1.000	.574
Gender Stereotyping 5	1.000	.886
Gender Stereotyping 6	1.000	.594
Gender Stereotyping 7	1.000	.669
Work Life Balance 1	1.000	.370
Work Life Balance 2	1.000	.682
Work Life Balance 3	1.000	.739
Work Life Balance 4	1.000	.978
Technical Skills Limitations 1	1.000	.782
Technical Skills Limitations 3	1.000	.882
Technical Skills Limitations 4	1.000	.693
Negative Perception 1	1.000	.222
Negative Perception 5	1.000	.858
Negative Perception 6	1.000	.830
Misogynistic Management 1	1.000	.807
Misogynistic Management 2	1.000	.902
Misogynistic Management 3	1.000	.659
Misogynistic Management 4	1.000	.843
Misogynistic Management 5	1.000	.800
Misogynistic Management 6	1.000	.579
Structural Empowerment 4	1.000	.794
Structural Empowerment 5	1.000	.794
Psychological Empowerment 1	1.000	.523
Psychological Empowerment 2	1.000	.602
Psychological Empowerment 3	1.000	.627
Psychological Empowerment 4	1.000	.656

Psychological Empowerment 5	1.000	.572
Self-efficacy Empowerment 1	1.000	.720
Self-efficacy Empowerment 2	1.000	.901
Self-efficacy Empowerment 3	1.000	.735
Self-efficacy Empowerment 4	1.000	.789
Self-efficacy Empowerment 5	1.000	.584
Career Progression 1	1.000	.809
Career Progression 3	1.000	.115
Career Progression 5	1.000	.646
Career Progression 6	1.000	.881
Career Progression 8	1.000	.767

Extraction Method: Principal Component Analysis.

Table 5.6 above presents the communalities result of the EFA. Earlier studies have indicated that item communalities of 0.8 or greater are considered high (Hair *et al.,* 2010). Nevertheless, communalities that range between 0.40 and 0.70 are regarded as moderate communalities that are applicable (Hair *et al.,* 2010). If the studied items are less than this threshold of 0.3 then it is considered dropped. Out of the 52 initial items that were used for the CMB, the researcher identified 12 items to be highly correlated, violating the multicollinearity rule, and excluded them from the subsequent analysis. This was done by using the determinants, KMO, and communalities rules. By excluding those items, the determinants were greater than 0.1 as expected (See Table 5.5). Thus, the communalities of 40 items of the 9 variables have been utilized in this research. All the 40 items after rotation prove usable because they have all met the cut-off point of 0.3 above. Noticeably, each variable consists of items included or used in this research. Hence, the application of communalities was used for further analysis.

Table 5.7 below shows the total variance explained by 9 factors extracted using 40 items. They were sub-factors that were grouped into the 9 main variables. All eight variables were multidimensional factors. A multidimensional factor was calculated by adding the sub-factors into a single variable. For example, original factors GS1 to GS3 as presented in the table were merged into a single factor. A total of 73.15% variance was explained by factor one (gender stereotyping), factor two (work-life balance = 69.25%), factor three (technical skills limitation = 78.56%), factor four (negative perception = 63.67%), factor five (misogynistic management = 76.48%), factor six (structural empowerment = 79.38%), factor seven (psychological empowerment = 59.61%), factor eight (self-efficacy = 74.58), and factor nine (career progression = 64.37). The results indicate that the factors or dimensions extracted explain more

than 60% of the variance in their respective variables or components. The factors were statistically sound to be used for further analysis. The factor scores were computed for each of the constructs utilising the Anderson-Rubin method because it calculates standardized components (mean = 0, SD = 1) that are orthogonal to each other (uncorrelated). This makes it more appropriate to compute [sum] them together as a single construct or a composite variable to use in the regression model (DiStefano *et al.,* 2009). The standardization and orthogonalization helped to reduce the impact of scale differences between the original variables, made the components more comparable and easier to interpret, and improved the stability of the regression model.

Table 5.7 Total Variance Explained

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
GS1	2.745	39.207	39.207	2.745	39.207	39.207
GS2	1.351	19.297	58.504	1.351	19.297	58.504
GS3	1.025	14.646	73.151	1.025	14.646	**73.151**
GS4	.864	12.340	85.491			
GS5	.650	9.290	94.781			
GS6	.246	3.518	98.299			
GS7	.119	1.701	100.000			
WLB1	1.746	43.644	43.644	1.746	43.644	43.644
WLB2	1.024	25.605	69.249	1.024	25.605	**69.249**
WLB3	.805	20.124	89.374			
WLB4	.425	10.626	100.000			
TSL1	2.357	78.563	78.563	2.357	78.563	**78.563**
TSL3	.465	15.513	94.076			
TSL4	.178	5.924	100.000			
NP1	1.910	63.670	63.670	1.910	63.670	**63.670**
NP5	.883	29.417	93.087			
NP6	.207	6.913	100.000			
MM1	2.173	36.212	36.212	2.173	36.212	36.212
MM2	1.265	21.079	57.292	1.265	21.079	57.292
MM3	1.151	19.188	76.480	1.151	19.188	**76.480**
MM4	.674	11.232	87.712			
MM5	.449	7.478	95.189			
MM6	.289	4.811	100.000			
SE4	1.588	79.380	79.380	1.588	79.380	**79.380**
SE5	.412	20.620	100.000			
PE1	1.775	35.498	35.498	1.775	35.498	35.498

PE2	1.205	24.107	59.605	1.205	24.107	**59.605**
PE3	.900	17.990	77.595			
PE4	.681	13.619	91.215			
PE5	.439	8.785	100.000			
SEE1	2.576	51.521	51.521	2.576	51.521	51.521
SEE2	1.153	23.054	74.575	1.153	23.054	**74.575**
SEE3	.734	14.673	89.248			
SEE4	.390	7.805	97.053			
SEE5	.147	2.947	100.000			
CP1	2.123	42.452	42.452	2.123	42.452	42.452
CP3	1.096	21.920	64.372	1.096	21.920	**64.372**
CP5	.964	19.275	83.647			
CP6	.568	11.367	95.014			
CP8	.249	4.986	100.000			

Extraction Method: Principal Component Analysis.

5.2.7 Descriptive Statistics for the Study Constructs

It is essential to provide a comprehensive overview of the data obtained, even if the primary insights are derived from inferential statistics. In this research, descriptive statistics were utilized as they effectively summarize the data by examining the original scores, detailing the size of the sample, and outlining the attributes of the participants. According to Garson (2012), employing descriptive statistics is beneficial as it enhances the researcher's confidence in understanding the distribution of the raw data through the calculation of mean values and standard deviations. Similarly, Lind et al. (2008) recommend that researchers explore various descriptive statistical methods to elucidate the data further, which may include frequency distributions, cumulative frequency distributions, frequency polygons, histograms, and diverse chart types such as bar and pie charts, as well as scatter diagrams and box plots. In this investigation, the researcher specifically used the mean and standard deviation to trace the data's trajectory. Furthermore, descriptive statistical analysis was used to quantitatively answer research questions 1 and 2. Table 5.8 shows the summary of the descriptive statistics for the computed constructs, following the factor analysis and based on the factor loading matrix reported earlier (see Table 5.4). Detailed results and interpretations are presented under each specific objective, particularly objectives 1 and 2.

Table 5.8 Descriptive statistics for study variables

Variables	Obs	Min	Max	Mean	SD	Skewness	Kurtosis
Gender stereotyping	120	2.40	3.40	3.05	0.31	-0.26	-0.80
Work life balance	120	2.50	4.50	2.88	0.61	0.83	0.32
Technical skills limitations	120	1.20	2.00	1.91	0.24	-0.56	0.84
Negative Perception	120	2.00	4.00	3.10	0.58	-0.02	-0.43
Misogynistic management	120	2.50	4.00	3.39	0.48	-0.22	-0.33
Structural empowerment	120	2.00	3.50	2.20	0.40	0.11	0.67
Psychological empowerment	120	2.00	2.75	2.20	0.23	0.79	-0.55
Self-efficacy empowerment	120	3.00	4.25	3.91	0.26	-0.05	0.81
Career progression	120	2.17	2.83	2.28	0.20	0.98	0.68

Author's computation (2024)

5.2.8 Career Barriers Confronting Middle-level Female Engineers (Objective 1)

The first objective of the study looked at the career barriers confronting middle-level female engineers in the Malaysian manufacturing sector. Middle level female engineers in industry were surveyed and they were expected to indicate the extent to which they agreed or disagreed with statements that sought to measure the career barriers they might be facing. The statements or items were designed with a suggested response scale from (1) strongly disagree, (2) disagree, (3) somewhat agree, (4) agree to (5) strongly agree. Five indicators of career barriers (gender stereotyping, work-life balance, technical skills limitation, negative perception, and misogynistic management) were identified in the literature and were investigated. The results of the descriptive statistical analysis are shown in Table 5.9. The interpretation is limited to the overall construct or main variables for simplicity purposes.

Table 5.9 Descriptive Statistics (Objective 1)

Items/Variables	N	Min	Max	Mean	SD	Skew
Female engineers' voices are not heard from the top-level management	120	3	4	3.60	.492	-.413
Female engineers lack equal opportunity at workplaces.	120	2	4	3.40	.586	-.368
Female engineers are mostly not allowed to take major tasks.	120	2	4	3.30	.643	-.370
The manufacturing industry is just not meant for women.	120	1	2	1.97	.157	-6.162
Female engineers have high family commitment (eg. Child Care) and therefore cannot work effectively	120	1	3	2.30	.559	-.035
Female engineers are weaker and make slow progress.	120	1	2	1.95	.219	-4.182
Female engineers receive lower salary compared to male workers.	120	2	3	2.95	.219	-4.182
Gender Stereotyping	**120**	**2.40**	**3.40**	**3.05**	**.310**	**-.263**
As an engineer, I enjoy flexible working hours.	120	2	3	2.20	.402	1.519
My organization pays for maternity leave.	120	3	5	3.35	.729	1.727
My organization is lenient on family issues.	120	2	4	2.40	.666	1.416
I have the opportunity to return to the same job after maternity or paternity leave.	120	1	3	2.55	.592	-.938
Work-life Balance	**120**	**2.50**	**4.50**	**2.88**	**.612**	**.832**
Women generally lack technical knowledge and skills.	120	1	2	1.85	.359	-1.985
Female engineers cannot easily understand and apply technical skills.	120	1	2	1.90	.301	-2.701
It is easier to train male engineers than female engineers.	120	1	2	1.90	.301	-2.701
It is much difficult for women to practice engineering skills efficiently than men.	120	1	2	1.95	.219	-4.182
Women cannot focus on key technical processes as they are pre-occupied with other issues.	120	1	2	1.95	.219	-4.182
Technical Skills Limitation	**120**	**1.20**	**2.00**	**1.91**	**.241**	**-.561**
Higher hierarchal positions are meant for men only.	120	1	3	2.05	.386	.496
Women are physically weaker to compete with men in the engineering sector.	120	1	4	2.05	.500	2.572
The social image of engineers and the culture of engineering is masculine.	120	2	4	3.15	.657	-.166

Peculiar female challenges and family responsibilities limit female engineers from excelling at work.	120	2	5	2.85	.729	1.033
Women are too emotional to lead effectively.	120	2	4	3.20	.603	-.113
There are events and conditions in my organization that make career progress difficult for women.	120	2	4	3.00	.635	.000
Negative Perception	**120**	**2.00**	**4.00**	**3.10**	**.585**	**-.015**
Within my organization, there are biases about women's capabilities which frustrate their career advancement.	120	3	4	3.40	.492	.413
Female engineers can explore and demonstrate their potential through mentorship support in my organization.	120	2	3	2.10	.301	2.701
There are inadequate support systems for women to move upwards in the engineering field.	120	2	4	3.45	.592	-.545
My organization provides well designed and scientifically validated tests to all candidates when recruiting.	120	2	4	2.25	.538	2.094
In my organization, there are policies not favorable to female engineers to attain career progression.	120	2	5	3.50	.870	-.702
The recruitment policies in my organization favour men more than women.	120	2	5	3.20	.751	.377
Misogynistic Management	**120**	**2.50**	**4.00**	**3.39**	**.485**	**-.223**
Valid N (listwise) 120						

Author's computation (2024)

To begin with, the analysis of gender stereotyping reveals a mean of 3.05, a standard deviation of 0.31, a skewness of -0.26, and a kurtosis of -0.80. This mean indicates that respondents perceived the occurrence of gender stereotyping within engineering firms in Malaysia's manufacturing industry. In essence, gender stereotyping appears to be widespread in this sector. The standard deviation of 0.31 illustrates the degree of variability in responses, while the negative skewness value of -0.26 indicates a slight left skew in the data distribution.

Moreover, regarding the evaluation of work-life balance, the average score was 2.88, with a standard deviation of 0.61, skewness at 0.83, and kurtosis of 0.32. The positive skewness suggests a significant skew towards higher values, and the standard deviation indicates less variability in responses. The mean score suggests that most respondents felt their work-life

balance was average, implying that it is not a major barrier to career advancement in Malaysia's manufacturing industry.

Additionally, when questioned about the limitations in technical skills that mid-level female engineers encounter, the analysis yielded a mean of 1.91, a standard deviation of 0.24, a skewness of -0.56, and a kurtosis of 0.84. This mean score indicates that respondents largely disagreed with the notion of facing technical skill limitations as female engineers, suggesting that such limitations are not a prevalent barrier in the manufacturing sector. The standard deviation reflects limited variability in responses, while the skewness indicates a relatively symmetrical distribution, albeit with a slight left skew.

In the assessment of negative perceptions, a mean of 3.10, a standard deviation of 0.58, a skewness of -0.02, and a kurtosis of -0.43 were recorded. The low skewness value implies that the data is fairly balanced. The standard deviation reflects a close clustering of responses around the mean, suggesting minimal variation. The average mean indicates that respondents generally agreed that negative perceptions hinder career advancement within the manufacturing industry in Malaysia, highlighting widespread beliefs that female engineers are viewed as lacking the qualifications for advancement to top management roles.

Lastly, the analysis of misogynistic management yielded a mean of 3.39, a standard deviation of 0.48, a skewness of -0.22, and a kurtosis of -0.33. The negative skewness indicates a slight leftward slant in the data distribution, while the standard deviation suggests a close clustering of values around the mean, indicating little variation in responses. On average, respondents suggested that their superiors exhibit a misogynistic leadership style, indicating that this management approach is common in Malaysian manufacturing companies and poses a significant barrier to the career growth of middle-level female engineers in the industry.

5.2.9 Empowerment Factors in Breaking Career Barriers (Objective 2)

With this second objective of the study, the researcher discovered the factors of empowerment that can break the career barriers of middle-level female engineers in Malaysia. Using the data collection and analysis procedures as in the case of the first objective, the respondents were asked to indicate the extent to which their institutions empower female engineers. Three empowerment factors were assessed including structural, psychological, and self-efficacy. The

result is displayed in Table 5.10 below. The interpretation is limited to main constructs or variables for simplicity purposes and to avoid being mechanical.

Table 5.10 Descriptive Statistics (Objective 2)

Items/Variables	Obs	Min	Max	Mean	SD	Skew
Female engineers work in a very supportive work environment.	120	2	3	2.20	.402	1.519
The compensation package attached to female engineers' job is satisfactory.	120	2	3	2.35	.479	.637
At your workplace, female engineers have the required technical knowledge and expertise vital to be effective.	120	2	5	3.60	.864	-.554
Female engineers regularly receive feedback and guidance from superiors and subordinates.	120	2	3	2.15	.359	1.985
Your organisation permits flexibility in how female engineers' work.	120	2	4	2.25	.538	2.094
Structural Empowerment	**120**	**2.00**	**3.50**	**2.20**	**.401**	**2.112**
Female engineers feel that their work is important to achieve their targets.	120	3	4	3.40	.492	.413
Female engineers have the independence in determining how they accomplish their tasks.	120	2	3	2.10	.301	2.701
Female engineers decide on their own, how to carry out challenging tasks.	120	2	3	2.10	.301	2.701 .
Female engineers have significant influence on what happens in their departments.	120	2	3	2.35	.479	.637
Female engineers have a feeling of accomplishment from the work they do.	120	2	3	2.25	.435	1.169
Psychological Empowerment	**120**	**2.00**	**2.75**	**2.20**	**.232**	**.792**
Female engineers enjoy tackling challenging problems.	120	3	4	3.95	.219	-4.182
Female engineers enjoy being involved in more innovative projects.	120	3	4	3.90	.301	-2.701
Female engineers prefer to resolve issues themselves.	120	3	4	3.85	.359	-1.985
Female engineers are satisfied with the success they have achieved in their career.	120	2	5	2.70	.904	1.050
Female engineers believe in their capability to perform tasks successfully.	120	3	5	3.95	.500	-.105
Self-efficacy Empowerment	**120**	**3.00**	**4.25**	**3.91**	**.266**	**-.050**
Valid N (listwise)	120					

Author's computation (2024)

The structural empowerment of female engineers showed a mean score of 2.20, indicating relatively low levels of empowerment since it fell below the midpoint of 2.5 on the 1-5 scale. The data distribution had a low spread (SD = 0.40), was moderately positively skewed (skewness = -0.11), and had a kurtosis of 0.67.

The assessment of psychological empowerment among female engineers yielded a mean score of 2.20, indicating below-average levels of psychological empowerment. The standard deviation (0.23) revealed minimal variation in responses, suggesting consistency in the perceived lack of empowerment. The data was moderately positively skewed (0.79), with a kurtosis of -0.55. These findings imply that female engineers' psychological empowerment could be enhanced through effective leadership practices within their organizations.

The self-efficacy empowerment assessment yielded a mean score of 3.91, indicating above-average levels, as it exceeded the midpoint of 2.5 on the 1-5 scale. Respondents confirmed their ability to take personal initiatives to improve their job performance. The standard deviation (0.26) showed minimal variation in responses, while the skewness (-0.05) revealed a near-symmetrical distribution. These findings suggest that female engineers possess a strong sense of self-efficacy empowerment.

5.2.10 Career Progression

Here, the researcher sought to measure career progression by using items to confirm or otherwise, the career advancement of middle-level female engineers in Malaysia. Respondents were asked to rate the extent to which they supported the career advancement of female engineers, using a 5-point response scale: (1) strongly disagree, (2) disagree, (3) somewhat agree, (4) agree to (5) strongly agree. This assessment followed the same data collection and analysis procedures used for the first two objectives. Nine independent items were assessed as shown in Table 5.11 below. The interpretation was limited to the overall construct or variable. Table 5.11 below shows a mean value of 2.28, a standard deviation value of 0.21, and a skewness of 0.98. The mean score indicates the extent of the respondents' agreement of career progression in their various organizations. The mean was below a mid-point of 2.5 on the scale of 1 to 5, suggesting that the career progression level in the selected Malaysian manufacturing companies is below average or quite low. It implies that the respondents decline to affirm there is career progression of female engineers in their respective manufacturing companies. This

could be attributed to several factors including the career barriers that are eminent in the organizations and lack of empowerment. Notably, the standard deviation revealed a narrow spread of values around the mean, indicating a high degree of consistency in the respondents' answers. The data was positively skewed. The standard deviation demonstrates that the respondents said similar things; in other words, the responses from one participant were not too different from others. Thus, there were fewer variations in the responses, signaling stability in the variance.

Table 5.11 Descriptive Statistics (Career Progression)

Items/Variables	Obs.	Min	Max	Mean	SD	Skew
Career progression opportunities are clearly communicated and advertised in my organization.	120	2	3	2.05	.219	4.182
Challenging projects are given to female engineers.	120	2	3	2.10	.301	2.701
More training on related work is provided for female engineers.	120	2	3	2.15	.359	1.985
There is opportunity for further studies for female engineers.	120	2	4	2.15	.479	3.213
Female engineers are selected into teams.	120	3	4	3.15	.359	1.985
Female engineers are given more responsibility.	120	2	4	2.65	.657	.514
There is a structured promotional system which rewards hard work for female engineers.	120	2	3	2.15	.359	1.985
There is an active approach by my organization to encourage female engineers to progress on the job.	120	2	3	2.10	.301	2.701
Female engineers are given the freedom to make sound decisions on major projects.	120	2	3	2.10	.301	2.701
Career Progression	**120**	**2.17**	**2.83**	**2.28**	**.206**	**0.983**
Valid N (listwise)	120					

Author's computation (2024)

5.2.11 Correlation Matrix

Table 5.12 presents the correlation matrix results for the study variables, revealing significant 2-tailed correlations at 1% and 5% significance levels. This analysis highlights the inter-construct correlations between variables. The results show that both independent variables (gender stereotyping, work-life balance, technical skills limitations, negative perception, and misogynistic management) and moderating variables (structural empowerment, psychological empowerment, and self-efficacy empowerment) are significantly correlated with the dependent

variable (career progression). This suggests that these variables may predict or explain changes in the career progression of female engineers in Malaysia. Notably, work-life balance is the only independent variable with a positive correlation with career progression, while the others show negative correlations. Among the moderators, self-efficacy empowerment has an inverse correlation with career progression, whereas structural and psychological empowerment have positive correlations. These findings necessitate further regression analysis to explore the relationships between career barriers, career progression, and the moderating effects of empowerment factors. The detailed results are presented below.

Table 5.12 reveals significant correlations between various factors and career progression. Specifically: gender stereotyping showed a moderate negative correlation (-0.43) with career progression, indicating that as gender stereotyping increases, career progression tends to decrease. Work-life balance had a moderate positive correlation (0.54) with career progression, suggesting that improving work-life balance may positively impact career progression. Technical skills limitation, negative perception, and misogynistic management all showed negative correlations (-0.48, -0.16, and -0.48, respectively) with career progression, implying that these factors may hinder career advancement.

Structural empowerment and psychological empowerment had modest positive correlations (0.19 and 0.20, respectively) with career progression, indicating that these factors may positively influence career progression. Self-efficacy empowerment showed a negative correlation (-0.17) with career progression, suggesting that increased self-efficacy empowerment may not necessarily lead to improved career progression.
These findings suggest that all study variables (independent and moderating) have some influence on career progression, warranting further regression analysis to explore these relationships in more detail.

Table 5.12 Correlation Matrix

Variables	1	2	3	4	5	6	7	8	9
1. Gender stereotyping	1								
2. Work life balance	0.01	1							
3. Technical skills limitations	0.14	-0.45**	1						
4. Negative Perception	0.47**	-0.21*	-0.22*	1					
5. Misogynistic management	0.09	-0.32**	0.06	0.10	1				
6. Structural empowerment	0.00	0.26**	-0.44**	0.45**	-0.01	1			
7. Psychological empowerment	0.04	0.66**	-0.04	0.08	-0.44**	0.37**	1		
8. Self-efficacy empowerment	-0.47**	-0.65**	0.15	0.08	0.36**	-0.07	-0.43**	1	
9. Career progression	-0.43**	0.54**	-0.48**	-0.16*	-0.48**	0.19*	0.20*	-0.17*	1

Note: **p<0.01 and *p<0.05

Author's computation (2024)

5.2.12 Relationship between Career Barriers and Progression (Objective 3)

To examine the relationship between career barriers and career progression, a regression analysis was conducted using hierarchical regression modeling. This model has been recommended by Aiken *et al.* (1991) and Cohen *et al.* (2003). Although the correlation analysis shows significant links among the study variables, the association effect could not be ascertained under such analysis as the results could only tell the mere relationships. Thus, to test the effect of career barriers (gender stereotyping, work-life balance, technical skills limitation, negative perception, and misogynistic management) on career progression, including empowerment factors (structural, psychological, and self-efficacy) as moderating variables, a moderation regression analysis was run by applying hierarchical regression modeling by Cohen *et al.* (2003) and macro-process modeling by Hayes (2018) in SPSS. Since the data was parametric, a regression analysis could be conducted to establish the association effects (Field, 2015).

Table 5.13 summarises the regression analysis, which examined the relationship between career barriers, empowerment factors, and career progression. The analysis consisted of five blocks, each addressing a specific career barrier, and followed a three-step procedure: Step 1 (tested the main effect of career barriers on career progression), Step 2 (assessed the controlling effect of empowerment factors on the relationship between career barriers and career progression), and Step 3 (examined the moderating effect of empowerment factors on the relationship between career barriers and career progression). The results, presented in three models, provide unstandardized beta coefficients, t-statistics, and other relevant statistics. The R-square, adjusted R-square, and F-statistics indicate that the independent and moderating variables significantly contribute to explaining variations in career progression.

For Block 1, the R-square in Step 1 was 0.181, meaning 18.1 % of the variation in the mean of the dependent variable (career progression) among the independent variables (career barriers) can be predicted from the relationship between career progression and gender stereotyping. In other words, the R-square value indicates that career progression can be explained by gender stereotyping at 18.1%. Conversely, 81.9% of the variation in the mean of career progression cannot be explained by only gender stereotyping. In Step 2, the R-square was 0.380, representing 38% of the variation in the mean of the dependent variable (career progression) between the independent variable (gender stereotyping) and the moderators (structural,

psychological, and self-efficacy empowerment) that can be predicted from the relationship between career progression and gender stereotyping, structural, psychological and self-efficacy empowerment. It follows that career progression can be explained by these variables at 38%. In Step 3, the R-square was 0.761. This suggests that 76.1% of the variation in the mean of the dependent variable (career progression) among the independent variable (gender stereotyping), the moderators (structural, psychological, and self-efficacy empowerment), and the interaction terms (GS × SE, GS × PE, and GS × SEE) can be predicted from the relationship between career progression, gender stereotyping, structural empowerment, psychological empowerment, self-efficacy empowerment, and interaction terms. It implies that career progression can be explained by these variables at 76.1%, but they cannot change 23.9% of the variation in mean of career progression. The F-statistics in Block 1 indicate that the regression model predicts the dependent variable (career progression) significantly well. In other words, the correlation between the outcome variable and predictors is very significant. The significant value, which is, p-value is 0.000, is less than the significant level of 0.05. Therefore, it is an indication that the regression model used is significantly good to predict the dependent variable (career progression).

Regarding Block 2, the R-square in Step 1 is 0.291, meaning 29.1 % of the variation in the mean of the dependent variable (career progression) among the independent variables (career barriers) can be predicted from the relationship between career progression and work-life balance. In other words, the R-square value indicates that career progression can be explained by work-life balance at 29.1%. On the contrary, 70.9% of the variation in mean of career progression cannot be explained by only work-life balance. In Step 2, the R-square is 0.398, representing 39.8% of the variation in the mean of the dependent variable (career progression) between the independent variable (work-life balance) and the moderators (structural, psychological, and self-efficacy empowerment) that can be predicted from the relationship between these variables. It follows that career progression can be explained by work-life balance, structural empowerment, psychological empowerment, and self-efficacy empowerment at 39.8%, meaning that 60.2% of the variation in the mean of career progression cannot be explained by work-life balance and the moderators as control variables. In Step 3, the R-square is 0.659. This illustrates that 65.9% of the variation in the mean of the dependent variable (career progression) among the independent variable (work-life balance), the moderators (structural, psychological and self-efficacy empowerment), and the interaction terms (WLB × SE, WLB × PE, and WLB × SEE) can be predicted from the relationship

between career progression, work-life balance, structural empowerment, psychological empowerment, self-efficacy empowerment, and interaction terms. It implies that career progression can be explained by work-life balance, structural empowerment, psychological empowerment, and self-efficacy empowerment at 65.9%, meaning that only 34.1% of the variation in the mean of career progression cannot be explained by work-life balance, the moderators as control variables and the interaction terms. The F-statistics in Block 2 indicate that the regression model predicts the dependent variable (career progression) significantly well. In other words, the association between the outcome variable and regressors is very significant. The significant value, which is, p-value is 0.000, is less than the significant level of 0.05. Thus, it is an indication that the regression model used is significantly good to predict the dependent variable (career progression).

In terms of Block 3, the R-square in Step 1 is 0.226, meaning 22.6% of the variation in the mean of the dependent variable (career progression) among the independent variables (career barriers) can be predicted from the association between career progression and technical skills limitation. In other words, the R-square value indicates that career progression can be explained by technical skills limitation at 22.6%. Contrariwise, 77.4% of the variation in mean of career progression cannot be explained by only technical skills limitation. In Step 2, the R-square is 0.270, representing 27% of the variation in the mean of the dependent variable (career progression) between the independent variable (technical skills limitation) and the moderators (structural, psychological, and self-efficacy empowerment) that can be predicted from the relationship between career progression, technical skills limitation, structural, psychological, and self-efficacy empowerments. It follows that career progression can be explained by these variables at 27%, meaning that 73% of the variation in the mean of career progression cannot be explained by technical skills limitation and the moderators as control variables. In Step 3, the R-square is 0.906. This shows that 90.6% of the variation in the mean of the dependent variable (career progression) among the independent variable (technical skills limitation), the moderators (structural, psychological, and self-efficacy empowerment), and the interaction terms (TSL × SE, TSL × PE, and TSL × SEE) can be predicted from the association between career progression, technical skills limitation, structural empowerment, psychological empowerment, self-efficacy empowerment, and interaction terms. It implies that career progression can be explained by technical skills limitation, structural empowerment, psychological empowerment, and self-efficacy empowerment at 65.9%, meaning that only 9.4% of the variation in the mean of career progression cannot be explained by technical skills

limitation, the moderators as control variables and the interaction terms. The F-statistics in Block 3 indicate that the regression model predicts the dependent variable (career progression) significantly well. In other words, the association between the outcome variable and regressors is very significant (p-value < 0.000), affirming the goodness of the regression model.

In the case of Block 4, the R-square in Step 1 is 0.025, which means that only 2.5% of the change in the mean of career progression among the career barriers can be predicted from the association between career progression and negative perception. In other words, the R-square value indicates that career progression can be explained by negative perception at only 2.5%. On the other hand, 97.5% of change in the mean of career progression cannot be explained by only negative perception. In Step 2, the R-square is 0.133, representing 13.3% of the variation in the mean of the dependent variable (career progression) between the independent variable (negative perception) and the moderators (structural, psychological, and self-efficacy empowerment) that can be predicted from the association between the variables. It follows that career progression can be explained by negative perception, structural, psychological, and self-efficacy at 13.3%, meaning that 86.7% of change in mean of career progression cannot be explicated by negative perception and the moderators as control variables. In Step 3, the R-square is 0.422. This indicates that 42.2% of the variation in the mean of the dependent variable (career progression) among the independent variable (negative perception), the moderators (structural, psychological, and self-efficacy empowerment), and the interaction terms (NP × SE, NP × PE, and NP × SEE) can be predicted from the correlation between career progression, negative perception, structural empowerment, psychological empowerment, self-efficacy empowerment, and interaction terms. It follows that career progression can be explained by these variables at 42.2%, meaning that 57.8% of alteration in the mean of career progression cannot be explicated by negative perception, the moderators as control variables and the interaction terms. The F-statistics in Block 4 show that the regression model predicts the dependent variable (career progression) significantly well. Put differently, the link between the outcome variable and explanatory variables is very significant (p-value < 0.000), indicating that the regression model used is significantly good in predicting the dependent variable (career progression).

For Block 5, the R-square in Step 1 is 0.234, which means that only 23.4% of alteration in the mean of career progression among the career barriers can be predicted from the association between career progression and misogynistic management. In other words, the R-square value

indicates that career progression can be explained by misogynistic management at 23.4%. On the other hand, 76.6% of adjustment in the mean of career progression cannot be elucidated by only misogynistic management. In Step 2, the R-square is 0.279, representing 27.9% of the variation in the mean of career progression between misogynistic management and moderators (structural, psychological, and self-efficacy empowerment) that can be predicted from the association between these variables. It signifies that career progression can be elucidated by misogynistic management and moderators at 27.9%, meaning that 72.1% of change in mean of career progression cannot be described by misogynistic management and the moderators as control variables. In Step 3, the R-square is 0.459. This denotes that 45.9% of alteration in the mean of career progression among misogynistic management, moderators (structural, psychological and self-efficacy empowerment), and the interaction terms (MM × SE, MM × PE, and MM × SEE) can be predicted from the association between these variables. It infers that career progression can be explained by misogynistic management and empowerment indicators at 45.9%, meaning that 54.1% of modification in the mean of career progression cannot be elucidated by misogynistic management, the moderators as control variables and the interaction terms. The F-statistics in Block 5 show that the regression model predicts the dependent variable (career progression) significantly (p-value < 0.000).

5.2.12.1 Main effects

From Table 5.13, it can be observed that in Step 1, the coefficients for gender stereotyping, work-life balance, technical skills limitation, negative perception, and misogynistic management are [β = -0.283, *t*-stat = -5.11], [β = 0.181, *t*-stat = 6.95], [β = -0.407, *t*-stat = -5.88], [β = -0.056, *t*-stat = -1.76], and [β = -0.206, *t*-stat = -6.00] respectively, and they are all significant. This establishes the main effects of the career barriers on the career progression of middle level female engineer managers in Malaysia. The career barriers have a significant negative relationship with career progression, except for work-life balance which shows a positive relationship. It suggests that a unit change in these career barriers will likely result in a corresponding negative change in career progression by the magnitude of their coefficients, other factors held constant. However, a unit change in work-life balance will likely lead to a positive change in female engineers' career progression. Hence, the null hypotheses of H1 to H5 are rejected, while the alternatives of H1 to H5 are accepted. Comparatively, it can be noticed that among the career barriers, technical skills limitation has the highest predictive effect (-0.407), followed by gender stereotyping (-0.283), with negative perception (-0.056) being the least. It is also important to note that work-life balance recorded a positive effect of

0.183 compared to the negative contributions of other independent variables. Therefore, these barriers are important to be understood among the engineering organisations in the Malaysian manufacturing sector.

5.2.13 Moderating effect of empowerment factors (Objective 4)

As part of assessing the relationship between the career barriers [gender stereotyping, work-life balance, technical skills limitation, negative perception, and misogynistic management] and career progression, the researcher also assessed the moderating effect of empowerment factors (structural, psychological, and self-efficacy) on the association between career barriers and career progression as a fourth research objective. Applying the procedure of Cohen *et al.* (2003), the moderation effect has been tested by creating multiplicative interaction terms. The variables were centered around a mean of 0 to reduce the correlation between the interaction terms and the variables comprising the interaction to prevent the possibility of high multicollinearity. The result of the moderating effect analysis is captured in Table 5.13 below.

5.2.13.1 Controlling effect of empowerment factors

Firstly, the moderators (structural empowerment, psychological empowerment, and self-efficacy empowerment) were entered as augmenting or control variables alongside each career barrier (Step 2). Under Step 2 and in Model 2, the controlling effects of structural empowerment, psychological empowerment, and self-efficacy empowerment are significant, indicating that these empowerment factors contribute to the explanation of the variance in career progression. It further implies that these empowerment factors may reduce the negative effect of career barriers on career progression.

Under Block 1, structural empowerment has significant positive controlling effect [$\beta = 0.091$, t-value = 2.21] on the association between gender stereotyping and career progression, and self-efficacy empowerment has significant negative controlling effect [$\beta = -0.370$, t-value = -5.06] on the relationship between gender stereotyping and career progression, but psychological empowerment has insignificant negative controlling effect [$\beta = -0.042$, t-value = -0.52] on the correlation between gender stereotyping and career progression. This means that structural empowerment tends to reduce the negative effect of gender stereotyping on the career progression of middle level female engineers in Malaysia. However, self-efficacy empowerment will likely augment gender stereotyping to negatively affect the career

progression of female engineers in Malaysia. Since the controlling effect of psychological empowerment is not significant, its contribution to the relationship between gender stereotyping and career progression will be inconsequential.

Under Block 2, psychological empowerment has a significant negative controlling effect [β = -0.281, t-value = -3.15] on the correlation between work-life balance and career progression, and self-efficacy empowerment has significant positive controlling effect [β = 0.227, t-value = 3.06] on the relationship between work-life balance and career progression, but structural empowerment has insignificant positive controlling effect [β = 0.051, t-value = 1.25] on the association between work-life balance and career progression. It means that self-efficacy empowerment tends to augment the positive effect of work-life balance on the career progression of middle level female engineers in Malaysia. However, psychological empowerment will likely decrease the positive effect of work-life balance on the career progression of female engineers in Malaysia. Since the controlling effect of structural empowerment is not significant, its contribution to the relationship between work-life balance and career progression will be inconsequential.

Under Block 3, psychological empowerment has significant positive controlling effect [β = 0.201, t-value = 2.30] on the association between technical skills limitation and career progression, and self-efficacy empowerment has insignificant negative controlling effect [β = -0.003, t-value = -0.04] on the relationship between technical skills limitation and career progression, but structural empowerment has insignificant negative controlling effect [β = -0.062, t-value = -1.22] on the association between technical skills limitation and career progression. It suggests that psychological empowerment tends to reduce the negative effect of technical skills limitation on the career progression of female engineers in Malaysia. However, structural empowerment will likely enhance the negative effect of technical skills limitation on the career progression of middle female engineers in Malaysia, but the effect will not be significant. Since the controlling effect of self-efficacy empowerment is not significant, its contribution to the relationship between technical skills limitation and career progression will be inconsequential.

Under Block 4, structural empowerment has a significant positive controlling effect [β = 0.148, t-value = 2.76] on the association between negative perception and career progression, but psychological empowerment has insignificant positive controlling effect [β = 0.065, t-value =

0.70] on the relationship between negative perception and career progression, and self-efficacy empowerment has insignificant negative controlling effect [β = -0.079, t-value = -1.05] on the link between negative perception and career progression. It means that structural empowerment can potentially reduce the negative effect of negative perception on the career progression of middle level female engineers in Malaysia. Nevertheless, self-efficacy empowerment will insignificantly augment negative perception to negatively impact the career progression of middle level female engineers on Malaysia. Similarly, since the controlling effect of psychological empowerment is not significant, its contribution to the relationship between negative perception and career progression will be inconsequential.

Last but not least, under Block 5, structural empowerment has significant positive controlling effect [β = 0.120, t-value = 2.66] on the association between misogynistic management and career progression, but psychological empowerment has insignificant negative controlling effect [β = -0.113, t-value = -1.25] on the connection between misogynistic management and career progression, and self-efficacy empowerment also has insignificant negative controlling effect [β = -0.012, t-value = -0.17] on the relationship between misogynistic management and career progression. It indicates that structural empowerment can potentially reduce the negative effect of misogynistic management on the career progression of female engineers in Malaysia. Howbeit, self-efficacy empowerment will insignificantly augment misogynistic management to negatively impact the career progression of female engineers in Malaysia. Likewise, since the controlling effect of psychological empowerment is not significant, its contribution to the relationship between misogynistic management and career progression will be inconsequential.

5.2.13.2 Interaction effect of empowerment factors

From Table 5.13, it can be seen in Step 3 that the interactive terms of gender stereotyping and structural empowerment produced significant positive results (β = -1.912; *t*-value = -12.49). This implies that though gender stereotyping may negatively influence career progression, interacting with structural empowerment will enhance the effect, resulting in a greater negative effect on career progression. In other words, practicing gender stereotyping alongside ensuring structural empowerment will significantly obstruct the career progression of female engineers in Malaysia. Regarding the interactive term of gender stereotyping and psychological empowerment, the coefficient is positively significant (β = 1.515; *t*-value = 6.74), meaning that jointly practicing gender stereotyping and promoting psychological empowerment will likely

lead to positive career progression and the magnitude of the effect will be about 151%. Next, the interactive term of gender stereotyping and self-efficacy empowerment has a significant positive effect on career progression [β = 1.654; *t*-value = 7.94], indicating that the negative relationship between gender stereotyping and self-efficacy empowerment can be positively moderated by the self-efficacy empowerment of middle level female engineers by a magnitude effect of 165%.

Furthermore, the interactive term of work-life balance and structural empowerment is positively significant (β = 0.495; *t*-value = 6.31), illustrating that work-life balance and structural empowerment will interactively improve career progression by a magnitude effect of 0.495 or 49.5%. The overall effect is that the positive relationship between the work-life balance and career progression is positively enhanced by the structural empowerment of female engineers, other factors held constant. Regarding the interactive term of work-life balance and psychological empowerment, the coefficient is positively insignificant (β = 0.075; *t*-value = 0.39), meaning that jointly practicing work-life balance and promoting psychological empowerment will likely lead to positive career progression and the magnitude of the effect will not be significant. Next, the interactive term of work-life balance and self-efficacy empowerment has a significant negative effect on career progression [β = -0.662; *t*-value = -6.18], indicating that the positive relationship between work-life balance and self-efficacy empowerment can be negatively moderated by the self-efficacy empowerment of middle level female engineers by a magnitude effect of 66.2%.

For technical skills limitation and structural empowerment, the interactive term is negatively significant (β = -1.650; *t*-value = -16.20), meaning that technical skills limitation and structural empowerment will interactively impede career progression by a magnitude effect of 1.650 or 165%. In other words, structural empowerment cannot be used to overturn the negative effect of technical skills limitation on the career progression of female engineers. It will rather increase the effect size of the inverse relationship between the two variables (technical skills and career progression). Next, the interactive term of technical skills limitation and psychological empowerment shows a negative significant coefficient (β = -1.650; *t*-value = -16.20), indicating that jointly technical skills limitation and psychological empowerment will likely lead to impede career progression and the magnitude of the effect will be about 165%. It also means that psychological empowerment is not an appropriate tool to address technical skills limitation barriers to career progression. Regarding the interactive term of technical skills

limitation and self-efficacy empowerment has a significant negative effect on career progression [β = -7.190; *t*-value = -24.25], illustrating that the negative relationship between technical skills limitation and self-efficacy empowerment can be enhanced by the self-efficacy empowerment of middle level female engineers by a magnitude effect of about 7.190.

Moreover, the interactive term of negative perception and structural empowerment is negatively significant (β = -0.705; *t*-value = -7.36), showing that negative perception and structural empowerment will interact to further impede career progression by a magnitude effect of 0.705 or 70.5%. In other words, structural empowerment cannot be used to overturn the negative effect of negative perception on the career progression of female engineers. It will rather increase the effect size of the inverse relationship between negative perception and career progression. On the contrary, the interactive term of negative perception and psychological empowerment depicts a positive significant coefficient (β = 0.541; *t*-value = 3.64), implying that jointly negative perception and psychological empowerment will likely lead to career progression and the magnitude of the effect will be about 54.1%. It also means that psychological empowerment is an appropriate tool to address the negative perception barrier of career progression. Similarly, the interactive term of negative perception and self-efficacy empowerment has a significant positive effect on career progression [β = 0.615; *t*-value = 4.88], meaning that the negative relationship between negative perception and self-efficacy empowerment can be overturned by the self-efficacy empowerment of middle - level female engineers by a magnitude effect of about 0.615 or 61.5%.

Lastly, the interactive term of misogynistic management and structural empowerment is negatively significant (β = -0.602; *t*-value = -5.53), meaning that misogynistic management and structural empowerment will further obstruct career progression by a magnitude effect of 0.602 or 60.2%. Put differently, structural empowerment will enhance the negative effect of misogynistic management on the career progression of female engineers. On the other hand, the interactive term of misogynistic management and psychological empowerment shows a positive significant coefficient (β = 0.987; *t*-value = 5.24), demonstrating that jointly misogynistic management and psychological empowerment will likely lead to career progression and the magnitude of the effect will be about 98.7%. It also suggests that psychological empowerment is an appropriate tool to address misogynistic barriers to career progression. Similarly, the interactive term of misogynistic management and self-efficacy empowerment has a significant positive effect on career progression [β = 0.665; *t*-value = 2.88],

illustrating that the negative relationship between misogynistic management and self-efficacy empowerment can be overturned by the self-efficacy empowerment of middle - level female engineers by a magnitude effect of about 0.665 or 66.5%.

Table 5.13 Regression Results for Career Progression

			Unstandardized betas									
			Model 1		Model 2		Model 3					
Block	**Step**	**Predictors**	***B***	***t***	***B***	***t***	***B***	***t***	R^2	ΔR^2	***F***	***P***
1	1	Gender Stereotyping (GS)	-0.283	-5.11**	-0.430	-7.61**	-0.104	-2.38**	0.181	0.174	26.08	0.000
	2	Structural Empowerment (SE)			0.091	2.21**	0.314	10.07**	0.380	0.358	17.62	0.000
	2	Psychological Empowerment (PE)			-0.042	-0.52	-0.241	-4.33**	0.380	0.358	17.62	0.000
	2	Self-efficacy Empowerment (SEE)			-0.370	-5.06**	0.398	5.06**	0.380	0.358	17.62	0.000
	3	GS × SE					-1.912	-12.49**	0.761	0.746	51.05	0.000
	3	GS × PE					1.515	6.74**	0.761	0.746	51.05	0.000
	3	GS × SEE					1.654	7.94**	0.761	0.746	51.05	0.000
2	1	Work-life Balance (WLB)	0.182	6.95**	0.309	7.94**	-0.137	-2.42**	0.291	0.285	48.32	0.000
	2	Structural Empowerment (SE)			0.051	1.25	0.090	2.84**	0.398	0.377	19.01	0.000
	2	Psychological Empowerment (PE)			-0.281	-3.15**	0.116	1.40	0.398	0.377	19.01	0.000
	2	Self-efficacy Empowerment (SEE)			0.227	3.06**	0.338	4.97**	0.398	0.377	19.01	0.000
	3	WLB × SE					0.495	6.31**	0.659	0.637	30.87	0.000
	3	WLB × PE					0.075	0.39	0.659	0.637	30.87	0.000
	3	WLB × SEE					-0.662	-6.18**	0.659	0.637	30.87	0.000
3	1	Technical Skills Limitation (TSL)	-0.407	-5.88**	-0.445	-5.65**	-1.384	-27.81**	0.226	0.220	34.53	0.000
	2	Structural Empowerment (SE)			-0.062	-1.22	-0.012	-0.67	0.270	0.245	10.63	0.000
	2	Psychological Empowerment (PE)			0.201	2.30**	0.175	5.51**	0.270	0.245	10.63	0.000
	2	Self-efficacy Empowerment (SEE)			-0.003	-0.04	0.415	13.05**	0.270	0.245	10.63	0.000
	3	TSL × SE					-1.650	-16.20**	0.906	0.901	181.15	0.000
	3	TSL × PE					-1.650	-16.20**	0.906	0.901	181.15	0.000
	3	TSL × SEE					-7.190	-24.25**	0.906	0.901	181.15	0.000
4	1	Negative Perception (NP)	-0.056	-1.76*	-0.102	-2.96**	-0.034	0.92	0.025	0.017	3.08	0.000
	2	Structural Empowerment (SE)			0.148	2.73**	0.495	7.33**	0.133	0.103	4.42	0.000

	2	Psychological Empowerment (PE)			0.065	0.70	-0.244	-2.62**	0.133	0.103	4.42	0.000
	2	Self-efficacy Empowerment (SEE)			-0.079	-1.05	0.036	0.46	0.133	0.103	4.42	0.000
	3	NP × SE					-0.705	-7.36**	0.422	0.386	11.67	0.000
	3	NP × PE					0.541	3.64**	0.422	0.386	11.67	0.000
	3	NP × SEE					0.615	4.88**	0.422	0.386	11.67	0.000
5	1	Misogynistic Management (MM)	-0.206	-6.00**	-0.226	-5.80**	-0.293	-6.95**	0.234	0.228	36.05	0.000
	2	Structural Empowerment (SE)			0.120	2.66**	0.389	6.30**	0.279	0.254	11.11	0.000
	2	Psychological Empowerment (PE)			-0.113	-1.25	-0.359	-3.40**	0.279	0.254	11.11	0.000
	2	Self-efficacy Empowerment (SEE)			-0.012	-0.17	0.041	0.35	0.279	0.254	11.11	0.000
	3	MM × SE					-0.602	-5.53**	0.459	0.425	13.57	0.000
	3	MM × PE					0.987	5.24**	0.459	0.425	13.57	0.000
	3	MM × SEE					0.665	2.88**	0.459	0.425	13.57	0.000

Note: **p<0.01 and *p<0.05; *Author's computation, 2024*

Table 5.14 Summary of Hypotheses Test Results

Hypotheses		Decision
H1	Gender Stereotyping negatively relates to Career Progression	Supported
H2	Work-life Balance positively relates to Career Progression	Supported
H3	Technical Skills Limitation negatively relates to Career Progression.	Supported
H4	Negative Perception negatively relates to Career Progression.	Supported
H5	Misogynistic Management negatively relates to Career Progression.	Supported
H6a	Structural Empowerment moderates Gender Stereotyping and Career Progression.	Supported (–)
H6b	Psychological Empowerment moderates Gender Stereotyping and Career Progression.	Supported (+)
H6c	Self-efficacy Empowerment moderates Gender Stereotyping and Career Progression.	Supported (+)
H7a	Structural Empowerment moderates Work-life Balance and Career Progression.	Supported (+)
H7b	Psychological Empowerment moderates Work-life Balance and Career Progression.	Not Supported (+)
H7c	Self-efficacy Empowerment moderates Work-life Balance and Career Progression.	Supported (–)
H8a	Structural Empowerment moderates Technical Skills Limitation and Career Progression	Supported (–)
H8b	Psychological Empowerment moderates Technical Skills Limitation and Career Progression	Supported (–)
H8c	Self-efficacy Empowerment moderates Technical Skills Limitation and Career Progression.	Supported (–)
H9a	Structural Empowerment moderates Negative Perception negatively and Career Progression.	Supported (–)
H9b	Psychological Empowerment moderates Negative Perception negatively and Career Progression.	Supported (+)
H9c	Self-efficacy Empowerment moderates Negative Perception negatively and Career Progression.	Supported (+)
H10a	Structural Empowerment moderates Misogynistic Management and Career Progression.	Supported (–)
H10b	Psychological Empowerment moderates Misogynistic Management and Career Progression.	Supported (+)
H10c	Self-efficacy Empowerment moderates Misogynistic Management and Career Progression.	Supported (+)

Author's computation, 2024

5.3 Qualitative Findings

This section reports and analyses semi-structured interviews held with 20 female engineers working in engineering or manufacturing organisations in Malaysia. This is after the quantitative study according to the sequential design adopted. This aspect of the study helped to explain the quantitative results and to provide a deeper understanding of the quantitative results.

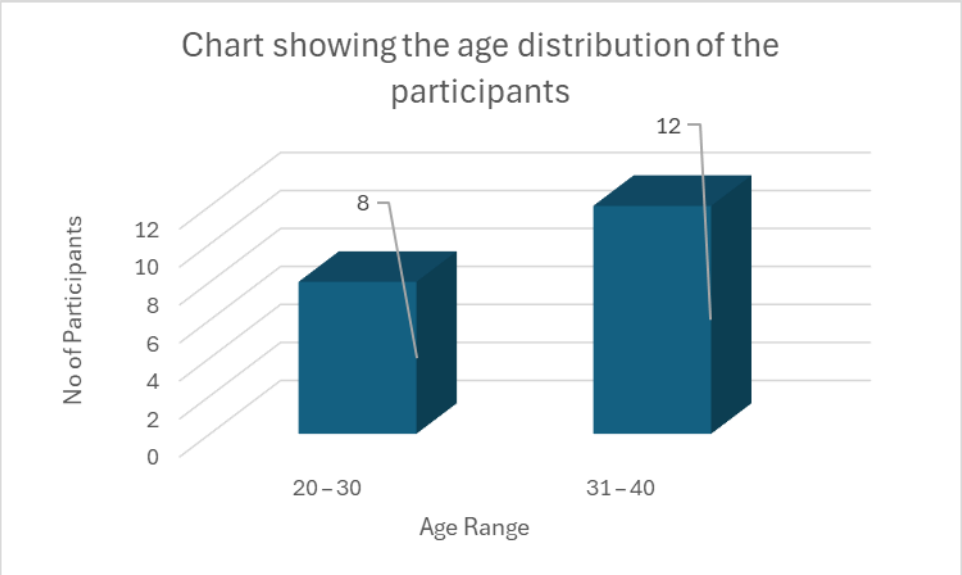
5.3.1 Demographic Characteristics of Participants

First, the age distribution of the participants is shown in Table 5.15 and Figure 5.1 below. It can be seen that 8 participants, representing 40% were within the age bracket of 20 to 30 while 12 participants, representing 60% were within the age group of 31 to 40. It is clear that the majority of the participants were aged between 31 and 40, and therefore they might be working as engineers for some time now to be in the position to provide reliable information.

Table 5.15 Age Distribution of Participants

Age	No. of participants	Percentage (%)
20 – 30	8	40%
31 – 40	12	60%
Total participants	**20**	**100%**

Figure 5.1 Age Distribution of Participants

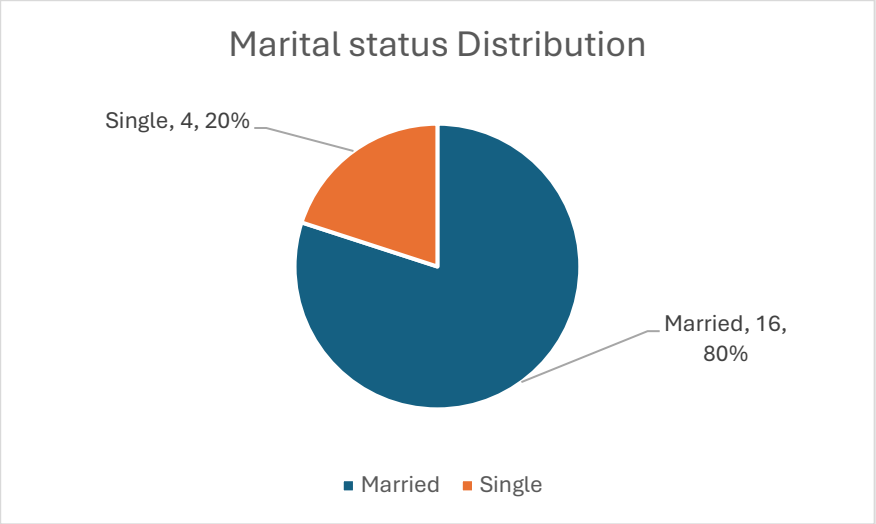


Next, the participants' nuptial status is shown in Table 5.16 and Figure 5.2 below. It can be seen that 16 participants representing 80% were married, while 4 participants representing 20% were single. It is clear that the majority of the participants were married, and therefore much more likely to provide detailed insights.

Table 5.16 Marital Status of Participants

Marital Status	No. of participants	Percentage (%)
Married	16	80%
Single	4	20%
Total participants	**20**	**100%**

Figure 5.2 Marital Status Distribution



The qualification of the participants is shown in Table 5.18 and Figure 5.3 below. It can be seen that 5 participants representing 25% were Masters in Engineering (M.E.) holders, only 1 participant representing 5% held a degree in Civil Engineering, only 1 participant representing 5% held an IT degree, 2 participants representing 10% had a degree in Mechanical Engineering, another 2 participants representing 10% had a degree in Chemical Engineering, 8 participants representing 40% held degree in Electrical Engineering, and only 1 participant representing 5% had a degree in Architectural Engineering. These results show clearly that the participants were in the field of engineering, and they had appropriate qualifications suitable to progress in their respective careers.

Table 5.17 Qualifications of the Participants

Qualifications	No. of participants	Percentage (%)
Masters in Engineering (M.E.)	5	25%
Civil Engineering	1	5%
IT Degree	1	5%
Mechanical Engineering	2	10%
Chemical Engineering	2	10%
Architectural Engineering	1	5%
Electrical Engineering	8	40%
Total participants	**20**	**100%**

Figure 5.3 Qualifications of the Participants

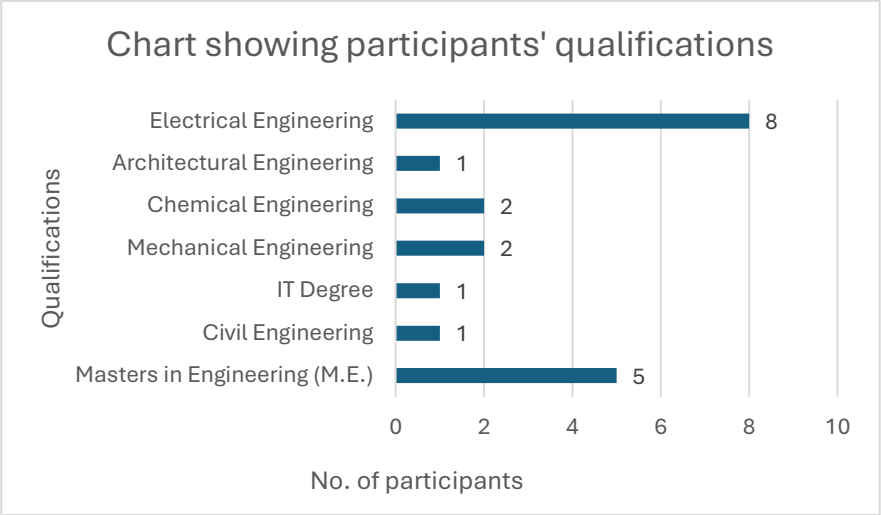


Table 5.19 and Figure 5.4 below display the positions of the participants. It can be observed that 7 participants representing 35% were managers, 4 participants representing 20% were supervisors and 9 participants representing 45% were team leaders. These results indicate clearly that the participants were in at least middle-level management as required for the study and were in a good position to provide objective views on the career barriers and career progression of the middle level female engineers in the manufacturing sector of Malaysia. They would also be able to comment on the empowerment policies of their respective manufacturing companies in Malaysia.

Table 5.18 Positions of the Participants

No. of Years in Position	No. of participants	Percentage (%)
Manager	7	35%
Supervisor	4	20%
Team Leader	9	45%
Total participants	**20**	**100%**

Figure 5.4 Positions of the Participants

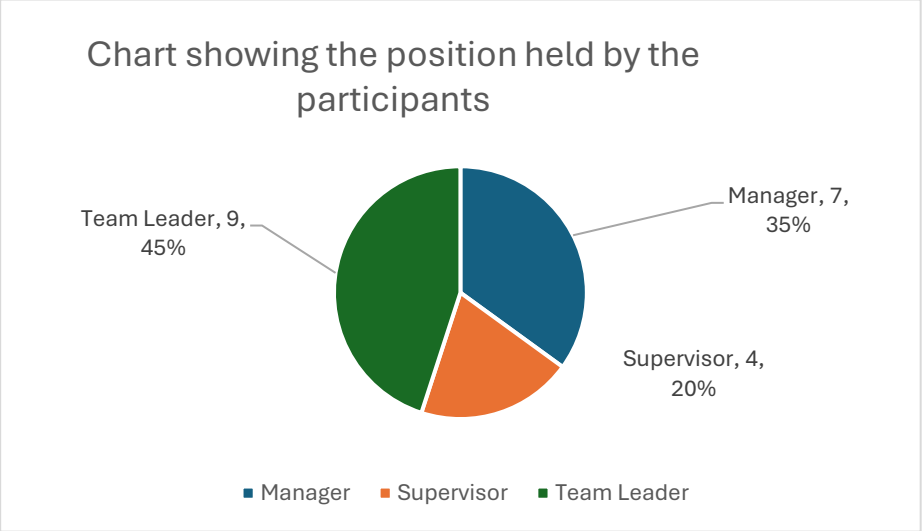


Table 5.20 and Figure 5.5 below depict the number of years in position at work by the participants. It can be noticed that 12 participants representing 60% had been in their positions between 1 and 5 years, while 8 participants representing 40% had been in their positions for 6 to 11 years. It is clear that the participants had been in their positions for a long time and so they could provide rich information about career barriers and career progression of middle level female engineers in Malaysia.

Table 5.19 Number of Years in Position

No. of Years in Position	No. of participants	Percentage (%)
1- 5 years	12	60%
6 - 11 years	8	40%
Total participants	**20**	**100%**

Figure 5.5 Number of Years in Position

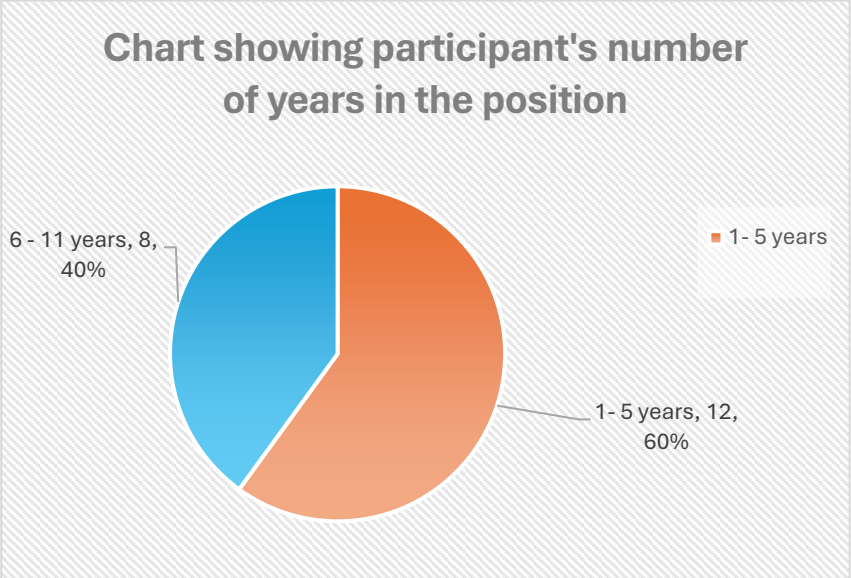
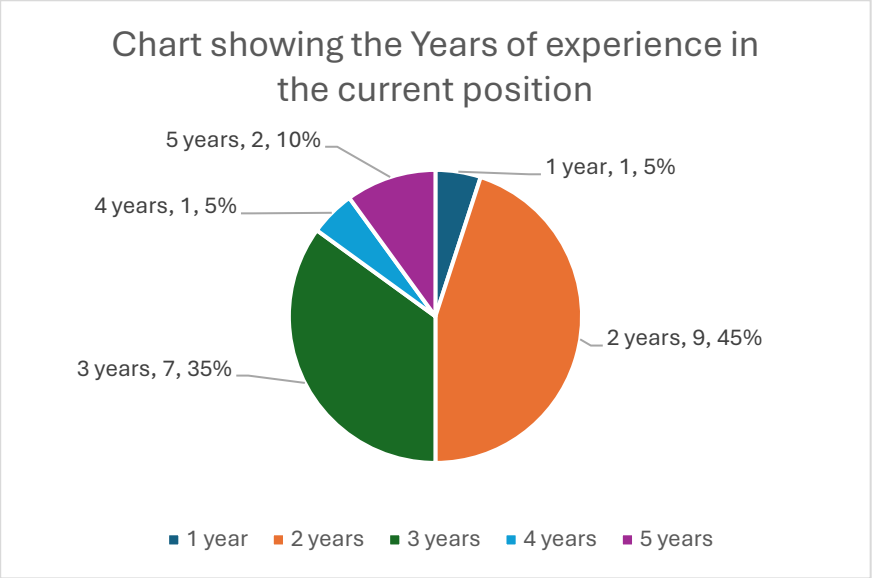


Table 5.21 and Figure 5.6 below display the years in the current position by the participants. It can be observed that 1 participant representing 5% had been in their current position for 1 year, 9 participants representing 45% had been in their current positions for 2 years, 7 participants representing 35% had been in their current position for 3 years, 1 participant representing 5% had been in her current position for 4 years, and 2 participants representing 10% had been in their current position for 5 years. It is clear that the participants had been in their current positions for a long time and so they could provide rich information about career barriers and career progression of middle level female engineers in Malaysia.

Table 5.20- Years in Current Position

Years in the current position	No. of participants	Percentage (%)
1 year	1	5%
2 years	9	45%
3 years	7	35%
4 years	1	5%
5 years	2	10%
Total participants	**20**	**100%**

Figure 5.6 Years in Current Position



5.3.2 Career barriers limiting middle-level female engineers in Malaysia

Respondents were required to identify and describe existing career barriers that occurred within their organizations.

Gender Stereotyping

Almost all respondents interviewed identified Gender Stereotyping as the main barrier impeding the progress of female engineers at workplaces. Some respondents remarked:

> *"Wrong perception of women and Gender Stereotyping has been deep rooted in Malaysian organisations. Our organisation is not respecting female engineers who are as qualified as men. Management follows biased behaviour to promote male counterpart".*
>
> *"In my organization, Career Barriers confronting female engineers are basically Gender Stereotyping and biased perceptions that question women's technical abilities and performance levels".*
>
> *"There is perception among male engineers that always they are better. They think female engineers are not as bright as* male. *In most cases, management blocks female engineers and promote male – because female involve with family development*".

These accounts align with the perspectives expressed by United Nations-Women (2018) and Amnesty International (2020), which highlight that discriminatory behaviours and attitudes based on gender, particularly directed at women in influential roles within a variety of public sectors, are significant issues that are prevalent around the world.

Respondents described varied ways in which female engineers were treated differently from their male counterparts. According to one of such respondents, employers sometimes disregard female engineers' viewpoints in decision making.

> *"Male engineers always think they can do better in decision making, but it is not true, I work very hard to break the opinion and I always fight to prove that they are wrong. […] they believe we are not capable to take certain decisions and handle certain tasks. One thing, I learnt was always to speak up for myself and prove my capabilities in various situations".*

Aged 27 years, Chemical Engineer

Other extracts captured on gender stereotyping are as follows:

> *"In software engineering, we are treated as male engineers and recognised. However, in other engineering fields, my colleagues are discriminated against simply because they are females. In most of the cases female engineers do exceptional jobs".*

Aged 42 years, Engineer ITM

> *"When I became a supervisor, suppliers were a bit reluctant to cooperate with me in the start. Male staff have always been favoured in many situations as supervisors".*

Aged 28 years, Civil Engineer

> *"Male engineers think female engineers are not as bright. Personally, I don't see any difference. We are engineers and we must work together".*

Aged 30 years, Electrical Engineer

> *"I could see there are issues regarding gender preferences in various departments of our organisation. Female engineers need to prove all the time, that they are capable in given tasks".*

Aged 32 years, Electrical Engineer

"I think, female members of staff do not enjoy same treatment as our male colleagues. […]. I have observed in higher positions; Management prefers men rather than women. However, I have not been treated differently and most of the higher jobs are taken by men".

Aged 35 years, Electrical Engineer

"We have about 45 female engineers, working in this company at various departments. We are constantly working hard to compete with male engineers. Most of the female engineers contribute more than men, but to obtain promotion is not as easy as the men".

Aged 36 years, ITM Engineer

The above findings confirm the observation of Tabassum and Nayak (2021) that persistent gender stereotypes and biases can affect how female engineers are perceived in the workplace which may lead to lower expectations and limited career advancement opportunities.

Negative Perception

The negative perception of women by organizations as unfit or incapable of doing engineering work was mentioned by the majority of respondents as another key factor that delayed or denied female engineers from gaining deserved promotions or rising to the top. Some of the observations of respondents are captured as follows:

"It is regrettable that female engineers are not perceived as capable engineers in spite of all our records and achievements. We are thought of as second-class engineers. We are slighted. Our colleagues make negative remarks about us. We are seen as incapable. There is little room for our progress because we are judged as limited or incapable engineers"

"We are denied career progression opportunities here compared to our male colleagues. Management perception is that it is not worthwhile training and promoting female engineers because as they put it, …. They (female engineers) will end up nowhere "

"In most engineering organisations like ours, there is male dominance at the top. This appears to be due to an ageless discrimination against women, something that is historically established in our culture. This analysis of women is not likely to change, especially in engineering because it is perceived that engineering is for males"

These findings are consistent with the views of Madegwa, (2011) who stated that women engineers were having slow progression issues that were due to gender discrimination among female workers based on how they were negatively perceived. The findings are also consistent with Lopes (2019) position that the perception that certain industries or positions are male dominated, can make it more challenging for women to network and find mentors who can help them advance in their careers.

Notably, many of the participants in the interviews expressed those certain female engineers often viewed themselves as less capable than their male counterparts. Furthermore, these women seemed hesitant to challenge or change this unfavourable self-assessment.

> *"There are times, I have a feeling that as a female engineer, I just cannot do what my male colleagues do. At times I come to work already tired due to my domestic and social responsibilities. I may also not have the physical strength they have to work as an engineer. Come on let's face the facts"*
>
> *"It is not only the management of this organisation that perceives women as not competent to be at the top of engineering assignments. What is sad is that some of us women ourselves do not have the confidence to go up there because we think we are not like men. It is unbelievable but tell you what, quite a number of my colleagues believe the men are superior to us and are more capable when it comes to certain engineering tasks and assignments"*

These assertions are supported by the views of Hoyt and Murphy (2016) who held that professional women negatively evaluate themselves and their fellow women as poor leaders because of their awareness that leadership effectiveness is socially skewed towards masculinity. The findings further corroborate the assertion of Mavin et al., (2017) that lack of confidence can result in women not pursuing leadership positions or not advocating for themselves when it comes to career advancement opportunities.

Misogynistic management

Another popular career barrier identified by the majority of respondents was misogynistic management. The majority of respondents blamed management for a type of management style that usually favoured men. Several respondents complained about a masculine bureaucracy. Their views included the following:

> *"Based on my experience I think my male managers always assume as female engineers, we aren't capable of doing certain tasks; they believe women are weaker. I think it is mere misogynism Management treats female engineers differently in my organization, compared to male counterparts",*
>
> *"This is a common bias against women created by men in management – a misconception that women are weaker, and engineering is men's job. So, they all discriminate against the women and we don't have*

the kind of opportunities the men have. There is clear inequality, a created misconception by male managers in the engineering field".

"In our consultancy engineering firm, there is prevalent discriminatory practices shown by top male-dominated management. Women engineers are always at the losing end".

The above findings on masculine bureaucracy in Malaysian Engineering companies are consistent with the findings of a study conducted on the effect of misogyny on Women's Leadership in South Africa by Hanyane and Ahiante (2022). The study identified four primary ways in which misogyny impacts the progress of women in leadership roles. First, it highlighted a pervasive scepticism towards women leaders, which undermines their authority. Second, the research revealed that many women experience diminished self-esteem and confidence in their abilities to lead. Third, it uncovered that female managers often suffer from mental health issues, including psychological distress and depression, as a direct consequence of this sexism. Finally, the findings showed a noticeable decline in the ambitions of women aspiring to attain directorships and senior leadership roles, reflecting the discouraging environment they face.

Work-life balance

Work-life balance was identified as a career barrier which was popularly cited by almost all female engineers during the research. Respondents widely asserted that their roles as women in society placed social and domestic responsibilities on them. For this reason, there was a false belief that women could not combine their domestic roles and be effective at work. One female mechanical engineer remarked:

"*Work-life balance is important in providing time and space for the female managers to sufficiently manage their work and home. However, this is not welcoming in my engineering organisation as I need to be there to check on workflow, testing, supplying, fitting, and monitoring projects"*

A female electrical engineer (aged 42) lamented how she and her colleagues were denied career opportunities due to challenges presented by work-life balance.

"There is no way I can work remotely; it will not be possible when dealing with technical issues on the site. It is difficult for mechanical engineers to work remotely. It is not possible when testing & monitoring a vessel. Because of this challenge, female engineers here are not given high responsibilities and high positions."

"There are no perfectly balanced support systems for career and family given by the management of this organisation. Flexible working conditions for women are not provided in most of the organisations".

The above views on work-life balance align with the view of Ann and James (2012), that the work-life balance barrier occurs when women encounter difficulties striking a balance between their family and their career roles.

The views further corroborate the assertions of Burke and McKeen (1994) that due to family responsibilities, women have difficulties committing themselves 100 percent to the organisation, which is usually anticipated.

Technical Skills limitation

Technical Skills limitation was another career barrier that was mentioned by about half of respondents. Respondents were asked whether they had constraints and deficiencies in their technical abilities that hindered their effectiveness and performance in their professional roles. Their popular responses were that female engineers were usually not given opportunities at their workplaces to upgrade or improve their technical skills through training, so they were handicapped during the process of delivering a project which hampered their promotion.

> *"Labelling women as not suitable for engineering and technically incompetent in engineering organisations is common in Malaysia. Facilities training and technical skills development are not available, yet they say women are not technically competent".*
>
> *"In some organisations where they are available, they are recommended by managers in a biased manner in favour of men".*
>
> *"Most of we female engineers do lack technical capabilities that restrict our ability to perform job-specific tasks effectively, thus due to inadequate training offered by our employer, or due to inadequate experience. The rapidly evolving technological requirements of the profession at times expose our inadequacy".*

The results align with the argument made by Hitka et al. (2018) regarding the potential insufficiencies in technical competencies among female engineers. These competencies encompass project management and planning skills aimed at addressing complex issues, the capacity to make sound decisions in high-pressure situations, leadership abilities that facilitate effective task delegation, and proficient time management skills. The findings suggest that these areas may be where female engineers experience shortcomings.

Artificial Intelligence (AI)

The majority of respondents had strong feelings that Artificial Intelligence (AI) is going to pose a strong career barrier for female engineers not only in Malaysia but globally. The majority of respondents identified this threat and were of the view that though AI is not an observable career barrier currently, it will be shortly. When the researcher probed further, respondents explained that in the engineering sector, it is easier to replace human skills with AI, considering the existing discrimination against women in engineering. Female engineers and female technicians face the biggest threat of redundancy. One female engineer remarked as follows:

"The threat of AI in job lay-offs is coming gradually but it seems this is un-noticed. It is going to affect manufacturing and industry, transportation and logistics, geological exploration, military and defence, the service industry as well as health care and medicine. We will be getting into global lay-offs soon, in Malaysia, female engineers will be among one of the first to go".

Some re*s*pondents explained further as follows:

"When AI identifies and capitalises on existing biases and inefficiencies within an organisation, this can result in female engineers being overlooked for promotions and opportunities".

"Currently organisations use A1 to evaluate performance reviews of engineers, which could unmistakably support gender biases- if not regulated carefully. This can lead to unfair evaluation for female engineers".

Some interesting remarks by respondents on this threat are as follows:

"Organisations using algorithms in the recruitment process can sustain enduring unfairness if they are trained on historical data that reflect gender imbalances in engineering roles"

"AI can influence the availability and recommendation of training programs and career development resources which will enhance women engineers' progression."...Additionally AI systems that recommend training programs might not be equally tailored to women, especially if they are based on male-dominated career paths and interests".

These concerns align with the perspective of Earl and Skyrme (1992), who envisioned hybrid managers as individuals possessing "strong technical and adequate business knowledge, or vice versa... individuals with technical expertise capable of operating within user areas while effectively developing and implementing IT application concepts."

A large size of respondents thought that AI could work against female engineers' career development when it comes to resource sharing within organisations. One such view was captured as follows:

"If AI systems prioritise training opportunities for employees in roles traditionally occupied by men, female engineers might have less access to important skill development resources".

"A1 systematically collaborates administrative tasks and repetitive tasks. Managerial or directorship jobs involve more administrative activities which will be a barrier for female engineers' managers".

Others also stated that AI could result in the under-utilisation of the full capacity of female engineers.

"If AI systems assign projects based on past assignments, women who have been historically assigned less challenging or less visible projects may continue to receive fewer high-profile assignments. Moreover, AI tools used to assign projects or tasks can exhibit biases that affect career development opportunities".

Another respondent was apprehensive of AI as follows:

"AI-driven professional networking platforms might reinforce existing gender imbalances. Networking platforms that suggest connections based on existing networks can perpetuate male-dominated professional circles, making it harder for women to connect with mentors and sponsors".

The above apprehensions are supported by Jang and Kyun (2021), who assert that as a result of AI, women's engineering careers can be curtailed due to different life events and female engineers may experience career interruption. It is the view of the researcher that considering the potential threat of AI in several areas within engineering organisations and considering their importance and significance in technological advancement and economic growth, the Malaysian Government should move in quickly to avert an imminent female engineer redundancy.

5.3.3 How career barriers affect career progression among female engineers

Respondents were asked to describe how each of the identified career barriers affected the career progression of middle level female engineers in Malaysia. The following responses were elicited.

Gender Stereotyping

Generally, Gender Stereotyping was said to be negatively affecting the career progression of middle level female engineers by under-rating or misconstruing their productive capacities and limiting their promotional fortunes. Some of the views by respondents are captured as follows:

"The top position is occupied only by males, even though there are more talented female engineers, we could see them only at supervisory levels, not as directors or CEO"

"In software or electronic engineering, we are treated like male engineers, but not in construction, manufacturing engineering, mechanical, aviation where men are believed to perform better than women engineers".

Many respondents stated that Gender Stereotyping continued to block key opportunities and promotions for women, assuming female engineers may not be able to cope with challenges at higher levels. One respondent stated as follows:

"The problem is that this reality is denying opportunities to females and not treating them equally. The management philosophy is one that just assumes women are not equal to men due to their biological structure, which completely blocks women's advancement".

All respondents were of the view that Gender Stereotyping was a big source of frustration to female engineers who are helpless about it, as a result of a male-dominated socio-cultural system in Malaysia.

The findings related to gender stereotypes align with the recent studies conducted by Khwela et al. (2020) and Ngoepe (2021). These studies reveal that women in the workplace, particularly those in positions of leadership, still encounter a range of challenging behaviours. Such difficulties include instances of sexual harassment, entrenched patriarchal attitudes, and discrimination that affects not only hiring practices but also the recognition of women in senior roles. In addition, many female leaders face bullying and uncooperative behaviour from their colleagues. These women often experience disrespectful treatment, humiliation, condescension, and a damaging reputation, all of which contribute to a toxic work environment.

Work-Life-Balance

All respondents pointed out that Work-Life Balance is important in providing time and space for the middle level female managers to sufficiently manage their work and home. Short of this, middle level female engineers may not be able to achieve speedy career progression. Two respondents remarked.

"Female engineers will do well and climb the career ladder once they can achieve Work-Life-Balance where they are available on the job when required and where they perform their key roles as engineers without excuses"

"For most successful career women or successful top executives, a large chunk of their success can be explained by their ability to balance a social life with work demands"

These responses were consistent with the views of Keyes, (2002) who held that generally, work-life balance plays an essential role in individual well-being such as health satisfaction, family satisfaction, and overall life satisfaction. The findings further confirmed research by Allen *et al.* (2000), that work-life balance leads to high organizational performance, increased job satisfaction, and stronger organisational commitment.

All respondents stated that they were presented with challenges in balancing professional and family responsibilities, a reality that forced women to sacrifice their careers. Female engineers struggled to balance career and family duties, trying to exceed expectations in both. One respondent stated:

"There is no way I can work remotely; it will not be possible when dealing with technical issues in the site".

Aged 27, Mechanical Engineer

> *"It is extremely difficult for a mechanical engineer to work from home. You can't test & monitor a vessel from home, can you."*

The majority of respondents indicated that it was unfair to conclude that women could not maintain a healthy work-life balance. This mindset about career women limited their progression on the job. One female engineer remarked as follows:

> *"Due to the family commitment with young children most of the women take a break after maternity to look after children, when children are grown, they resume work with 5-10 years gap in their experience, which does not allow climbing the career ladder".*

This and other similar responses support the findings of a study by Miller (2004) on engineering women, where he recognized that women engineers spend between 12 – 14 hours on their work, and struggle to compete between family and career.

In terms of organisational support for work-life balance, most respondents stated that engineering organisations were not supportive enough. One senior female engineer remarked:

> *"This Organisation fails to provide sufficient programs and facilities. Malaysian organisations should provide childcare facilities so that mothers will have peace of mind to focus on their career advancement. Organisations decline integrated support to ensure effective performance by female engineers. This often forces women to compromise career goals as the organization does not provide a balanced working environment or programs."*

This lack-of-support perception by respondents is supported in the literature by Williams & Boushey (2010) who held the view that the engineering field is predominantly male, and its culture may not prioritise or understand the specific needs of female engineers, resulting in inadequate support for work-life balance. This position is further supported by Heilman, (2012) who states that unconscious biases against women in engineering can lead to unequal treatment and a lack of support for work-life balance initiatives.

Technical Skills Limitation

Respondents were asked to describe the relationship between Technical Skills Limitations and career progression among middle level female engineers. All respondents were unanimous on the view that the absence of technical skills and technical efficiencies among engineering personnel could limit their promotion career development or progression. A respondent stated:

> *"Without upskilling and updating technical skills, of course, there will be technical deficiencies on the part of both male and female engineers, so acquiring new technical skills for me is a must in every manufacturing organization."*

The majority of the respondents lamented that their organisations provided little support to female engineers to overcome their Technical Skills Limitations which impeded female career progression. The following were remarks made in this regard:

> *"There is insufficient technical skills development in this organisation, which focuses only on productivity. Productivity targets to be achieved end of the month is the main priority, not female engineers training".*
>
> *"There are limits in career advancement opportunities for women due to unavailability of set skills. However. development programs for career progress exist for all and are provided to all equally".*
>
> *"Limited access to training and development and sufficient time not given for training and development. Training is given for project accomplishment only not for future progression to anyone in the organisations".*
>
> *"My organisation provides technical skills training focusing on assigned projects only. To enhance career development prospects, future skills need to be developed by each individual whether male or female.*

The above findings are consistent with the observation by Ziegler et al (2017) that persistent stereotypes and biases about gender roles can negatively impact women's access to technical skills training, where women may be subtly or overtly discouraged from pursuing technical fields due to the perception that these fields are more suitable for men.

Negative Perception

Respondents were asked to describe how Negative Perception affected the career progression of middle level female engineers. The following are summary responses.

"Negative Perception creates unwelcoming environments for the progress and prosperity of female engineers and also reduces their motivation. This phenomenon distracts and demotivates women further in their career progression".

"In our context, the Negative Perception of bias against women reduces job satisfaction and retention among female engineers' managers. It is worrying to note that this is happening here. I mean doubting female abilities for senior positions even though we have proved ourselves in various projects and with our several years of experience".

"Assumptions created by men that women are not suitable for the engineering field due to childbearing and the constant negativity fuels frustration and demotivation. This makes job satisfaction non-existent".

The above views by respondents confirm the observation of Mavin et al., (2017) that the perception of women as less competent or less suited for leadership roles can lead to a lack of confidence among female employees which can result in women not pursuing leadership positions or not advocating for themselves when it comes to career advancement opportunities.

Misogynistic Management

The research sought to assess the effect of Misogynistic Management on the career progression of middle level female engineers. All respondents stated that this phenomenon of masculine management has always been detrimental to the progress of female engineers. Some of the responses elicited are as follows;

"In manufacturing and engineering companies mostly, top positions are managed by males as CEO, Directors, etc. Even though there are female engineer managers, who have proved over the years in the sector, top management knowingly or unknowingly excludes female engineer managers for selecting for the top senior positions".

"Male-dominated management ignores to support or foresee female engineers' talents within the organisation. Management does not promote fair and equitable advancement for all".

"Discriminatory practices by male-biased management hinder career growth through biased management practices. This ensures no career progression for women. It will be welcomed by female engineers if our organisation includes a policy to empower us".

The perspectives mentioned align well with Rokka's (2021) assertion that misogyny poses a significant obstacle to the advancement of women in leadership roles and their career development across the globe, affecting both

private companies and government organisations. Similarly, these insights echo the findings of Ngoepe (2021) and Kipkosgei (2021), who note that female managers often encounter misogynistic attitudes, especially from their male counterparts. Such behaviours are typically employed to reinforce male authority in public sector leadership and to hinder the professional growth and leadership potential of women in managerial positions.

5.3.4 Empowerment factors for breaking career barriers of female engineers in Malaysia

Respondents were required to identify existing empowerment factors that could be used to break the career barriers of female engineers in Malaysia.

Empowerment Policies

The majority of the respondents indicated that currently, their respective organizations do not have any official policies on empowerment as well as decision-making by middle-level female engineers in Malaysia. This is how some of the interviewees captured their experiences.

> *"[…] there are no empowerment policies due to the fear their subordinates might overtake their position".*

Aged 36 years, ITM Engineer

> *"There is no empowerment policy formulated as such. […] but clearly, they will not allow me to take any final decision. Frankly speaking, there is no empowerment policy in our organisation".*

Aged 36 years, Mechanical Engineer

> *"I don't think in Malaysia they have formulated policy as such. Malaysia should come out with an empowerment policy. Top senior female managers are not allowed to make decisions like senior male managers. […] middle-level female engineers are not allowed to make or take serious decisions because of gender stereotyping".*

Aged 42 years, Engineer ITM

> *"I have been working for the past 10 years and never heard of empowerment policy. I believe every organization should empower their employees. I think our HR should draft a policy on how to empower their staff. It will be wonderful if our organisation comes out with an empowerment policy. I have not been participating in decision-making activities".*

Aged 39 years, Electrical Engineer

I have worked in two companies in Malaysia since graduating in electrical engineering but never heard of any policy on empowerment.

The seeming absence of Empowerment policies in most engineering or manufacturing businesses in Malaysia is perhaps a reflection of the view of Aghazamani and Hunt (2017) that despite its scholarly and practical importance, empowerment remains a highly sophisticated and fluid concept that rejects any single operationalization.

Respondents were required to describe empowerment factors that could be used to break the career barriers of female engineers in Malaysia. The concepts of structural empowerment; psychological empowerment and self-efficacy were discussed by respondents as follows:

Structural Empowerment

Perceptions of Structural Empowerment by respondents were captured as follows:

> *"Providing a conducive working environment with facilities such as childcare, maternity leave, providing training, etc. for lower-level employees",*
>
> *"Organisational practices providing opportunities, resources, and provide guidance and support to the staff"*
>
> *"A system which determines the organisations policies, incorporate legislations, and monitors equal opportunities systematically, with an ability to provide access to key projects and promotions for both males and females from the lower ranks"*
>
> *"Structural Empowerment is ideal in theory but often lacking in practice. It is a robust support structure fostering opportunities within the organization. It consists of bridges of support and opportunity for progression of an individual".*

The above perceptions on Structural empowerment appear to be consistent with the position of Seibert *et* al. 2011 and Hansen *et al*., (2017) who held the view that

Structural empowerment refers to the process by which employees at lower levels within an organisation are given the authority and resources to make decisions and take action. This empowerment arises from the implementation of various frameworks, practices, and policies designed to reduce the traditional hierarchical barriers within the organization. By creating a more horizontal structure, employees are better positioned to exercise their capabilities effectively.

Psychological Empowerment

Perceptions of Psychological Empowerment by respondents were captured as follows:

> *"Recognising individual's abilities, providing support, guidance promoting, providing monetary allowances such as bonus, etc., Trusting the candidate to accomplish tasks/responsibilities".*
> *"Fostering a sense of belonging, competence, and providing purpose/desire to develop along with the organisation. It should involve promoting systemic issues and enhance motivation and creativeness".*
> *"Lighting the inner flame which motivates to reach a desired goal. Providing support & guidance, delegate responsibility by establishing trust with female employees, which will empower the employees".*
> *"Providing a sense of belonging and motivating to achieve what one desires in his or her career which is difficult to achieve in a biased environment"*

The above perceptions on psychological empowerment appear to be consistent with the position of Spreitzer*et al.,* (1997) and Dewettinck and Ameijde, (2011) who held that psychological empowerment gives priority to individuals' satisfaction rather than a specific management approach that is intended to empower individuals

Self-Efficacy

Perceptions of Self-Efficacy by respondents were captured as follows:

> *"Well… organisations may put in place all the facilities – structural and psychological but as an individual, we need to have the ambition to climb the career ladder by breaking all the obstacles- such as negative perception, gender stereotype".*
>
> *"Belief in one's abilities to meet challenges and developing ambition to achieve to the highest goal".*
>
> *"Allowing staff to develop confidence in the difficult and biased environment to succeed."*
> *"The inner mantra of "I can."*
>
> *"Unwavering belief in one's abilities to attain the goal, influenced by personal and situational factors."*
>
> *"Hard to maintain confidence amidst systemic barriers".*

The above perceptions on Self-Efficacy tie in with the conclusion drawn by Holdsworth (2007) that high self-efficacy results in initiating behaviours and causes people to work hard and persist when faced with obstacles, whereas low self–efficacy causes individuals to avoid situations that require certain skills, therefore depriving them of learning and obtaining competencies in relevant area.

Spiritual empowerment

Interesting views on the role of the Spiritual in empowerment emerged during the interviews. Most respondents, in addition to Structural Empowerment, Psychological Empowerment, and Self-Efficacy, mentioned 'Spiritual Empowerment', another kind of empowerment derived from the Spiritual. The respondents believed that Structural Empowerment was derived from the administrative and bureaucratic mechanisms of the Organization; Psychological Empowerment was derived from the mind, and Self-Efficacy was an attitude derived from the persona or the self. Several respondents held the view that granted beliefs that the Spiritual or Spiritual was superior to the self, there is the possibility of the existence of 'Spiritual Empowerment' derived from a higher or superior power or a supreme being (God). Similar views expressed were that believing in the power of the Supreme God and practicing positive thinking can foster a proactive attitude and encourage female engineers to pursue opportunities and overcome obstacles in their career paths. Many respondents believed Spiritual empowerment generates inner confidence among female engineers and propels them to achieve career progress**.** Some of the remarks are captured below:

> *"Spiritual empowerment can assist female engineers in achieving career progression by fostering a strong sense of inner confidence and resilience. It encourages self-reflection, helping them to align their professional goals with their values and purpose" This inner clarity can lead to greater motivation, effective decision-making, and the ability to navigate workplace challenges with grace, ultimately enhancing their leadership qualities and career advancement opportunities".*

> *"Spiritual empowerment can enhance female engineers' resilience and ability to handle stress, which is crucial for career progression. By aligning their work with their values, they can find greater energy and satisfaction in their roles, leading to increased productivity and a stronger presence in the workplace"*

Some of the respondents believed that Spiritual empowerment could promote a more inclusive and supportive work environment which can enhance the career progression of women.

> *"By integrating spiritual principles of equality and shared well-being, female engineers can create a more inclusive and supportive work environment that promotes collective progress and individual advancement".*
>
> *"Spiritual empowerment can assist female engineers in achieving career progression by fostering a sense of collective purpose and solidarity with their colleagues. This communal strength can inspire them to challenge workplace inequalities and advocate for fair treatment and opportunities".*

Another category of respondents held that Spiritual empowerment given by the supreme being can open career advancement opportunities. They stated that spiritual empowerment can serve as a tool for female engineers to project an image of confidence and leadership, enhancing their visibility and influence within their workplaces.

> *"By showcasing their spiritual journey through personal success, they can position themselves as valuable assets to their employers, which will pave the way for career progression through increased recognition".*
>
> *"Spiritual beliefs such as mindfulness, and the power of positive thinking can motivate female engineers. Mindfulness can help them stay focused and improve their performance.*
>
> *"Believing in the power of positive thinking can result in a proactive attitude, which will encourage them to pursue opportunities and overcome obstacles in their career paths"*

5.4 Triangulation of Quantitative and Qualitative Findings

Triangulating quantitative and qualitative results involves combining and integrating both types of data to gain a more comprehensive understanding of a research topic. In this study, the triangulation involved the following six (6) steps: (1) identification of overlapping themes or common themes or patterns that emerge from both quantitative and qualitative data, (2) compare and contrast findings (similarities and differences), (3) validating the qualitative findings using the quantitative data, (4) using the qualitative data to contextualize the quantitative findings (providing deeper understanding of the quantitative results, (5) looking for convergence and divergence, and (6) integrating findings into a cohesive narrative. These steps are applied to triangulate each research objective.

5.4.1 Career Barriers Confronting Middle-level Female Engineers

This objective sought to identify the barriers that confront middle-level female engineers in Malaysia. The overlapping themes were gender stereotyping, work-life balance, technical skills limitation, negative perception, and misogynistic management. These five (5) themes emerged in both quantitative and qualitative data, and they constitute the barriers that confront middle-level female engineers in Malaysia.

First and foremost, the quantitative data depicts a mean of 3.05 and a standard deviation of 0.31 for gender stereotyping. The mean shows that the respondents affirmed that they experience gender stereotyping. Put differently, gender stereotyping is pervasive among engineering companies in the Malaysian manufacturing sector. A similar finding was obtained from the qualitative data, where the respondents emphasised that gender stereotyping was the main barrier impeding the progress of female engineers at workplaces. They stated that

women who qualified just like men were not respected and recognized as such, and this had the potential to impede their [female engineers] career progression. Even though the quantitative results show that gender stereotyping is not the main career barrier confronting female engineers, the qualitative results show otherwise as all the participants in the interview indicated that gender stereotyping was the main career barrier of female engineers to progress. Regardless, there are no conflicting views or divergence in both quantitative and qualitative results that gender stereotyping is a career barrier that could affect female engineers. Thus, it can be concluded that gender stereotyping is one of the main career barriers confronting female engineers in Malaysia.

Next, the quantitative data showed a mean of 2.88 and a standard deviation of 0.61 for work-life balance. The mean depicts that approximately the respondents agreed that their work-life balance was average, affirming that work-life balance was not a too prevalent career barrier in the manufacturing sector of Malaysia. From the qualitative perspective, work-life balance was identified as a career barrier which was popularly cited by almost all female engineers during the research. The participants widely asserted that their roles as women in society placed social and domestic responsibilities on them. For this reason, there was a false belief that women could not combine their domestic roles and be effective at work. Therefore, it was considered that a female engineer could not balance her work-life effectively and was marginalized from top managerial positions. There are no conflicting views or divergences in both quantitative and qualitative results that work-life balance is a career barrier that could affect female engineers. Both quantitative and qualitative results converged, and the qualitative findings explain the perception behind female engineers' work-life balance, and how it could affect their progress to the top management level. Hence, it can be said that work-life balance is another career barrier confronting female engineers in Malaysia.

The quantitative data presented a mean of 1.91 and a standard deviation of 0.24 for technical skills limitation. The mean showed that the respondents approximately disagreed that they had technical skills limitations to progress as female engineers. It follows that technical skills limitation as a career barrier among female engineers was not pervasive among manufacturing companies in Malaysia. It also means that the respondents do not consider technical skills limitation as a major career barrier confronting female engineers. However, from the qualitative perspective, the participants were asked whether they had constraints and deficiencies in their technical abilities that hindered their effectiveness and performance in their professional roles. Their popular responses were that female engineers were usually not given opportunities at their workplaces to upgrade or improve their technical skills through training, so they were handicapped during the process of delivering a project which hampered their promotion. There was a sharp divergence between the qualitative and quantitative results. While the quantitative results showed that the respondents did not consider technical skills limitation as a major career barrier, the qualitative results show that it was a considerable barrier because women were not allowed to handle technical assignments to even learn on the job. The qualitative results further

explained that female engineers are usually labelled as not suitable for engineering and technically incompetent in engineering organizations. Therefore, training and technical skills development were not available for them. It follows that female engineers may be technically competent but were not trained and developed to handle technical duties. Thus, the perception of technical skills limitation serves as a career barrier confronting female engineers in Malaysia.

The quantitative data depicted a mean of 3.10 and a standard deviation of 0.58 for negative perception. The mean suggested that approximately the respondents agreed that negative perception was a career progression barrier in the manufacturing sector of Malaysia, affirming that female engineers were widely perceived to lack what it takes to progress to the top management level in the sector. A similar finding was obtained from the qualitative data, where the respondents emphasised that negative perception was another key barrier impeding the progress of female engineers at workplaces. They mentioned that women were perceived by organizations as unfit or incapable of doing engineering work. Thus, female engineers were delayed or denied from gaining deserved promotions or rising to top managerial roles. They explained that their male counterparts made negative remarks about them, and management's perception was that it was not worthwhile training and promoting female engineers. These qualitative results explain why about 62% of the respondents (representing the mean of 3.10) in the survey affirmed that negative perceptions about female engineers were pervasive in the manufacturing sector of Malaysia, serving as a major career barrier. It can be noticed that there is no divergence in both qualitative and quantitative results, and the qualitative data sufficiently explain the quantitative findings.

Lastly, the quantitative data presented a mean of 3.39 and a standard deviation of 0.48 for misogynistic management. The mean showed that the respondents confirmed that their superiors exhibited a misogynistic management style in managing their organisations. It follows that misogynistic management was pervasive among manufacturing companies in Malaysia, which hindered the career advancement of middle-level female engineers in the sector. Similarly, the qualitative data shows that the majority of participants blamed management for a type of management style that usually favoured men. Several participants complained about a masculine bureaucracy. They believe male managers always assumed that female engineers were not capable of doing certain tasks. They believed women were weaker, which is mere misogynism. As a result, management treated female engineers with disregard. The qualitative results provided a better understanding of the quantitative findings. However, it is worth noting that among the five barriers identified in the quantitative data, misogynistic management was the most prevalent or the major career barrier likely to confront female engineers in Malaysia. However, the qualitative findings emphasis gender stereotyping as the main career barrier.

5.4.2 Empowerment Factors in Breaking Career Barriers

Under this objective, the quantitative data affirms three (3) dimensions of empowerment or empowerment factors in breaking career barriers. These factors were structural empowerment, psychological empowerment, and self-efficacy empowerment. These factors were overlapping themes in both quantitative and qualitative results. Their convergence or divergence and explanations are provided in the ensuing paragraphs.

The quantitative data showed a mean of 2.20 and a standard deviation of 0.40 for structural empowerment. The mean indicates that the structural empowerment of female engineers is relatively low since the mean is below the midpoint of 2.5 on a scale of 1 to 5. Though structural empowerment is identified as an empowerment factor, its potency in addressing the career barriers may be low. Regarding the qualitative data, the participants generally noted that there are no empowerment policies in their organisations to break the career barriers. However, they admitted that structural empowerment may help to break the career barriers. They indicated that it is important for the management of various organisations to provide a conducive working environment with facilities such as childcare, maternity leave, training, and skill development for lower-level employees to structurally empower them to progress to the top. They also recommended organizational practices that provide opportunities, resources, guidance, and support to the staff, especially female engineers. While the qualitative results support the quantitative findings, the potency of this empowerment factor in breaking the career barriers can be statistically proven under objective four.

The quantitative data presents a mean of 2.20 and a standard deviation of 0.23 for psychological empowerment. The mean indicates that the respondents confirmed they were not psychologically empowered as expected. It suggests that the psychological empowerment of female engineers was below average, and it could be stimulated by the type of management style in the various organizations. Though psychological empowerment was identified as an empowerment factor, its potency in addressing the career barriers may be low. In terms of the qualitative data, the participants generally noted that there are no deliberate psychological empowerment strategies or policies in their organisations to break the career barriers. Nevertheless, they submitted that psychological empowerment may also help to break career barriers. They suggested it is important for the management of various organizations to recognize individual abilities, provide support, promote guidance, provide monetary allowances such as bonuses, and trust the workers, particularly female engineers to accomplish tasks/responsibilities. They also emphasised fostering a sense of belonging, and competence, and providing purpose to develop along with the organization. Such empowerment should involve promoting systemic issues and enhancing motivation and creativeness. The qualitative results underscore the quantitative

findings, but the potency of this empowerment factor in breaking the career barriers can be statistically proven under objective four.

The quantitative data shows a mean of 3.91 and a standard deviation of 0.26 for self-efficacy empowerment. The mean score indicates that the respondents confirmed they were empowered to take personal initiatives to become better in the discharge of their duties. It suggests that self-efficacy empowerment was above average because the mean was above the midpoint of 2.5 on a scale of 1 to 5. Thus, as an empowerment factor, self-efficacy empowerment may have a high potency to break the career barriers. Regarding the qualitative data, the participants generally expressed their perception of self-efficacy empowerment and how it may serve as a tool to break the career barriers. They noted that organisations may put in place all the facilities structural and psychological, but female engineers need to have the ambition to climb the career ladder by breaking all the obstacles including negative perceptions, gender stereotypes, etc. They added that believing in their [female engineers] abilities to meet challenges and developing ambition to achieve the highest goal was a sure way to overcome the career barriers. However, they stressed the need for management to allow staff, particularly female engineers to develop confidence in difficult and biased environments to succeed. Though the qualitative results underscore the quantitative findings, the potency of the self-efficacy empowerment factor in breaking the career barriers can be statistically proven under objective four.

5.4.3 Relationship between Career Barriers and Career Progression

Regarding this objective, the quantitative data was used to test the hypotheses to establish the relationship between career barriers and the career progression of female engineers. The five career barriers (gender stereotyping, work-life balance, technical skills limitation, negative perception, and misogynistic management) identified were employed as independent variables while career progression was employed as a dependent variable. Given the analytical model (i.e. hierarchical regression model) that was adopted, the relationship between the career barriers and career progression was treated as the main effect. The quantitative findings showed that all career barriers (gender stereotyping, work-life balance, technical skills limitation, negative perception, and misogynistic management) had a significant relationship with career progression. Whereas work-life balance depicted a positive effect, the rest revealed a negative effect. Compared to the qualitative results, the participants did indicate that these career barriers have the potential to impede the career progression of female engineers. Through the qualitative results, it is understandable that work-life balance will rather promote career progression unless it is imbalanced. This explains why work-life balance had a positive

relationship with career progression. It implies that if female engineers are unable to balance their work-life, they are likely not to progress in their career to top managerial roles as they might be perceived as having no time to take on a higher responsibility. It must be emphasised that the qualitative findings should be used to explain the quantitative findings since it is impossible to establish a statistical relationship qualitatively.

5.4.4 Moderating effect of empowerment factors

This is the fourth objective of this study. Here, the researcher sought to test whether the empowerment factors – structural, psychological, and self-efficacy could serve as an appropriate tool to break the career barriers and improve career progression. As part of the hierarchical regression analysis, the researcher assessed the interaction effect of the independent variables (gender stereotyping, work-life balance, technical skills limitation, negative perception, and misogynistic management) and empowerment factors (structural, psychological, and self-efficacy) on career progression. The potency of each empowerment factor was tested by using them to moderate the relationship between career barriers and career progression. The results are highlighted below and underscored by the qualitative results.

Structural empowerment enhanced the negative relationship between gender stereotyping and career progression. Thus, structural empowerment could not serve as an empowerment tool to break gender stereotyping. This quantitative result is contrary to the qualitative result, where the participants submitted that though there is no empowerment policy in various organisations, structural empowerment could potentially break gender stereotyping. Therefore, practicing gender stereotyping alongside ensuring structural empowerment will significantly obstruct the career progression of female engineers in Malaysia. Next, psychological empowerment positively moderates the negative relationship between gender stereotyping and career progression. This means that psychological empowerment is an appropriate tool to break gender stereotyping. This quantitative finding is underscored by the qualitative result which emphasised the potency of psychological empowerment to improve the career progression of female engineers where the culture of gender stereotyping is pervasive. Lastly, self-efficacy empowerment positively moderates the negative relationship between gender stereotyping and career progression, meaning that self-efficacy empowerment is an effective tool to break the gender stereotyping of female engineers. In a nutshell, psychological and self-efficacy empowerment factors are relevant and effective mechanisms for breaking gender stereotyping of female engineers to promote them to the top management level in the Malaysian manufacturing sector.

Furthermore, structural empowerment enhanced the positive relationship between work-life balance and career progression. It follows that structural empowerment can serve as an empowerment tool to break the imbalance

work-life of female engineers. This quantitative result is supported by the qualitative result, where the participants noted that structural empowerment could potentially augment work-life balance to promote the career progression of female engineers. Therefore, practicing work-life balance alongside ensuring structural empowerment will significantly enhance the career progression of female engineers in Malaysia. Next, psychological empowerment does not moderate the positive relationship between work-life balance and career progression. It follows that the promotion of psychological empowerment would not affect the association between work-life balance and career progression. This quantitative finding is a divergence from the qualitative result which emphasized the potency of psychological empowerment to improve the career progression of female engineers where the culture of work-life balance is pervasive. Lastly, self-efficacy empowerment negatively moderates the positive relationship between work-life balance and career progression, meaning that self-efficacy empowerment is not an effective tool to improve the positive effect of work-life balance on the career progression of female engineers.

Structural empowerment enhanced the negative effect of technical skills limitation on career progression. Thus, structural empowerment could not serve as an empowerment tool to break technical skills limitations. This quantitative result is contrary to the qualitative result, where the participants mentioned that though there is no empowerment policy in various organizations, structural empowerment could potentially break technical skills limitations. Therefore, the perception of technical skills limitation together with structural empowerment will significantly obstruct the career progression of female engineers in Malaysia. Additionally, psychological empowerment negatively moderates the negative association between technical skills limitation and career progression. This means that psychological empowerment is not an appropriate tool to break technical skills limitations. This quantitative finding contradicts the qualitative result which stressed the potency of psychological empowerment to break technical skills limitation and improve career progression of female engineers. Self-efficacy empowerment negatively moderates the negative relationship between technical skills limitation and career progression. This suggests that self-efficacy empowerment cannot serve as an effective tool to break the technical skills limitation of female engineers. In effect, all empowerment factors were not relevant and effective mechanisms to break the technical skills limitations of female engineers to promote them to the top management level in the Malaysian manufacturing sector.

Structural empowerment enhanced the negative relationship between negative perception and career progression. Thus, structural empowerment could not serve as an empowerment tool to break negative perceptions. This quantitative result is contrary to the qualitative result, where the participants submitted that though there is no empowerment policy in various organisations, structural empowerment could potentially

break negative perceptions. Therefore, where there is a negative perception and management implements structural empowerment, the career progression of female engineers is likely to be obstructed significantly. On the other hand, psychological empowerment positively moderates the negative relationship between negative perception and career progression. This means that psychological empowerment is an appropriate tool to break negative perceptions. This quantitative finding is underscored by the qualitative result which emphasised the potency of psychological empowerment to improve the career progression of female engineers where negative perception is pervasive. Similarly, self-efficacy empowerment positively moderates the negative relationship between negative perception and career progression, meaning that self-efficacy empowerment is an effective tool to break negative perceptions about female engineers. To sum up, psychological and self-efficacy empowerment factors are relevant and effective mechanisms to break negative perceptions about female engineers to promote them to top management level in the Malaysian manufacturing sector.

Structural empowerment enhanced the negative association between misogynistic management and career progression. It means that structural empowerment could not serve as an empowerment tool to break misogynistic management. This quantitative result is contrary to the qualitative result, where the participants submitted that though there is no empowerment policy in various organizations, structural empowerment could potentially break misogynistic management. Therefore, practicing misogynistic management alongside ensuring structural empowerment will significantly obstruct the career progression of female engineers in Malaysia. On the contrary, psychological empowerment positively moderates the negative association between misogynistic management and career progression. It implies that psychological empowerment is an appropriate tool to break misogynistic management. This quantitative finding is underscored by the qualitative result which stressed the efficacy of psychological empowerment to improve the career progression of female engineers where the management style is misogynistic. Likewise, self-efficacy empowerment positively moderates the negative correlation between misogynistic management and career progression, indicating that self-efficacy empowerment is an effective tool to break misogynistic management style, which affects female engineers in the Malaysian manufacturing sector. It can be concluded that psychological and self-efficacy empowerment factors are relevant and effective mechanisms to break misogynistic management in the various organisations to help female engineers advance to the top in the Malaysian manufacturing sector.

5.5 Validation of Conceptual Framework

This section reports on qualitative data collected from 20 Human Resource (HR) managers working in selected Engineering and Manufacturing Organizations in Malaysia. The purpose was to enable the researcher to carry out a validation of the conceptual framework that was formulated in Chapter Two. The model suggested that career barriers inhibiting female engineers in Malaysia can be mitigated through structural empowerment, psychological empowerment, and self-efficacy empowerment to promote the career progression of female engineers in Malaysia.

Before the interview, the researcher provided a brief background to the research including the explanation of key concepts, notably: Career Barriers (Gender Stereotyping, Work-Life Balance, Technical Skills Limitation, Perception and Misogynistic Management) and Career Progression. The structured interview approach was used to collect qualitative data from HR Managers. The following are the results.

5.5.1 Gender Stereotyping

How Structural Empowerment can be used to mitigate Gender Stereotyping to facilitate Career Progression

The majority of respondents stated they would recommend a quota system for female engineers to be able to attain promotion. A 50% quota was popularly mentioned for gender balance reasons. A few respondents proposed between 50 to 60%. It was largely agreed among respondents that female engineers will be motivated to be more innovative in accomplishing tasks due to equal opportunity and treatment. The majority of respondents supported the view that the quota system should be implemented as a long-term policy. Nearly all respondents were of the view that transparency in the recruitment process will inspire female engineers to progress in their careers.

Asked if they would consider gender equality policy as a top priority, most respondents responded in the affirmative. They explained that gender equality will motivate female engineers to achieve progression. Others stated that Female engineers would be confident to participate in all organisational activities. Another popular response was that allowing middle-level female engineers to develop policies and training programs would boost their morale.

Asked how transparent the staff hiring process was in their respective Organisations, most respondents described it as “very transparent” with about a quarter suggesting that it was “fairly transparent”

How Psychological Empowerment can be used to mitigate Gender Stereotyping to facilitate Career Progression

The majority of respondents said they would recommend that female engineers should be given equal opportunity to participate in challenging projects/tasks. Asked how they would promote and facilitate female engineers' participation in challenging projects, the majority of HR managers said they would introduce incentive schemes and provide guidance and support. They also suggested that close bonds with all staff regardless of their gender should be built. Asked how HR managers could stimulate a sense of belonging within the team that does not discriminate against female engineers, all respondents stated that could be done by implementing non-discriminatory policies concerning rewards and by ensuring equal opportunity for all. There was a common suggestion that regular staff durbars and off-site retreats should be frequently held.

How self-efficacy can be used to mitigate Gender Stereotyping to facilitate Career Progression

All HR managers said they would recommend a career advancement policy to provide opportunities for female engineers to upgrade their knowledge. HR Managers reported that they would support female engineers to be assertive and proactive to defend in any discriminatory situation, through organisational policies and motivational workshops and seminars. The majority of respondents stated they would strongly promote self-efficacy among female engineers by updating their knowledge on the latest technological changes in the industry, which will provide confidence among the female engineers to handle challenging tasks.

5.5.2 Work-Life Balance

How Structural Empowerment can be used to promote Work-Life Balance to facilitate Career Progression

Almost all HR respondents agreed to recommend and implement a flexible working hours policy for female engineers concerning maternity leave and childcare facilities according to EU/NORDIC countries' standards. They all advocated for a flexible working policy that allows female engineers to allocate time between family and career. Asked how they would ensure the wellness of female engineers, over half of respondents stated they would achieve this by promoting work-life balance among female engineers based on EU/NORDIC procedures. Nearly all respondents agreed on the view that promoting a supportive organizational culture where equality and diversity are celebrated will promote career progression. Such a culture will motivate female engineers to aspire to the top, they unanimously stated.

How Psychological Empowerment can be used to promote Work-Life Balance to facilitate Career Progression.

All respondents agreed that a culture of trust will motivate both female and male engineers to carry out tasks much more effectively and efficiently. Asked how they will spearhead the building of a culture of trust in the organisation to motivate all the staff, one respondent stated

"Regular open communications including career advancement will motivate female engineers to progress to the next level."

How Self-Efficacy can be used to promote Work-Life Balance to facilitate Career Progression

All respondents agreed to provide and continuously improve the time management skills of female engineers given their extra-domestic responsibility through training and advocacy. All respondents saw this as very important as female engineers would be time-conscious and disciplined to balance their time between family and career. All respondents agreed it is important to ensure that female engineers are well organised to achieve work-life balance. When this is achieved, female engineers will properly organise their activities to achieve career progression.

5.5.3 Technical Skills Limitation

How Structural Empowerment can be used to mitigate Technical Skills Limitation to facilitate Career Progression

All respondents agreed to recommend and implement accessibility for all staff to participate in the skills development programme. This would encourage and provide equal opportunities for formal and informal networking by both male and female engineers. Respondents stated that formal and informal networking would allow female engineers to share technical and other information and to gain different perspectives to develop their careers.

A large number of respondents mentioned they would advocate for on-the-job training and mentoring programmes for female engineers to overcome their Technical Skills Limitations. They proposed regular training to improve technical skills. Some programmes cited included workshops, seminars, CPD and overseas exchange programmes. A sabbatical leave policy that allows female engineers to meet personal goals and discovers their future needs was also mentioned by half of the respondents.

How Psychological Empowerment can be used to mitigate Technical Skills Limitations to facilitate Career Progression

Respondents in the majority agreed to recommend and provide an exclusive environment for females to participate in training and mentoring programmes, funds permitting. They hoped to achieve this by establishing financial support systems to fund training mentoring and reward schemes. All respondents suggested the implementation of reward schemes such as promotion, bonuses and allowance for staff (both male and female) who upgrade their qualifications. One respondent stated that she would encourage female engineers to develop a self-reflection portfolio to assess themselves to progress in their careers.

How self-efficacy can be used to mitigate Technical Skills Limitations to facilitate Career Progression

All of the respondents agreed to arouse female engineers' willingness to enhance skills and technologies through regular occupational campaigns and persuasive approaches. Female engineers will be motivated and prepared to be proactive in enhancing their skills and qualifications.

5.5.4 Negative Perception

How Structural Empowerment can be used to mitigate Negative Perceptions to facilitate Career Progression

Nearly all of the respondents agreed they would recommend and ensure that female engineers are given independence in determining tasks, on the basis that opportunities given to make decisions would promote their self-esteem. Also, nearly all respondents stated that they were willing to motivate Female engineers to aspire for higher designation.

Respondents were asked to suggest systems they will implement to ensure that female engineers are not perceived to be physically weak to compete with their male counterparts. Seven out of ten HR managers stated that they will recommend and ensure that challenging projects/tasks are distributed to all the staff equally. A female respondent stated, "…. *it is important to create among female engineers the willingness to tackle challenging tasks and develop self-motivating skills that will lead to their career progression*". All respondents said they would campaign to ensure that top management positions are not reserved for only men in the organisation but for females as well. They all indicated they would inspire female engineers to compete for higher managerial roles thereby progressing in their careers.

How Psychological Empowerment can be used to mitigate Negative Perception to facilitate Career Progression

HR managers were asked if they would recommend and ensure that both male and female engineers are equally allowed to participate in decision-making. Nearly all of them responded in the affirmative. They further agreed that promoting inclusiveness will enable female engineers to exhibit their creativity and individuality. Four female respondents were of the view that female engineers should be bold and brave to accept higher roles in engineering. Similarly, four out of ten respondents supported the view that it will be worthwhile to provide an organisational psychologist to disabuse the minds of female engineers that the culture of engineering is masculine.

How self-efficacy can be used to mitigate Negative Perceptions to facilitate Career Progression

Respondents were asked how they could empower female engineers to be emotionally tough to lead just as their male counterparts. Nearly all respondents were of the view that Female engineers should get emotionally balanced to lead others, including male colleagues, providing the edge to seek to advance in their careers.

5.5.5 Misogynistic Management

How Structural Empowerment can be used to mitigate Misogynistic Management to facilitate Career Progression

Respondents were asked if they would recommend and introduce a career pathway to all staff. All respondents said they would, giving various reasons, One HR Manager stated: "*Including career pathway as criteria in the staff performance review will motivate female engineers to work towards career advancement".* All respondents said they would address biases about female engineers' capabilities, to ease the frustration of progressing in their careers, by encouraging Female engineers to develop their capacity.

About six out of ten respondents stated that they would recommend and implement a support system for female engineers to move upwards in the management structure. The same number of respondents thought that female engineers should be recruited based on a quota system on a balance of 50:50. Seven out of ten respondents were of the view that there should be equal chances for female engineers to progress to the top management level in the organisation.

How Psychological Empowerment can be used to mitigate Misogynistic Management to facilitate Career Progression.

Nearly all respondents offered to recommend and implement a grievance response system to support female engineers who are frustrated by unfair managerial treatment. Eight out of ten respondents supported the idea of

a support system for female engineers who may be unfairly treated by management. Furthermore, nearly all respondents saw the need for a psychologist to address females who experience bias or any mental breakdown of female engineers that may affect their career advancement.

How Self-Efficacy can be used to mitigate Misogynistic Management to facilitate Career Progression

Respondents were asked how they would empower female engineers to handle and overcome managerial biases in the organisation. Nearly all respondents suggested that Female engineers will be encouraged not to be weighed down by an inferiority complex. There was a unanimous view amongst respondents that Female engineers must develop the ability to handle and overcome bias against them. All respondents called for systems to be put in place to ensure that female engineers do not feel inferior when management is misogynistic, or leadership is strongly prejudiced against them.

The qualitative dimension of the study revealed that artificial intelligence (AI) posed a serious threat to the career progression of female engineers in Malaysia. The majority of respondents had strong feelings that AI is going to pose a strong career barrier for female engineers not only in Malaysia but globally. They identified this threat and were of the view that though AI is not an observable career barrier currently, it will be so before long. When the researcher probed further, respondents explained that in the engineering sector, it is easier to replace human skills with AI, considering the existing discrimination against women in engineering. Middle level female engineers and female technicians face the biggest threat of redundancy. This finding on AI was validated and confirmed by the 10 human resource managers during the validation.

In the qualitative aspect of the study, most respondents, in addition to Structural Empowerment, Psychological Empowerment, and Self-Efficacy, mentioned ‘Spiritual Empowerment’, another kind of empowerment derived from the Spiritual. The respondents believed that Structural Empowerment was derived from the administrative and bureaucratic mechanisms of the Organization; Psychological Empowerment was derived from the mind, and Self-Efficacy was an attitude derived from the persona or the self. Several respondents held the view that granted beliefs that the Spiritual or Supernatural was superior to the self, there is the possibility of the existence of ‘Spiritual Empowerment’ derived from a higher or superior power or a supreme being (God). Similar views expressed were that believing in the power of the Supreme God and practicing positive thinking can foster a proactive attitude and encourage female engineers to pursue opportunities and overcome obstacles in their career paths. Many respondents believed Spiritual empowerment generates inner confidence among female engineers and propels them to achieve career progress. This finding on spiritual empowerment was validated and confirmed by the 10 human resource managers during the validation.

5.6 Chapter Summary

This chapter has reported qualitative and quantitative findings of the research by displaying data in appropriate forms. The first section of the chapter analysed quantitative data, whilst the second section analysed and discussed qualitative findings on the topic under investigation. Given that the researcher adopted the mixed method approach, the results from the quantitative and qualitative data were triangulated. The qualitative results provided a better understanding of the quantitative findings. Whilst among the five barriers identified in the quantitative data, misogynistic management was the most prevalent or the major career barrier likely to confront female engineers in Malaysia, the qualitative findings emphasize gender stereotyping as the main career barrier. Subsequently, the chapter reported on the model validation. The next chapter, Chapter Five, discusses the results of the research in light of existing theories and past research to lay the foundation for the derivation of conclusions for the study.

CHAPTER SIX

DISCUSSION

6.1 Chapter Introduction

This study aimed at examining the association between career barriers and career progression, including the moderating effect of empowerment factors (structural, psychological, and self-efficacy) among female engineers in the manufacturing sector of Malaysia. The investigation specifically targeted the career challenges faced by middle -level female engineers, the empowerment factors that can serve as strategies to overcome these challenges, the connection between career obstacles and professional growth, and the role of empowerment factors in this dynamic. A mixed methods approach was utilised, allowing for the integration of both quantitative and qualitative findings, which were analysed in chapter four. This chapter presents a comprehensive discussion of the results from both methodologies in relation to the literature reviewed in chapter two, organized according to the study's objectives.

6.2. Career Barriers Confronting Middle-level Female Engineers

This objective sought to identify the barriers that confront middle-level female engineers in Malaysia. Both quantitative and qualitative data recorded five career barriers (gender stereotyping, work-life balance, technical skills limitation, negative perception and misogynistic management) that confront middle-level female engineers in Malaysia. Each of these barriers has been discussed with respect to the literature reviewed, and the researcher’s intuitions.

To begin with, the quantitative data depicted a mean of 3.05 and a standard deviation of 0.31 for gender stereotyping. The mean shows that the respondents affirmed that they experience gender stereotyping. Put differently, gender stereotyping is pervasive among engineering companies in the Malaysian manufacturing sector. This finding is supported by the qualitative data, where the respondents emphasised that gender stereotyping is the main barrier impeding the progress of female engineers in workplaces. Women who qualified just like men were not respected and recognised as such, and this could potentially obstruct their [female engineers] career progression. Compared to other barriers, the quantitative results indicate that gender stereotyping is not the main career barrier confronting female engineers. In contrast, the qualitative results reveal that gender stereotyping is the main career barrier for female engineers to progress. Nevertheless, both methods prove that gender stereotyping is a career barrier confronting female engineers in Malaysia.

This outcome is consistent with several existing literature which reported that gender stereotyping key factor that potentially obstructs female engineers in their engineering careers. For instance, United Nations Women (2018) and Amnesty International (2020) submit that gender discriminatory behaviours and attitudes towards women, especially those in powerful positions in diverse public workplaces, are major concerns globally. This present finding can further be explained using the glass ceiling theory which suggests that gender stereotyping is a factor that prevents women from moving up to top management (Mooney and Ryan, 2008; Enache *et al.,* 2011). According to the theory, it is difficult for female engineers to be promoted to levels of authority within workplaces, because of gender stereotyping. Glass ceiling is considered a major barrier to women engineers' advancement opportunities (Morrison *et al.,* 1987). The patriarchal nature of societies acts as an obstacle for women engineers to have "control access to hierarchical power and characteristics of knowledge claims" (Collinson and Hearn, 2000). The theory of a glass ceiling is observed as a set of hitches and/or barriers to career progression for women (Baxter and Wright, 2000). It is the barrier of immoral impressions and prejudices towards women's capabilities that does not allow them to move from one position to another in the organization hierarchy (Baxter and Wright, 2000). It follows that stereotypes about gender roles and capabilities contribute significantly to the glass ceiling. This is affirmed by Heilman (2001) in the discussion of how gender stereotypes create biased perceptions of women's leadership abilities, often leading to their exclusion from high-level positions. Similarly, Eagly and Karau (2002) highlight the role congruity theory, which suggests that women are perceived as less suitable for leadership roles that are stereotypically associated with masculine traits.

It can be concluded that gender stereotyping is one of the main career barriers confronting female engineers in Malaysia. This is so because of the age-long culture which does not project women as capable of competing with men in certain professions or occupations. Unfortunately, engineering is a particular field such organizational culture is widely shared. This culture inadvertently creates the situation of gender stereotyping that confronts female workers in the sector. This intuition is underscored by literature. For instance, it is established that companies with traditional, male-dominated cultures often lack policies that support diversity and inclusion (Ely *et al.,* 2011). Similarly, Oakley (2000) observed that such cultures may implicitly favour men for leadership roles, perpetuating gender biases and stereotypes. Additionally, the lack of flexible work policies can disproportionately impact women, who are often the primary caregivers in their families (Ely *et al.,* 2011).

The quantitative data showed a mean of 2.88 and a standard deviation of 0.61 for work-life balance. The mean depicts that approximately the respondents agreed that their work-life balance was average, affirming that work-life balance was not too prevalent a dimension of career barrier in the manufacturing sector of Malaysia. This finding is explained by the qualitative result that female engineers' roles as women in society place social and

domestic responsibilities on them, which affect their work-life balance, thereby serving as a barrier to their progression. For this reason, there was a false belief that women could not combine their domestic roles and be effective at work. It follows that where it is considered that a female engineer cannot balance her work-life effectively, she is marginalized from top managerial positions. Hence, it can be said that work-life balance is another career barrier confronting female engineers in Malaysia.

This particular outcome is consistent with literature about the work-life balance of female workers, especially female engineers. Earlier researchers observed that balancing work and personal life is a common challenge for many professionals, but it can be particularly pronounced for women in engineering, especially those navigating family responsibilities (Calinaud *et al*., 2021; Cast, 2018; Bosak *et al*., 2017). Stereotypes around gender roles may impact perceptions of commitment and dedication, especially when it relates to their ability to balance their work-life (Tabassum and Nayak, 2021).

It follows that literature considers work-life balance as when women encounter difficulties striking a balance between their family and their career roles (Ann and James, 2002). This is confirmed in the study by revealing that work-life balance in itself will likely promote career progression, while work-life imbalance will likely serve as a career barrier. In the quest to understand this phenomenon, the researcher interviewed some female engineers to share their insights on work-life balance and how it could serve as an obstacle to their career progression. The interviewees explained that in most cases they were perceived as having so much to do, hence they could not handle top managerial roles. This revelation suggests that work-life can obstruct women engineers if they are unable to balance it with domestic and social responsibilities. Thus, where females can effectively balance their work lives, they are more likely to progress in their engineering careers because they can handle top roles.

The quantitative data presented a mean of 1.91 and a standard deviation of 0.24 for technical skills limitation. This finding indicates that the respondents disagreed that female engineers have technical skills limitations to progress in their careers. It follows that technical skills limitation as a career barrier among female engineers is not pervasive among manufacturing companies in Malaysia, meaning that technical skills limitation is not seen as a major career barrier confronting female engineers. Nevertheless, the qualitative finding proves that female engineers were usually not given opportunities at their workplaces to upgrade or improve their technical skills through training, so they were handicapped during the process of delivering a project which hampered their promotion. They were seen as people lacking the technical skills to perform certain tasks. The quantitative and qualitative findings were therefore contradictory. While the quantitative results showed that the respondents do

not consider technical skills limitation as a major career barrier, the qualitative results show that it was a considerable barrier because women are not allowed to handle technical assignments to even learn on the job. The qualitative finding explains that female engineers were usually labelled as not suitable for engineering and technically incompetent in engineering organisations. Therefore, training and technical skills development are not made available for them. It follows that female engineers may be technically competent but are not trained and developed to handle technical duties, hence the view that technical skills limitations constitute a career barrier confronting female engineers in Malaysia.

This finding elaborates on the concept of technical skills limitation, which has to do with the lack of required knowledge and capabilities by a person to perform specialised tasks in a specific field (Kucharčíková *et al.,* 2018a). Unfortunately, the case of this study shows that technical skills limitation is more of a perception than reality. Thus, there is a deliberate attempt to deny female engineers the opportunity to be trained and developed to handle technical roles, unlike their male counterparts. This conclusion is consistent with the literature that women have limited access to high-visibility projects, leadership roles, and opportunities for professional development (Creed *et al.,* 2004; Cast, 2018). This restricted access can impede their ability to showcase their skills and contribute to their organizations. It follows that while technical skills limitation may be a career barrier confronting female engineers; it is merely a consequence of the glass ceiling as elaborated by the glass ceiling theory. Consequently, the present finding does not support the position of Hitka *et al.* (2018) that technical skills, including the ability to manage and plan projects, focus on problem-solving, being able to make the right decision under pressure, ability to be a leader, delegating tasks/responsibilities and having good time management may be lacking in female engineers.

The quantitative data depicted a mean of 3.10 and a standard deviation of 0.58 for negative perception. This finding demonstrates that the respondents agreed that negative perception is a career progression barrier in the manufacturing sector of Malaysia, affirming that female engineers were widely perceived to lack what it takes to progress to the top management level in the engineering sector. This finding is supported by the qualitative findings, as the interviewees emphasised that negative perception was another key barrier impeding the progress of female engineers in workplaces. It became apparent that women were perceived by companies as unfit or incapable of doing engineering work. As a result, they were usually denied or delayed promotion to top managerial roles. The qualitative finding explains why about 62% of the respondents (representing the mean of 3.10) in the survey affirmed that negative perceptions about female engineers were pervasive in the manufacturing sector of Malaysia and considered a major career barrier. Thus, both qualitative and quantitative

findings affirm that negative perception is a major career barrier confronting female engineers in the Malaysian manufacturing sector.

The findings of this research are consistent with the belief that women are physically weaker to compete in the engineering sector as a result of bias within the organisational structure (Kolade and Kehinde, 2013). These findings are also supported by the views of Hoyt and Murphy (2016), who held that professional women negatively evaluate themselves and their fellow women as poor leaders because of their awareness that leadership effectiveness is socially skewed towards masculinity. The current findings further corroborate the assertion of Mavin *et al.* (2017) that lack of confidence can result in women not pursuing leadership positions or not advocating for themselves when it comes to career advancement opportunities. Though the present findings are consistent with existing views and assertions regarding negative perception as a career barrier confronting female engineers, this study explored negative perception from the perspectives of both male and female workers. It can be noticed that it is not the female engineers who perceived themselves as incapable but their organisations, defining the organisational culture of such companies. It can also be observed that negative perceptions about female engineers are predominant among their male counterparts. The women see themselves as technically competent to hold any position just as their male counterparts, however management in the manufacturing sector believe otherwise. This negative perception has the propensity to impede female engineers career progression, as they are more likely not to be assigned technical or top managerial roles.

The quantitative data presented a mean of 3.39 and a standard deviation of 0.48 for misogynistic management. This quantitative finding confirms that respondents' superiors exhibited a misogynistic management style in managing their organisations. It suggests that misogynistic management is pervasive among manufacturing companies in Malaysia, which may hinder the career advancement of middle-level female engineers in the sector. Consistently, the qualitative finding indicates that the majority of participants blamed management for a type of management style that usually favoured men. The interviewees complained about a masculine bureaucracy. They believed male managers always assumed that female engineers were not capable of doing certain tasks. They believed women were weaker, which is mere misogynism. As a result, management treated female engineers discriminately. The qualitative results provide a better understanding of the quantitative findings. However, it is worth noting that among the five barriers identified in the quantitative data, misogynistic management is the most common or the major career barrier likely to confront female engineers in Malaysia. However, the qualitative findings emphasis gender stereotyping as the main career barrier.

These current findings support the assertion that there are organisational structures, practices, or forms of treatment that systematically function to implement patriarchal relations (Manne, 2017), describing the misogynistic management approach of organisations, particularly in the manufacturing sector of Malaysia. Furthermore, the above findings on masculine bureaucracy in Malaysian engineering companies are consistent with the findings of a study conducted on the effect of misogyny on Women's Leadership in South Africa by Hanyane and Ahiante (2022). Their findings categorized the effects of misogyny on women's leadership advancement into four main themes: distrust in women's leadership, lack of self-confidence, psychological distress, depression among female managers, and reduction in women's aspiration for directorship and top leadership positions. Additionally, the above findings underscore literature that some organizations may have rigid structures that do not accommodate diverse needs, making it challenging for female engineers who may require flexibility in work arrangements due to family responsibilities (McWhirter *et al.,*2007; Bosak *et al*., 2017; Tabassum and Nayak, 2021).

Theoretically, the current findings provide support for the glass ceiling theory, which suggests that some management styles serve as a major barrier to women engineers' advancement opportunities (Morrison *et al.,* 1987). The theory further asserts that the patriarchal nature of organisations acts as an obstacle for female engineers to have "control access to hierarchical power and characteristics of knowledge claims" (Collinson and Hearn, 2000). Given the meaning of misogynistic management, the glass theory provides a theoretical basis to assess whether such a management approach would obstruct female engineers, and the empirical findings of this study uphold that assertion of the glass ceiling theory.

6.3 Empowerment Factors in Breaking Career Barriers

This objective relates to empowerment factors that can serve as tools or mechanisms to break career barriers. From the literature, the researcher identified three empowerment factors: structural empowerment, psychological empowerment, and self-efficacy empowerment. These factors were tested using both quantitative and qualitative data. The findings show that they are empirically viable to break the career barriers confronting women engineers. Specifically, each factor is discussed in line with the literature in the ensuing paragraphs.

First and foremost, the quantitative data shows a mean of 2.20 and a standard deviation of 0.40 for structural empowerment. This finding indicates that the structural empowerment of the female engineers is relatively low since the mean is below the midpoint of 2.5 on the scale of 1 to 5. Though structural empowerment is identified as an empowerment factor, its potency in addressing the career barriers may be low. The qualitative finding

reveals that there are no empowerment policies in the selected organisations to break the career barriers. This explains why the respondents in the survey nearly declined the existence of structural empowerment in their organizations. Only 44 percent of the respondents (representing 2.20) affirmed the practice of structural empowerment, which is less than 50 percent. It could also mean that the respondents disagree that structural empowerment existing in their organizations break the career barriers. Albeit, they admitted that structural empowerment may help to break career barriers. They indicated that it is important for management of various organizations to provide a conducive working environment with facilities such as childcare, maternity leave, training, and skill development for lower-level employees to structurally empower them to progress to the top. They further recommended organisational practices that provide opportunities, resources, guidance, and support to the staff, especially female engineers. While the qualitative results support the quantitative findings, the potency of this empowerment factor in breaking the career barriers can be statistically proven under the objective four.

The recommendations of the respondents, tie into literature that the core of structural empowerment is the transition of authority and responsibility from upper management to employees (Maynard *et al.,* 2012). It is also consistent with the concept of structural empowerment as a fundamental determinant that influences behaviour, whereby employees with sufficient empowerment can fulfil the tasks (Conrad, 2017). Structural empowerment implies that lower-level employees in an organization are enabled to take appropriate action through a set of structures, practices and policies within the organization that result from a flattening of the hierarchy (Seibert *et al.,* 2011; Hansen *et al*., 2017), as confirmed in this study. The present finding also agrees with previous studies that have found that structural empowerment leads to innovative behaviour (Hebenstreit, 2012; Dan *et al.,* 2018), which help both male and female workers to take advantage of higher opportunities in an organisation, in this case, within the engineering manufacturing companies in Malaysia.

The potency of structural empowerment to influence organisational factors such as breaking career barriers has been criticized by some scholars. For instance, Kanter (1977) admits that the work attitudes and behaviour of employees are greatly influenced by structural factors in the work environment with power being an important structural factor that impacts organisational behaviours and attitudes. This view is supported by Laschinger *et al.* (2001), Menon (2001), and Loughman *et al.* (2009). However, Tuuli and Rowlinson (2009) criticise the structural empowerment literature for ignoring the cognitive circumstances of those being empowered. The structural approach to empowerment is criticised for taking into consideration the experiences of those being empowered (Thomas and Velthouse, 1990; Spreitzer, 1995; Chan *et al.,* 2008). On the contrary, this study fails to support any of the critics, and reveals that structural empowerment, though not being practice, could help to

limit the impact of the career barriers confronting female engineers. This possibility has been tested and discussed under the objective four.

Furthermore, the quantitative data presents a mean of 2.20 and a standard deviation of 0.23 for structural empowerment. This finding shows that they are not psychologically empowered. It implies that the psychological empowerment of female engineers is below average, and it could be stimulated by the type of management style (such as misogynistic management) in the various organisations. Though psychological empowerment is identified as an empowerment factor, its potency in addressing the career barriers may be low. This quantitative finding is underscored by the qualitative finding that there are no deliberate empowerment strategies or policies in their organisations to break the career barriers. The interviewees, however, submitted that psychological empowerment may also help to break the career barriers. It follows that management of manufacturing companies must recognise individual's abilities, provide support, promote guidance, provide monetary allowances such as bonus, and trust the workers, particularly female engineers to accomplish tasks/responsibilities. This will foster a sense of belonging, competence, and providing purpose to develop along with the organisation as emphasised by the empowerment theory (Fawcett *et al.,* 1994; Ahearne *et al.*, 2005). Psychological empowerment may also involve promoting systemic issues and enhance motivation and creativeness (Hechanova *et al.,* 2006; Joo *et al.,* 2019). The qualitative results strongly support the quantitative findings, but the potency of this empowerment factor in breaking the career barriers has been statistically proven under the objective four.

The concept of psychological empowerment is based on Bandura's notion of self-competence; self-capability which concentrates on how one can accomplish courses of activity required to deal with prospective situations (Bandura, 1982), as recommended by the respondents in this study. Likewise, Spreitzer (1995) submits that psychological empowerment has to do with how one sees himself or herself at the workplace and the extent to which he or she would be able to establish a work role. This assertion is also supported by both quantitative and qualitative findings of this study, highlighting how female engineers could recognise their own abilities and build self-confidence to take on challenging roles as their male counterparts do. However, it is worth noting, that without structural empowerment, it is most likely that psychological empowerment may not be effective in breaking the career barriers, in that the structural empowerment will provide organisational policy and culture based on which the psychological empowerment will thrives.

Psychological empowerment is said to have been emerged as a response to the criticisms of the structural empowerment. Here, it is expressed as an attitude of employees to distinguish themselves as being empowered (Dee *et al.,* 2003). This earlier assertion supports the findings of this study and the intuition of the researcher that the effectiveness of psychological empowerment is dependent on structural empowerment which provides

managerial support for employees, particularly female engineers to distinguish themselves as being empowered. It follows that the structural empowerment is associated with sharing of authority and resources (Spreitzer and Doneson, 2008), while psychological empowerment gives priority for individuals' satisfaction rather than specific management approach which is intended to empower individuals or employees (Spreitzer*et al.,* 1997; Dewettinck and Ameijde, 2011). As done in this study, scholars such as Koberg *et al.* (1999) also used both perspectives in their study, where the structural perspective had to do with the power and control that an individual wields relative to others and the sharing and transmission of that power, and the psychological perspective was about the cognitions and perceptions of an individual that according to them constitute "feelings of behavioural and psychological investment in work".

Last but not least, the quantitative data shows a mean of 3.91 and a standard deviation of 0.26 for self-efficacy empowerment. This result shows that the respondents confirmed they are empowered to take personal initiatives to become better in the discharge of their duties. It suggests that self-efficacy empowerment is above average, because the mean is above the midpoint of 2.5 on the scale of 1 to 5. Thus, as an empowerment factor, self-efficacy empowerment may have high potency to break the career barriers. Regarding the qualitative data, the participants generally expressed their perception about self-efficacy empowerment and how it may serve as a tool to break the career barriers. They noted that organisations may put in place all the facilities – structural and psychological, but middle level female engineers need to have the ambition to climb the career ladder by breaking all the obstacles including negative perception, gender stereotype, etc. They added that believing in their [female engineers] abilities to meet challenges and developing ambition to achieve the highest goal is a sure way to overcome the career barriers. However, they stressed the need for management to allow staffs, particularly female engineers to develop confidence in difficult and biased environment to succeed. Though the qualitative results support the quantitative findings, the effectiveness of self-efficacy empowerment factor in breaking the career barriers has been statistically proven under the fourth objective.

The above findings give emphasis to the concept of self-efficacy empowerment and its potency in breaking career barriers in existing literature. For instance, both quantitative and qualitative findings indicate that female engineers have the self-belief to handle technical and challenging roles as women, which is emphasised by Bandura (1977) that it is all about the belief that an individual has in their capability to perform a task successfully. Self–efficacy is a very important factor in the employee empowerment process as it has to do with their confidence in their ability to effectively perform in their empowered roles (Heslin, 1999), as ascertained in this study. Literature also suggests that high self-efficacy results in initiating behaviours, causes people to work hard and persist when faced with obstacles, whereas low self–efficacy causes individuals to avoid

situations that require for certain skills therefore depriving them from learning and obtaining competencies in relevant areas (Holdsworth, 2007). Though this study did not explore the high and low types of self-efficacy, there was a general consensus among the respondents that female engineers need to have the ambition to climb the career ladder by breaking all the obstacles including negative perception, gender stereotype, etc. They added that believing in their [female engineers] abilities to meet challenges and developing ambition to achieve the highest goal is a sure way to overcome the career barriers. These views reflect the concept of high self-efficacy, which has the high propensity to break the career barriers identified.

In a nutshell, the three empowerment factors are interrelated. It is obvious from the present findings supported by existing literature (both empowerment theory and empirical studies) that the three empowerment factors must be simultaneously implemented to produce the intended outcome. Though self-efficacy largely focuses on the individual, it can be enhanced or hindered by organizational culture, which can be promoted through structural and psychological empowerments. To this end, it is imperative to emphasis that structural empowerment is necessary to provide conducive environment for both psychological and self-efficacy empowerments. While self-efficacy empowerment is mainly employee-centered, psychological empowerment requires the commitment of both management and employees. In this case, management has a major role to play through structural and psychological empowerment of female engineers, and the female engineers have to concentrate on self-efficacy empowerment. However, a strong collaboration is expected between management and employees (i.e. female engineers) through psychological empowerment. This way, these factors might be effective in breaking the career barriers identified. The effectiveness and its significance have been assessed and discussed under the fourth objective.

Now, regarding career progression, the quantitative finding shows a mean value of 2.28, and a standard deviation value of 0.21. This finding indicates the extent of the respondents' agreement of career progression in their various organisations. The mean is below a mid-point of 2.5 on the scale of 1 to 5, suggesting that career progression level in the selected Malaysian manufacturing companies is below average or quite low. It implies that the respondents decline to affirm there is career progression of female engineers in their respective manufacturing companies. This could be attributed to several factors including the career barriers that are eminent in organisations and lack of empowerment. It is worth noting that the standard deviation result shows a very close spread of the values in the distribution around the mean, indicating less variation in the responses. The standard deviation demonstrates that the respondents said similar things or a response from a participant is not too different from others. Thus, there are fewer variations in the responses, signaling stability in the variance. It can be concluded that the career progression of middle-level female engineers is low in the manufacturing sector of Malaysia.

This finding could be attributed to gender disparity which remains a prominent issue in engineering career progression. The present finding supports existing studies that have shown that women are underrepresented in engineering roles and face unique barriers to advancement. Similarly, Fouad *et al.* (2017) observed that women in engineering often encounter gender bias, lack of mentorship, and work-life balance challenges, which hinder their career growth. Additionally, Hunt (2016) found that female engineers are less likely to receive promotions compared to their male counterparts, even when they have similar qualifications and experience. The low level of career progression of the middle-level female engineers could be further attributed to organizational culture, because it is reported that organizational culture significantly influences career progression in engineering. Companies that foster an inclusive and supportive environment tend to have higher employee retention, satisfaction, and progression rates. This is affirmed by Ely and Thomas (2021) that organizations with diverse and inclusive cultures are more successful in promoting engineers from various backgrounds. Likewise, flexible work policies, such as remote work options and flexible hours, can positively impact career progression by enabling engineers to balance work and personal commitments effectively (Ely and Thomas, 2021). Additionally, well-structured career development programs such as training sessions, workshops, leadership development initiatives, and succession planning are found by Garavan *et al.* (2019) to contribute to higher career advancement for engineers.

6.4 Relationship between Career Barriers and Career Progression

Regarding this objective, the quantitative data was used to test the hypotheses to establish the relationship between career barriers and career progression of female engineers. The five career barriers (gender stereotyping, work-life balance, technical skills limitation, negative perception, and misogynistic management) identified were employed as independent variables while career progression was employed as a dependent variable. Given the analytical model (i.e. hierarchical regression model) that was adopted, the relationship between the career barriers and career progression was treated as the main effects. From Table 5.14, it can be observed that in Step 1, the coefficients for gender stereotyping, work-life balance, technical skills limitation, negative perception, and misogynistic management are [β = -0.283, t-value = -5.11], [β = 0.181, t-value = 6.95], [β = -0.407, t-value = -5.88], [β = -0.056, t-value = -1.76], and [β = -0.206, t-value = -6.00] respectively, and they are all significant. This establishes the main effects of the career barriers on the career progression of female engineers in Malaysia. The results indicate that these career barriers have significant negative relationship with career progression, except work-life balance which shows positive relationship. It suggests that a unit change in these career barriers will likely result in a corresponding negative change in career progression by the magnitude of their coefficients, other factors held constant. However, a unit changes in work-

life balance will likely lead to a positive change in the career progression of the female engineers. Hence, the null hypotheses of H1 to H5 are rejected, while the alternatives of H1 to H5 are accepted. Comparatively, it can be noticed that among the career barriers, technical skills limitation has the highest predictive effect (-0.407), followed by gender stereotyping (-0.283), with negative perception (-0.056) being the least. It is also important to note that work-life balance recorded positive effect of 0.183 compared to the negative contributions of other independent variables. Therefore, these barriers are important to be understood among the engineering organisations in the Malaysian manufacturing sector.

The quantitative findings show that all career barriers (gender stereotyping, work-life balance, technical skills limitation, negative perception, and misogynistic management) have a significant relationship with career progression. Whereas work-life balance depicts positive effects, the rest reveal negative effects. Compared to the qualitative results, the participants did indicate that these career barriers have the potential to impede career progression of female engineers. Through the qualitative results, it is understandable that the work-life balance will rather promote career progression unless it is imbalanced. This explains why work-life balance has a positive relationship with career progression. It implies that if female engineers are unable to balance their work-life, they are likely not to progress in their career to top managerial roles as they might be perceived as having no time to take on a higher responsibility. It must be emphasised that the qualitative findings are used to explain the quantitative findings since it is impossible to establish statistical relationships qualitatively. These findings are discussed based on each hypothesis or the relationship between career progression and each career barrier.

First, the findings showed that gender stereotyping and career progression are negatively and significantly related. It means that gender stereotyping has a significant effect on career progression. This indicates the two variables are moving in the opposite direction so an increase in gender stereotyping will likely lead to a decrease in career progression of female engineers by the effect size reported under results in the previous chapter. It further means that gender stereotyping impedes the career progression of female engineers in the manufacturing sector of Malaysia. This finding suggests the results in objective one that gender stereotyping is a major barrier confronting middle-level female engineers in Malaysia. This finding is consistent with the assertion of Papa and Natalie (1989) that gender stereotyping is the underlying assumption about the actual and or perceived behaviour of men and women, could potentially affects the career progress of women. Empirically, this current finding is not different from the findings that some women engineers working in the construction industry have been facing issues such as partiality, segregation, and discrimination in relation to support from peers (Johari *et*

al., 2013), affecting their career progression. It is usually stressed that construction industry is not meant for women (Ismail and Ibrahim, 2008).

The current finding confirms an existing belief that limitation of women in higher hierarchy is due to a gender bias evaluation (Heilman, 2001). According to Eagly and Makhijani (1992), women's credentials and performance are not fairly evaluated. Women's capabilities are usually under-evaluated, and this explains the discriminations in promotion opportunities between male and female workers both in private and public sector (Heilman, 2001). Apart from Heilman (2001), various evidence have shown that the lack of methodical benchmarks and well-designed assessment processes have led to biased choices being made, which prevents women from getting into higher positions within their organisations. And such cases have led to gender stereotypes as validated in this study.

While recent research indicates a decline in various gender-related barriers and biases, gender stereotypes still hinder women's career advancement (Tabassum and Nayak, 2021). This study confirms that opportunities for women's career progression are adversely influenced by these stereotypes, which impact managerial behavior and workplace perceptions through patriarchal norms. Tabassum and Nayak (2021) noted that gender stereotypes persist and are perpetuated by media, as well as through social, educational, and recreational avenues that foster gender bias and discrimination against women. Although their research did not specifically focus on middle -level female engineers, the alignment between their results and those of this study suggests that the adverse effects of gender stereotypes on career progression extend beyond female engineers, potentially affecting them even more severely. Tabassum and Nayak (2021) argue that modern management practices often overlook the insights offered by gender studies, which could inform the creation of gender-neutral, affirmative action-based managerial strategies. This could account for the pronounced negative impact of gender stereotyping on mid-level female engineers in Malaysia.

Furthermore, it is found that work-life balance has a significant positive relationship with career progression. This means that both variables are moving in the same direction, so an increase in work-life balance will likely result in a rise in the career progression of female engineers, other factors held constant. It implies that work-life balance cannot serve as an obstacle to women's career progression in the engineering field. However, it is important to note that work-life balance is a concept in positive sense, so work-life imbalance may serve as a barrier confronting female engineers. It means that where middle – level female engineers are not able to balance their work with social and domestic responsibility, they are more likely to be obstructed. From the finding of

this study, a decrease in work-life balance (which means work-life imbalance) will lead to a decline in career progression of middle -level female engineers. Thus, whereas work-life balance is not a career barrier that impedes career progression of middle -level women engineers, work-life imbalance may serve an effective career barrier. This distinction must be emphasised to ensure that the treatment of work-life balance as a career barrier will be put in proper context.

The above finding agrees with the concept of work-life balance as engagement in work and non-work roles, producing an outcome of equal amounts of satisfaction in work and non-work life domains (Fisher et al., 2009). In this case, work-life balance is considered in a positive sense, which is consistent with the view of Ann and James (2002) that work-life balance barrier occurs when women encounter difficulties striking a balance between their family and their career roles. Studies have shown that women have continued their responsibility as mothers, in spite of being away from home, affirming the finding of this study. Just as it has been established in this study, because of the family responsibilities, women have difficulties to commit themselves 100 percent to the organisation, which is usually anticipated (Burke and McKeen, 1994). Another study by Ann and James (2002) reported that one might occasionally see women with children in higher positions in hierarchy. It follows that women are generally unable to maintain a balanced work-life, leading to their inability to assume top roles in their organizations. By this logic, when women are no longer burdened with family and domestic responsibilities, they are able to balance their work-life to comfortably assume challenging top roles. A directly related study by Miller (2004) on engineering women indicated that women engineers spend between 12 – 14 hours on their work, and struggle to compete between family and career. This study is supported by the present finding that work-life imbalance is a barrier that hinders middle-level female engineers in Malaysia from progressing in their career.

Next, the analysis revealed that there is significant negative relationship between technical skills limitation and career progression of female engineers in Malaysia. In other words, technical skills limitation has significant negative effect on career progression. It means that both variables are inversely related, so an increase in technical skills limitation may lead to a decrease in career progression by the magnitude of the effect size reported under the results in the precious chapter. Thus, technical skills limitation is an effective carrier barrier confronting middle-level female engineers in the manufacturing sector of Malaysia. It is important to emphasis that though technical skills limitation is a major carrier barrier, the middle -level female engineers surveyed and interviewed decline that they have limited technical skills to progression in their career. The female engineers' respondents argued that the lack of technical skills among middle -level female engineers is negative perception but not real. What is essential to note is the fact that without the required technical skills, one [male or female] cannot progress to the top in the engineering field. Therefore, technical skills limitation must be emphasised

and discussed without gender sentiments. And whether a lacuna of perception exists, it should be addressed using appropriate management style.

The present finding is not different from the assertion of Hitka *et al.* (2018) that technical skills is about the ability to manage and plan projects focused on the problem solving, which means being able to make the right decision even under pressure, the ability of being a leader and delegating tasks/responsibilities and having good time management. It follows that in the event that the middle -level female engineers have limited technical skills, they will likely not progress in their career, holding other factors constant. On the other hand, in the event that female engineers have required technical skills to assume more challenging role, they will likely progress in their career as engineers. This intuition is underscored the fact that technical skills make it possible to identify problems, accomplish complex actions, and complete specific tasks and processes related to a field that other individuals are not as specialised in (Lorincova *et al.,* 2018). Top management roles require all these skills. Hence, it is more unlikely that middle – level female engineers who cannot exhibit or show evidence of technical skills, will be promoted to the top roles.

Albeit, it is worth noting that female engineers in the manufacturing sector of Malaysia do have the technical skills to assume higher roles like their male counterpart contrary to the anecdotal evidence that Malaysian female engineers lack the technical skills to hold managerial positions, thereby unable to progress in their career. Per this study, it is now known in the field of engineering and in the context of Malaysia about how technical skills limitation might be an impediment to the progress of middle -level female engineers. It is, therefore, apt to stress the negative effect of technical skills limitation as a barrier on career progression of female engineers, providing empirical evidence for policy reforms in Malaysia.

Again, the findings indicated a significant negative relationship between negative perception about the competence and capabilities of female engineers is an effective career barrier confronting female engineers in the manufacturing sector of Malaysia. As such perception lingers, women engineers are denied or delayed the opportunity to be promoted to top managerial roles. They are denied the technical training and development to advance in their career. These quantitative findings have been elaborated by the qualitative findings, where the interviewees disclosed that they denied training and development opportunities because they are perceived as not capable and competent enough to handle some technical roles or top managerial roles. This may serve as great disincentive for women to belief that their efforts will be recognised and rewarded with a promotion to top roles in their various organizations.

The above finding fails to depart from the submission of Kolade and Kehinde (2013) that perceptions still prevail that women are physically weaker to compete in an engineering sector due to bias within the

organisational structure. Here, it is believed that middle -level female engineers are generally weak to handle some technical engineering work. This negative perception is attributed to organisational policies that are not favourable for women engineers to attain career development. This assertion is affirmed by the results of this study. It follows that women can equally occupy top managerial roles, if this negative perception is curbed. For instance, Heilman (2001) observed that being competent or experienced alone is not sufficient for women engineers to advance in their career. Female engineers are having slow progression issues because of gender discrimination among female workers based on how they are negatively perceived (Madegwa, 2011). As a result of the unfavourable perception, professional women gradually come to view themselves and their peers as lacking in completeness as leaders in the public sphere. This self-assessment is influenced by their recognition that societal views of effective leadership tend to favour masculinity (Hoyt and Murphy, 2016). Lopes (2019) also submitted that managers and colleagues may unconsciously favour male employees when it comes to promotions and challenging assignments, assuming that men are more suited for leadership roles.

The perception of women as less competent or less suited for leadership roles can lead to a lack of confidence among female employees. This lack of confidence can result in women not pursuing leadership positions or not advocating for themselves when it comes to career advancement opportunities (Mavin *et al.,* 2017). Some scholars such as Lopes (2019) describes this consequence of negative perception about female engineers as unconscious bias, which can affect how people perceive women's competence and leadership abilities. Therefore, conscious effort should be made to deconstruct internalised gender-insensitive traditional norms and leadership stereotypes from the psyche of employees, working women, regardless of their professions and positions to prevent or minimise the negative perception about women, particularly female engineers.

Last but not least, the results showed that there is significant negative relationship between misogynistic management and career progression. This finding illustrates that misogynistic management has significant negative effect on career progression of female engineers in the manufacturing sector of Malaysia. This means that the two variables are moving in the opposite direction such that an increase in misogynistic management will likely lead to a decrease in the career progression of middle-level female engineers by the magnitude of the effect size that was reported under the preceding results chapter. The implication of this finding is that misogynistic management is an effective career barrier confronting female engineers as identified under the objective one in both qualitative and quantitative data. This suggests that management styles such misogynistic management, which is inimical to the progression of female engineers should carefully considered in addressing the career barriers that middle-level female engineers face in the Malaysian manufacturing sector. This type of management approach discriminates against women and provides the enabling environment for negative

perception about the incompetence and incapability of women to assume technical or challenging top managerial role.

The present finding is consistent with existing studies on the link between misogynistic management and career progression, particularly among female engineers. For instance, it is found in this study that misogynistic management is the most pervasive career barrier in the manufacturing sector of Malaysia and affirms Srivastava *et al.*'s (2017) submission that male managers normally perpetuate hatred and contempt towards women.
This study confirms that misogynistic management practices are encouraged by various organisational structures, a point effectively highlighted by Manne (2017), who argues that misogyny flourishes within any system, procedure, or treatment that systematically enforces patriarchal interactions in the presence of resistance. The qualitative findings are further supported by Stalker (2001), who notes that misogynistic attitudes and actions encompass the oppression, exploitation, and suppression of women by men, manifesting through male resentment, intimidation, and demeaning behaviour towards women. Additionally, the study's outcomes align with existing literature indicating that misogyny is reflected in the negative labelling of female managers as overly assertive, disrespectful, or unfit for leadership, as well as viewing women pursuing power as socially deviant, ambitious, or lacking femininity (Mwale and Dodo, 2017; Mavin et al., 2017).

In a related examination of misogyny and women's leadership within South Africa, Hanyane and Ahiante (2022) highlighted the detrimental impact of misogyny on women's advancement in leadership roles within local government. Although this research focuses on middle -level female engineers in Malaysia, the South African study identified four primary themes concerning women in leadership: distrust in women leaders, lack of self-confidence, psychological distress and depression among female managers, and a decrease in aspirations for directorship and higher leadership roles. Their findings, corroborated by earlier research, revealed that the misogynistic behaviour faced by female managers, especially from their male counterparts, serves to uphold and reinforce male dominance in public sector leadership, while also hindering the leadership potential and career advancement of female managers (Ngoepe 2021; Kipkosgei, 2021).It follows that there is strong negative connection between misogynistic management and career progression as established in this study and as reported in other jurisdictions by Hanyane and Ahiante (2022), Ngoepe (2021), and Kipkosgei (2021).

It is important to highlight that misogyny poses a significant challenge that hinders women's leadership roles and career advancement worldwide, affecting both the private and public sectors (Rokka, 2021). Despite existing labour regulations against gender discrimination and increased global focus on safeguarding women's human rights, misogyny has been linked to psychological distress and depression among women in local

government positions (Hanyane and Ahiante, 2022). This aligns with the findings of our study, which identifies misogynistic management as the primary obstacle faced by middle-level female engineers in Malaysia. Ngoepe (2021) noted that female managers' opinions on the salient factors that trigger their psychological stress and depression showed that it ensues from the patriarchal, sexist and gender unequal working environment. Additionally, men use gender discriminatory behaviours and patriarchal attitudes to subordinate women and to maintain their leadership dominance in the local government sphere. This observation is also found in the current study, where respondents contended against the nature of organisational culture and policies and the masculine work environment that has been deliberately created across various organisations in the manufacturing sector of Malaysia. Such uncivil behaviours are major barriers to the leadership advancement of women for the achievement of gender leadership equality in both public and private sectors, especially in fields like engineering.

6.5 Moderating effect of empowerment factors

This is the fourth objective of this study. Here, the researcher sought to test whether the empowerment factors – structural, psychological and self-efficacy could serve as an appropriate tool to break the career barriers and improve career progression. As part of the hierarchical regression analysis, the researcher assessed the interaction effect of the independent variables (gender stereotyping, work-life balance, technical skills limitation, negative perception, and misogynistic management) and empowerment factors (structural, psychological and self-efficacy) on career progression. Applying the procedure of Cohen *et al.* (2003), the moderation effect has been tested by creating multiplicative interaction terms. The variables were centered around a mean of 0 to reduce the correlation between the interaction terms and the variables comprising the interaction to prevent the possibility of high multicollinearity. The result of the moderating effect analysis is captured in Table 5.14 below. The potency of each empowerment factor was tested by using them to moderate relationship between the career barriers and career progression. The findings are highlighted and discussed as follows.

To begin with, the finding showed that structural empowerment negatively moderated the relationship between gender stereotyping. This means that structural empowerment enhanced the negative effect of gender stereotyping on career progression of female engineers. Thus, structural empowerment could not serve as an empowerment tool to break gender stereotyping. Even though the qualitative finding indicated there is no empowerment policy in various organisations, but structural empowerment could potentially break gender stereotyping, the moderating analysis proves otherwise. As indicated earlier, the effectiveness of structural empowerment in breaking gender stereotyping can be appropriately tested using statistical model like

moderation. Therefore, based on the moderation finding, practicing gender stereotyping alongside ensuring structural empowerment will significantly obstruct career progression of female engineers in Malaysia. There is on precise empirical study on whether structural empowerment could break gender stereotypes. This study becomes extremely relevant in filling the research gap. The finding of this study augments existing literature on gender stereotyping and career progression by showing that structural empowerment is not an appropriate mechanism to curb gender stereotyping among middle – level female engineers in the manufacturing sector of Malaysia.

Next, psychological empowerment positively moderates the negative relationship between gender stereotyping and career progression. This means that psychological empowerment is an appropriate tool to break gender stereotyping among middle-level female engineers. This quantitative finding is underscored by the qualitative finding which emphasised the potency of psychological empowerment to improve career progression of female engineers where the culture of gender stereotyping is pervasive. Though there is no precedence of this finding, indirectly related literature suggests that when employees feel psychologically empowered, they are more likely to be satisfied with their jobs and perform better (Spreitzer, 1995; Seibert *et al.,* 2004), and they are more likely to progress top management level. Psychologically empowered employees are also more proactive, innovative, and committed to their work. This suggests that when female engineers are psychologically empowered, they are more likely to themselves as belonging to the organisation and take advantage over existing opportunities to progress in their careers. This possibility coincides with earlier assertion of Spreitzer (1996) that psychologically empowered employees [both male and female] experience lower levels of job-related stress and burnout because they feel more in control of their work and have the resources to handle challenges. Psychologically empowered employees exhibit higher levels of organisational commitment. They are more likely to identify with organisational goals and remain loyal to the organisation (Joo and Shim, 2010). This increased commitment can lead to lower turnover rates and higher retention of top talent, leading to constant promotion of deserving staffs regardless of their gender.

Regarding self-efficacy empowerment, it also positively moderates the negative relationship between gender stereotyping and career progression. This means that self-efficacy empowerment is an effective tool to break gender stereotyping of female engineers. This suggests that self-efficacy is a crucial factor in promoting career progression among female engineers as established by Heslin (1999) that employee empowerment process enables them to build confidence in their ability to effectively perform in their empowered roles. Additionally, the current findings diverge from an empirical investigation conducted by UNW (2018) regarding self-efficacy in South Africa. The study revealed that respondents pointed out the lack of confidence among female managers,

largely due to the intimidating and belittling behaviour they faced from male supervisors and colleagues. The research further noted that some middle-level female engineer managers with diminished self-confidence often refrain from pursuing senior leadership roles. UNW (2018) highlighted that self-doubt is a significant barrier preventing female managers from ascending to higher leadership positions. This implies that some women hesitate to apply for executive jobs due to fears of stepping into unfamiliar territory, concerns about job titles and responsibilities—potentially influenced by traditional gender roles—and the belief that male counterparts are more qualified. These observations resonate with the theoretical perspectives of scholars who assert that even when women possess the necessary qualifications in male-dominated fields, they may still underestimate their capabilities, opting instead to support male candidates for such roles (Koca, Arslan, and Asci, 2011).

All these reasons can be antecedents of gender stereotyping. But the present finding shows that they can be curbed by self-efficacy empowerment, particularly among female engineers in Malaysia. The differences in the results could be due to the methodological disparity, setting of the studies, and the study constructs.

In a nutshell, psychological and self-efficacy empowerment factors are relevant and effective mechanisms to break gender stereotyping among female engineers to promote them to top management level in the Malaysian manufacturing sector. However, structural empowerment cannot be used as an empowerment tool to break gender stereotyping. This vindicates the researcher's position to use the dimensions or factors of empowerment rather than the single empowerment factor. Policy decisions can be tailored based on these specific findings to ensure that gender stereotyping among female engineers are broken to allow smooth career progression.

In terms of the relationship between work-life balance and career progression, structural empowerment has enhanced the positive effect of work-life balance on career progression. It means that structural empowerment can serve as an empowerment tool to break imbalance work-life of female engineers. This quantitative result supported by the qualitative result, where the participants noted that structural empowerment could potentially argument work-life balance to promote career progression of female engineers. Therefore, practicing work-life balance alongside ensuring structural empowerment will significantly enhance career progression of female engineers in Malaysia. On the other hand, psychological empowerment does not moderate the positive relationship between work-life balance and career progression. It follows that the promotion of psychological empowerment would have no effect on the association between work-life balance and career progression. This quantitative finding is in divergence to the qualitative result which emphasised the potency of psychological empowerment to improve career progression of female engineers where the culture of work-life balance is pervasive. Lastly, self-efficacy empowerment negatively moderates the positive relationship between work-life

balance and career progression, meaning that self-efficacy empowerment is not an effective tool to improve the positive effect of work-life balance on career progression of female engineers.
It can be observed that structural empowerment is an effective empowerment mechanism to break work-life imbalance in order to promote career progression of middle-level female engineers in Malaysia. On the other hand, psychological and self-efficacy cannot be used as effective empowerment mechanisms to break work-life imbalance to enhance career progression of middle-level female engineers in Malaysia.

Regarding the relationship between technical skills limitation and career progression, structural empowerment has enhanced the negative effect of technical skills limitation on career progression. It means that structural empowerment could not serve as an empowerment tool to break technical skills limitations. There is no convergence between the quantitative finding and qualitative finding, because in the case of the qualitative finding, the interviewees mentioned that structural empowerment could potentially break technical skills limitation. It follows that the perception of technical skills limitation together with structural empowerment will significantly obstruct career progression of middle -level female engineers in Malaysia. Similarly, psychological empowerment negatively moderates the negative association between technical skills limitation and career progression. This implies that psychological empowerment is not an appropriate tool to break technical skills limitations. This finding also contradicts the qualitative finding which stressed the potency of psychological empowerment to break technical skills limitation and improve career progression of female engineers. To end, self-efficacy empowerment negatively moderates the negative relationship between technical skills limitation and career progression. This suggests that self-efficacy empowerment cannot serve as an effective tool to break technical skills limitation of female engineers.

In effect, all empowerment factors are not relevant and effective mechanisms to break technical skills limitations of female engineers in order to facilitate their promotion to top management level in the Malaysian manufacturing sector. So, in the case of technical skills limitation, empowerment mechanisms are not appropriate tools to curtail it in order to overturn its negative impact on female engineers' career progression in Malaysia. Perhaps, future study may consider other organisational factors such as motivation, satisfaction, training, incentives, etc. as potential mechanisms to break technical skills limitations.

More so, structural empowerment has moderated the negative relationship between negative perception and career progression. This demonstrates that structural empowerment cannot serve as an empowerment tool to break negative perception. This quantitative result is contrary to the qualitative result, where the participants submitted that though there is no empowerment policy in various organizations, structural empowerment could

potentially break negative perception. Therefore, where there is negative perception and management implements structural empowerment, career progression of female engineers is likely to be obstructed significantly. On the other hand, psychological empowerment positively moderates the negative relationship between negative perception and career progression. This means that psychological empowerment is an appropriate tool to break negative perception. This quantitative finding is underscored by the qualitative result which emphasized the potency of psychological empowerment to improve career progression of middle -level female engineers where negative perception is pervasive. Similarly, self-efficacy empowerment positively moderates the negative relationship between negative perception and career progression, meaning that self-efficacy empowerment is an effective tool to break negative perception about female engineers.

To sum up, psychological and self-efficacy empowerment factors are relevant and effective mechanisms to break the negative perception about middle -level female engineers so as to facilitate their elevation to top management level in the Malaysian manufacturing sector. On the other hand, structural empowerment may not be an effective tool to address the negative perception about women engineers.

Finally, regarding the relationship between misogynistic management and career progression, structural empowerment has negatively moderated the negative effect of misogynistic management on career progression. It means that structural empowerment could not serve as an empowerment tool to break misogynistic management. This quantitative result is contrary to the qualitative result, where the participants submitted that though there is no empowerment policy in various organizations, structural empowerment could potentially break misogynistic management. Therefore, practicing misogynistic management alongside ensuring structural empowerment will significantly obstruct career progression of female engineers in Malaysia. On the contrary, psychological empowerment positively moderates the negative association between misogynistic management and career progression. It implies that psychological empowerment is an appropriate tool to break misogynistic management. This quantitative finding is underscored by the qualitative result which stressed the efficacy of psychological empowerment to improve career progression of female engineers where the management style is misogynistic. Likewise, self-efficacy empowerment positively moderates the negative correlation between misogynistic management and career progression, indicating that self-efficacy empowerment is an effective tool to break misogynistic management style, which affects female engineers in the Malaysian manufacturing sector.

In summary, psychological and self-efficacy empowerment factors are relevant and effective mechanisms to break misogynistic management in the various organisations to help female engineers to advance to the top in

the Malaysian manufacturing sector. However, structural empowerment may not be an effective empowerment mechanism to address misogynistic management approach in order to promote career progression of female engineers in the manufacturing sector of Malaysia.

6.7 Chapter Summary

This chapter presented the discussion of the findings of the research in relation to the literature reviewed in chapter two of this thesis, to lay the foundation for the derivation of conclusions for the study in the next chapter. All career barriers (gender stereotyping, work-life balance, technical skills limitation, negative perception, and misogynistic management) were sufficiently identified and accordingly discussed. Next, the relationship between the career barriers and career progression of middle -level female engineers in Malaysia was established and accordingly discussed. It is important to stress that technical skills limitation has the highest negative effect on career progression, followed by gender stereotyping (-0.283), with negative perception (-0.056) showing the lowest negative effect on career progression.

CHAPTER SEVEN

SUMMARY, CONCLUSION AND RECOMMENDATIONS

7.1 Chapter Introduction

The previous chapter discussed the results that were presented in chapter four. In this closing chapter, the researcher has provided summary of the findings, derived conclusions based on the findings, suggested some implications and made appropriate recommendations. The researcher believes that when the recommendations are implemented, the career progression barriers facing female engineers in Malaysia will be significantly mitigated.

7.2 Summary

In spite of the fact that many studies have been done that show that the number of women in engineering has been increasing in many developed and developing countries (Dean and Fleckenstein, 2007; Burke, 2007; Powell *et al.,* 2007), gender gap in engineering still exist, particularly in developing countries. In the case of Malaysia, literature suggests that the number of women entering into engineering has increased. However, female engineers encounter some barriers, which inhibit their chances of progressing in their careers and attaining higher positions in the organisational hierarchy. It is generally perceived that women are weaker in engineering, and over time barriers such as gender stereotypes, work-life balance, technical skills limitation, negative perception, and misogynistic management became prominent. These barriers have been considered as antecedents of the slow career progression of female engineers, particularly middle-level female engineers in Malaysia. Given that these perceptions have not received a tailored empirical assessment and granted that no study has considered how empowerment mechanisms could be employed to break the career barriers, the researcher saw the need to close this gap. The researcher therefore sought to explore the role of empowerment as a tool in breaking career barriers of female engineers to facilitate their career progression in the manufacturing sector of Malaysia.

This study has investigated the career barriers confronting middle-level female engineers in Malaysia, the empowerment factors that could adopted as mechanisms to break the career barriers, the relationship between the career barriers and career progression of middle-level female engineers, and the moderating effect of the empowerment factors on the relationship between the career barriers and career progression of middle-level female engineers.

To achieve the research objectives and answer the research questions, a thorough literature review was conducted, which included a theoretical, conceptual, and empirical review. The SET (Individuals are rational actors who weigh the costs and benefits of social interactions), glass ceiling theory (Systematic barriers that

prevent certain groups, particularly women and minorities, from advancing to the highest levels of leadership and management within organizations) and empowerment theory (Gaining influence over events and outcomes of importance to an individual or group) were reviewed to explain the career barriers and empowerment mechanisms. The concept of career barriers such as gender stereotyping, work-life balance, technical skills limitation, negative perception, and misogynistic management were explained, and how they potentially hinder the progression of female engineers in their careers. Additionally, the dimensions or factors of empowerment (structural, psychological, and self-efficacy) were reviewed, and how they potentially moderate the relationship between the career barriers and career progression of middle-level engineers in the manufacturing sector of Malaysia. Subsequently, a conceptual framework was designed to illustrate the potential association between career barriers and career progression, including the moderating effect of empowerment factors. The conceptual framework served as a model which was tested, and which also guided the data collection. The conceptual framework was subsequently validated.

The study adopted a mixed-method approach to explore career barriers and their relationship with the career progression of female engineers in Malaysia. It also explored empowerment factors as effective mechanisms to break the career barriers to promote the progression of female engineers in Malaysia. Cross-sectional data from primary sources were collected using survey and interview methods. Thus, the researcher used a questionnaire and interview guide as data collection instruments whose validity and reliability were confirmed. In all, 120 engineers responded to the questionnaire, while 20 female engineers participated in the interview exercise. The researcher employed descriptive statistics, correlation model, and hierarchical regression model to analyse the quantitative data, while the thematic analysis technique was employed to analyse the qualitative data. The explanatory sequential design was employed to enable the researcher to explain the quantitative findings with the qualitative data, leading to a strong triangulation of both results. The conceptual model was later validated using 20 Human resource managers via semi-structured interviews. The research findings are highlighted as follows.

The first objective sought to identify the barriers that confront middle-level female engineers in Malaysia. Both quantitative and qualitative data affirmed five career barriers (gender stereotyping, work-life balance, technical skills limitation, negative perception, and misogynistic management) that confront middle-level female engineers in Malaysia. The qualitative aspect of the research revealed artificial intelligence as a potential career barrier facing women. Each of these barriers has been discussed in relation to the literature reviewed. It is worth noting that work-life balance promotes career progression, but work-life imbalance hinders the career progression of middle-level female engineers. Additionally, female respondents declined that they had limited

technical skills. Thus, in the context of this study, technical skills limitation was found to be more of a perception than reality.

The second objective sought to explore empowerment factors that can serve as mechanisms to break career barriers. The study proceeded to address the identified barriers through the moderating power of empowerment. The researcher affirmed three empowerment factors: structural empowerment, psychological empowerment, and self-efficacy empowerment. The qualitative aspect of the study revealed Spiritual empowerment as a latent empowerment factor that could powerfully motivate female engineers. These factors (excluding spiritual empowerment) were tested using both quantitative and qualitative data. The findings showed that the empowerment factors are empirically viable to break the career barriers confronting the women engineers at the initial stage of the analyses, where their potency or effectiveness had not been assessed statistically. Specifically, each factor was discussed in line with the literature. At the last stage of the quantitative analysis, it was found that some of these empowerment factors may not be effective in breaking some career barriers. The details have been provided in the last paragraph which highlights the moderating effect of findings.

The third objective related to the assessment of the relationship between career barriers and career progression, that is the main effects of the career barriers on the career progression of middle -level female engineers in Malaysia. The finding indicated that the career barriers have a significant negative relationship with career progression, except for work-life balance which showed a positive relationship. It suggests that a unit change in these career barriers is likely to result in a corresponding negative change in career progression by the magnitude of their coefficients, other factors held constant. However, a unit change in work-life balance will likely lead to a positive change in the career progression of female engineers. Hence, the null hypotheses of H1 to H5 are rejected, while the alternatives of H1 to H5 are accepted. Comparatively, it can be noticed that among the career barriers, technical skills limitation had the highest predictive effect (-0.407), followed by gender stereotyping (-0.283), with negative perception (-0.056) being the least. It is also important to note that work-life balance recorded a positive effect of 0.183 compared to the negative contributions of other independent variables. So, work-life imbalance serves as a career barrier. These barriers are important to understand among the engineering organizations in the Malaysian manufacturing sector.

The fourth objective was about the moderating effect of the empowerment factors on the association between career barriers and career progression. This objective was to test the effectiveness or potency of the empowerment factors in breaking the career barriers. It was established that psychological and self-efficacy empowerment factors are relevant and effective mechanisms for breaking gender stereotyping of middle-level

female engineers to progress in their careers to the top management level in the Malaysian manufacturing sector. It was further established that structural empowerment is an effective empowerment mechanism to break work-life imbalance to promote the career progression of middle-level female engineers in Malaysia. However, psychological and self-efficacy cannot be used as effective empowerment mechanisms to break work-life imbalance to enhance the career progression of middle-level female engineers in Malaysia. Next, all empowerment factors are not relevant and effective mechanisms to break the technical skills limitation of middle-level female engineers to facilitate their progression to the top management level in the Malaysian manufacturing sector. So, in the case of technical skills limitation, empowerment mechanisms are not appropriate tools to curtail it to overturn its negative impact on middle-level female engineers' career progression in Malaysia. Perhaps, future studies may consider other organisational factors such as motivation, satisfaction, training, incentives, etc. as potential mechanisms to break technical skills limitations. In terms of negative perception, psychological and self-efficacy empowerment factors are relevant and effective mechanisms to break the negative perception about female engineers to facilitate their elevation to the top management level in the Malaysian manufacturing sector. On the other hand, structural empowerment may not be an effective tool to address the negative perception of women engineers. To conclude, psychological and self-efficacy empowerment factors are relevant and effective mechanisms to break misogynistic management in the various organizations, to help female engineers advance to the top in the Malaysian manufacturing sector. However, structural empowerment may not be an effective empowerment mechanism to address the misogynistic management approach to promote the career progression of female engineers in the manufacturing sector of Malaysia. A summary of the hypotheses test results is displayed below:

Table 7:1 Summary of Hypotheses Test Results

Hypotheses		Decision
H1	Gender Stereotyping negatively relates to Career Progression	Supported
H2	Work-life Balance positively relates to Career Progression	Supported
H3	Technical Skills Limitation negatively relates to Career Progression	Supported
H4	Negative Perception negatively relates to Career Progression	Supported
H5	Misogynistic Management negatively relates to Career Progression	Supported
H6a	Structural Empowerment moderates Gender Stereotyping and Career Progression	Supported (–)
H6b	Psychological Empowerment moderates Gender Stereotyping and Career Progression	Supported (+)
H6c	Self-efficacy Empowerment moderates Gender Stereotyping and Career Progression	Supported (+)
H7a	Structural Empowerment moderates Work-life Balance and Career Progression	Supported (+)
H7b	Psychological Empowerment moderates Work-life Balance and Career Progression.	Not Supported (+)
H7c	Self-efficacy Empowerment moderates Work-life Balance and Career Progression	Supported (–)
H8a	Structural Empowerment moderates Technical Skills Limitation and Career Progression	Supported (–)
H8b	Psychological Empowerment moderates Technical Skills Limitation and Career Progression	Supported (–)
H8c	Self-efficacy Empowerment moderates Technical Skills Limitation and Career Progression	Supported (–)
H9a	Structural Empowerment moderates Negative Perception and Career Progression	Supported (–)
H9b	Psychological Empowerment moderates Negative Perception and Career Progression	Supported (+)
H9c	Self-efficacy Empowerment moderates Negative Perception and Career Progression	Supported (+)
H10a	Structural Empowerment moderates Misogynistic Management and Career Progression	Supported (–)
H10b	Psychological Empowerment moderates Misogynistic Management and Career Progression	Supported (+)
H10c	Self-efficacy Empowerment moderates Misogynistic Management and Career Progression	Supported (+)

Author's computation, 2024

7.3 Conclusion

This research has explored the challenges faced by middle -level female engineers in Malaysia concerning their careers, identified the empowerment factors that may serve as tools to overcome these obstacles, examined the connection between these career challenges and the professional advancement of middle-level female engineers, and assessed how the empowerment factors influence this relationship. The researcher then presents the overarching conclusions derived from the study.

7.3.1 Factual and Interpretive Conclusions

The researcher concludes that as the participation rate of female engineers in the labour market can influence a nation's global competitiveness, there needs to be a broader exploration of career management strategies for women in engineering from various perspectives.

1. The research affirmed five career barriers (gender stereotyping, work-life balance, technical skills limitation, negative perception, and misogynistic management) that limit the career progression of middle-level female engineers in Malaysia. Artificial intelligence is a potential career barrier facing female engineers more than male engineers because of the above-mentioned career barriers.

2. The research affirmed three empowerment factors: structural empowerment, psychological empowerment, and self-efficacy empowerment as forces that are empirically capable of breaking the career barriers confronting middle -level female engineers. Spiritual empowerment is a latent empowerment factor that could equally motivate female engineers to progress in their careers. However, some of these empowerment factors may not be effective in breaking some of the career barriers as highlighted in the moderating effect findings.

3. The research indicated that all the above-mentioned career barriers had a significant negative relationship with career progression, except work-life balance which showed a positive relationship. Thus, a unit change in these career barriers will likely result in a corresponding negative change in career progression by the magnitude of their coefficients, other factors held constant. However, a unit change in work-life balance is likely to lead to a positive change in the career progression of female engineers. Among the career barriers, technical skills limitation has the highest predictive effect (-0.407), followed by gender stereotyping (-0.283), with negative perception (-0.056) being the least. On the other hand, the work-life balance recorded a positive effect of 0.183 compared to the negative contributions of other

independent variables. It can be safely stated therefore that work-life imbalance is a carrier barrier. The Malaysian manufacturing sector must understand these relationships.

4. The following conclusions are drawn on the moderating effect of empowerment factors on the association between career barriers and career progression.

Gender Stereotyping

Psychological and self-efficacy empowerment factors are viable and effective mechanisms to break the gender stereotyping of middle-level female engineers to progress in their careers.

Work-Life Balance

Structural empowerment is an effective empowerment mechanism to break work-life imbalance to promote the career progression of middle-level female engineers in Malaysia. However, psychological and self-efficacy cannot be used as effective empowerment mechanisms to break work-life imbalance to enhance the career progression of female engineers in Malaysia.

Technical Skills Limitation

None of the empowerment factors are relevant and effective mechanisms to break the technical skills limitation of middle-level female engineers to facilitate their progression to the top-level management level in the Malaysian engineering sector. So, in the case of technical skills limitation, empowerment mechanisms are not the appropriate tools to curtail the limitation. Perhaps, future studies may consider other organizational factors such as motivation, satisfaction, training, incentives, etc. as potential mechanisms to break technical skills limitations.

Negative Perception

In terms of negative perception, psychological and self-efficacy empowerment factors are relevant and effective mechanisms to break the negative perception about female engineers to facilitate their elevation to the top management level in the Malaysian manufacturing sector. On the other hand, structural empowerment may not be an effective tool to address the negative perception of women engineers.

Misogynistic Management

Psychological and self-efficacy empowerment factors are relevant and effective mechanisms to break misogynistic management in various organizations, to help female engineers advance to the top in the Malaysian engineering sector. However, structural empowerment may not be an effective empowerment mechanism.

7.3.2 Conceptual Conclusion

This study has provided empirical corroboration of the concepts of the career barriers (gender stereotyping, work-life balance, technical skills limitation, negative perception and misogynistic management) of middle-level female engineers and theories such as the glass ceiling theory. These barriers can be conceptualised in the context of Malaysia by adopting the principles of the glass ceiling theory, which suggests that gender stereotyping is a factor that prevents women from moving up to top management. This theory suggests that it is difficult for middle -level female engineers to be promoted to levels of authority within workplaces, because of gender stereotyping and other barriers as confirmed in this study. Therefore, glass ceiling theory is considered a major barrier to women engineers' advancement opportunities.

For many years, the glass ceiling theory is observed as immoral impressions and prejudices towards women's capabilities that do not allow them to move from one position to another in the organisation hierarchy. This is clearly what the career barriers denote, especially gender stereotyping, negative perception, and technical skills limitation. Stereotypes about gender roles and capabilities contribute significantly to the glass ceiling, because they create biased perceptions of women's leadership abilities, often leading to their exclusion from high-level positions. Unconsciously, this feeds into managerial styles that are inimical to the progress of female engineers. The finding of misogynistic management approach as a major career barrier underscores the principles of the glass ceiling theory, which must be keenly considered in the study of the career barriers, particularly in Malaysia where this study has been conducted.

Given the age-long culture which does not project women as capable of competing with men in certain professions or occupations, the barriers, especially gender stereotyping and negative perception, are equally predominant among middle -level female engineers in Malaysia. These barriers, therefore, transcend regions and countries. Thus, their evaluation, the other barriers must be holistically considered, following the conceptual framework of this study to provide workable and applicable models. Unfortunately, engineering is a particular field that such organisational culture is widely shared. This culture inadvertently creates the situation of gender

stereotyping that confronts female workers in the sector. This intuition is underscored by literature. For instance, it is established that companies with traditional, male-dominated cultures often lack policies that support diversity and inclusion. Similarly, it has been observed that such cultures may implicitly favour men for leadership roles, perpetuating gender biases and stereotypes. Additionally, the lack of flexible work policies can disproportionately impact women, who are often the primary caregivers in their families.

The aforementioned barriers can be curbed using empowerment as postulated by the empowerment theory and SET. This study identified structural empowerment, psychological empowerment, and self-efficacy empowerment as mechanisms to control the barriers to reduce their impact on career progression of female engineers in Malaysia. This validates the potency of the empowerment theory in explaining how management of the manufacturing companies in Malaysia could empower middle -level female engineers using the SET. Literature suggests that SET can be applied to structural empowerment by examining the social exchanges that occur between employees and their supervisors or managers. For example, if an employee perceives that their supervisor is providing them with the necessary resources and support to perform their job effectively, they may be more likely to engage in positive social interactions with their supervisor. This can help to curb the negative perception, gender stereotyping, and misogynistic management style that adversely affect female engineers. It follows that SET, which has been applied to various social contexts, including interpersonal relationships, workplace dynamics and larger societal structures, provides framework of how the empowerment theory should be implemented to achieve the desired outcome. It provides a framework for understanding why individuals choose to initiate, maintain, or terminate social relationships.

The SET is also important theoretical framework that explains the relationship between psychological empowerment and turnover intentions, making it suitable to augment the empowerment theory to provide sound theoretical foundation for the implementation of the findings of this study using the revised conceptual framework that is tailored to the manufacturing sector of Malaysia. Key concepts and principles of SET in the social exchange and the empowerment dimensions as established in this study are essential to ensure the barriers are curbed to their minimum impact, if not eliminated completely. What must be keenly considered is the individual contributions of the empowerment dimensions and how the moderate the effect of each career barrier on career progression of the middle-level female engineers in Malaysia. By context, this study has breached the empirical gap in the application of the SET and empowerment theory as well as the glass ceiling theory by consolidating their interdependence nature of reduce the career barriers and promoting career progression.

Revised Conceptual Framework

Subsequent to the theoretical, conceptual, and empirical review of the literature in chapter two, and based on the hypotheses derived, the conceptual framework in Figure 3.1 was proposed to illustrate the relationship between the independent variables (Gender Stereotyping; Work-Life Balance; Technical Skills Limitation; Perception; Misogynistic Management) and dependent variable (Career Progression), alongside the moderating effect of empowerment (structural, psychological and self-efficacy). It was expected that the career barriers would negatively influence Career Progression. However, the interaction effect of empowerment would decrease the effect of the barriers on female engineers' career progression in Malaysia. During the study, however, a new independent variable (Artificial Intelligence) and a new moderating variable (Spiritual Empowerment) emerged.

Artificial Intelligence (AI)

The majority of respondents had strong feelings that Artificial Intelligence (AI) is gradually posing a strong career barrier for female engineers in Malaysia. The majority of respondents identified this threat and were of the view that though AI is not an observable career barrier currently, it will be shortly. When the researcher probed further, respondents explained that in the engineering sector, it is easier to replace human skills with AI, considering the existing discrimination against women in engineering. female engineers and female technicians face the biggest threat of redundancy. One female engineer remarked as follows:

> "The threat of AI in job lay-offs is coming gradually but it seems this is un-noticed. It is going to affect manufacturing and industry, transportation and logistics, geological exploration, military and defence, the service industry as well as health care and medicine. We will be getting into global lay-offs soon, and in Malaysia, female engineers will be among one of the first to go".

Some respondents explained further as follows:

> "When AI identifies and capitalizes on existing biases and inefficiencies within an organization, this can result in female engineers being overlooked for promotions and opportunities".
>
> "Currently organizations use A1 to evaluate performance reviews of engineers, which could unmistakably support gender biases- if not regulated carefully. This can lead to unfair evaluation for female engineers".
>
> "Organisations using algorithms in the recruitment process can sustain enduring unfairness if they are trained on historical data that reflect gender imbalances in engineering roles"

> "AI can influence the availability and recommendation of training programs and career development resources which will enhance women engineers' progression."…Additionally AI systems that recommend training programs might not be equally tailored to women, especially if they are based on male-dominated career paths and interests".

Earl and Skyrme (1992) anticipated the emergence of hybrid managers—individuals possessing both solid technical expertise and sufficient business acumen, or the other way around. These are professionals with technical abilities who can operate effectively in user environments while also being skilled in creating and executing IT application concepts. A large size of respondents thought that AI could work against female engineers' career development when it comes to resource sharing within organizations. One such view was captured as follows:

> "If AI systems prioritise training opportunities for employees in roles traditionally occupied by men, female engineers might have less access to important skill development resources".
> "AI systematically collaborates administrative tasks and repetitive tasks. Managerial or directorship jobs involve more administrative activities which will be a barrier for female engineers' managers".

Others also stated that AI could result in the under-utilisation of the full capacity of female engineers.

> "If AI systems assign projects based on past assignments, women who have been historically assigned less challenging or less visible projects may continue to receive fewer high-profile assignments. Moreover, AI tools used to assign projects or tasks can exhibit biases that affect career development opportunities".

Another respondent was apprehensive of AI as follows:

> "AI-driven professional networking platforms might reinforce existing gender imbalances. Networking platforms that suggest connections based on existing networks can perpetuate male-dominated professional circles, making it harder for women to connect with mentors and sponsors".

The above apprehensions are supported by Jang and Kyun (2021), who assert that as a result of AI, women's engineering careers can be curtailed due to different life events and female engineers may experience career interruption. It is the view of the researcher that considering the potential threat of AI in several areas within engineering organisations and considering their importance and significance in technological advancement and

economic growth, the Malaysian Government should move in quickly to avert an imminent female engineer redundancy.

Spiritual Empowerment

Interesting views on the role of the Spiritual in empowerment emerged during the interviews. Most respondents, in addition to Structural Empowerment, Psychological Empowerment, and Self-Efficacy, mentioned 'spiritual empowerment', another kind of empowerment derived from the Spiritual. The respondents believed that Structural Empowerment was derived from the administrative and bureaucratic mechanisms of the Organisation; Psychological Empowerment was derived from the mind, and Self-Efficacy was an attitude derived from the persona or the self. Several respondents held the view that granted beliefs that the Spiritual or Spiritual was superior to the self, there is the possibility of the existence of 'Spiritual Empowerment' derived from a higher or superior power or a supreme being (God). Similar views expressed were that believing in the power of the Supreme God and practicing positive thinking can foster a proactive attitude and encourage female engineers to pursue opportunities and overcome obstacles in their career paths. Many respondents believed that spiritual empowerment could generate inner confidence among female engineers and propel them to achieve career progress**.** Some of the remarks are captured below:

> "Spiritual empowerment can assist female engineers in achieving career progression by fostering a strong sense of inner confidence and resilience. It encourages self-reflection, helping them to align their professional goals with their values and purpose" This inner clarity can lead to greater motivation, effective decision-making, and the ability to navigate workplace challenges with grace, ultimately enhancing their leadership qualities and career advancement opportunities".

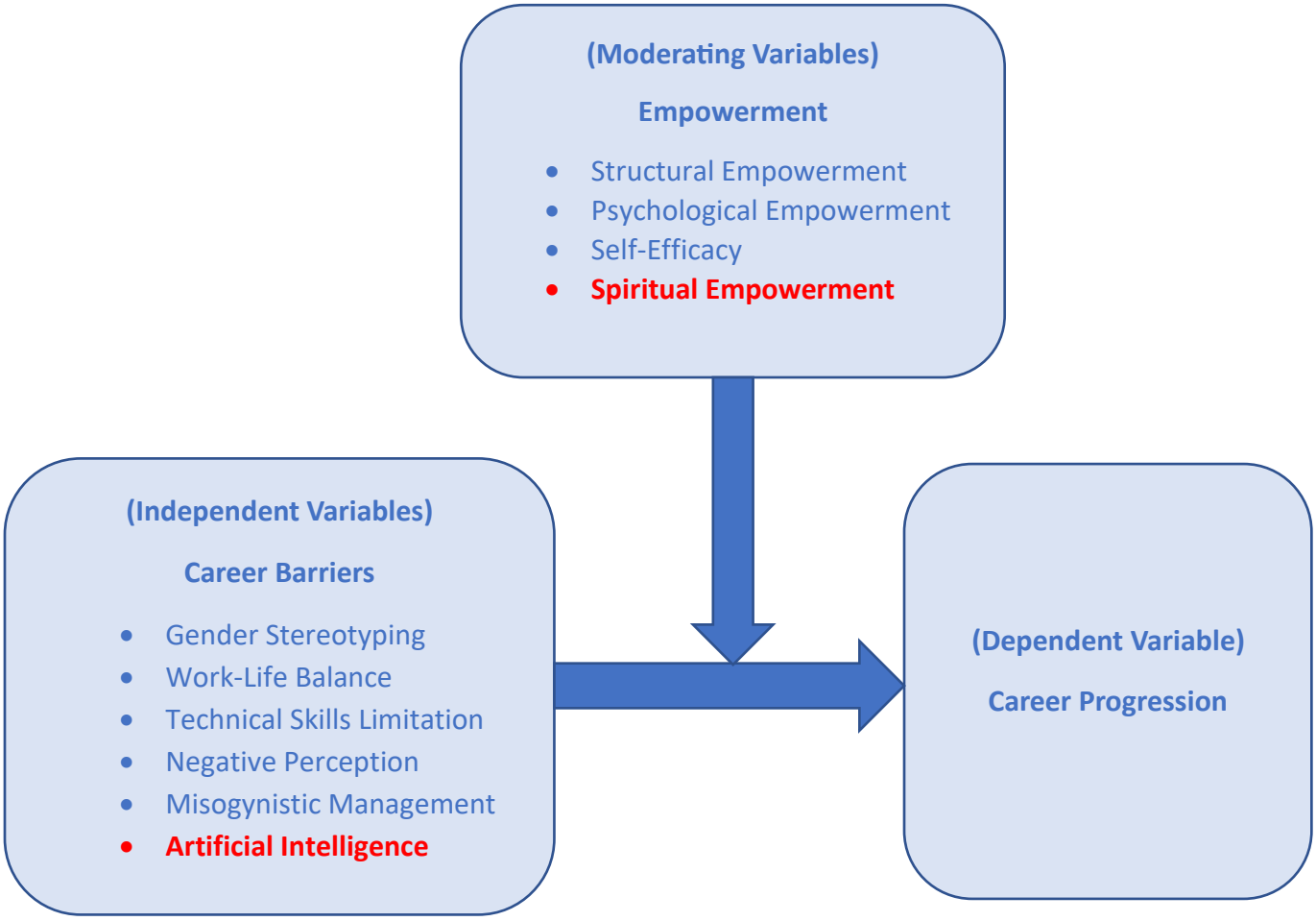
> "Spiritual empowerment can enhance female engineers' resilience and ability to handle stress, which is crucial for career progression. By aligning their work with their values, they can find greater energy and satisfaction in their roles, leading to increased productivity and a stronger presence in the workplace"

Another category of respondents held that spiritual empowerment derived from the supreme being can open career advancement opportunities. They stated that spiritual empowerment can serve as a tool for female engineers to project an image of confidence and leadership, enhancing their visibility and influence within their workplaces.

"By showcasing their spiritual journey through personal success, they can position themselves as valuable assets to their employers, which will pave the way for career progression through increased recognition".

Based on the above insights from the research, the researcher has revised the study framework to include Artificial Intelligence as an independent variable and Spiritual Empowerment as a moderating variable in Figure 7:1 below.

Figure 7.1: Barriers to Female Engineers' Career Progression and Empowerment Model



Source: Author's Revised Conceptual Framework 2024

7.3.3 Generalisability of Conclusions

The findings of this research are subject to limited generalizability. As elaborated in Chapter 3, the multi-dimensional nature of the research questions necessitated the adoption of both inductive and deductive approaches to formulate an appropriate research strategy. Furthermore, it was outlined that, within the mixed-methods approach employed, the quantitative dimension served as the primary method, while the qualitative component played a secondary role.

The deductive approach adopted allows for a certain degree of generalization of the research findings. As presented in Table 4.2, the results of the reliability analysis demonstrated that all scales within the research instrument achieved Cronbach's alpha coefficients exceeding the prescribed threshold of 0.70, indicating a high level of reliability. Nevertheless, the constrained sample size of 120 engineers imposes limitations on the extent to which the findings can be generalised.

Additionally, the qualitative aspect of the study further restricts generalizability. As noted by Polit and Hungler (1999), qualitative research prioritizes an in-depth understanding of phenomena rather than the generalizability of findings. In this study, the validation of findings involving HR managers, assistant HR managers both relied on non-probability purposive sampling, utilising a small sample size of 20 participants. This methodological choice further constrains the broader applicability of the results.

7.4 Contribution to Knowledge

This study makes a modest yet significant contribution to theoretical model development, empirical research, framework for developing human resource strategies that human resource managers could implement and policymaking within the gender literature in the following ways:

7.4.1 The Research Gap and How It Has Been Filled

The Gap

Inarguably, male dominance has become phenomenal in the engineering profession, presenting a challenge, in the view of the researcher, that requires a holistic approach to resolve, hence this study. Relative to the globally observed male dominance in engineering professions, Malaysia's storyline is generating research interest due to literature and knowledge gaps. Extant literature and empirical studies do exist on engineering studies, especially on women in engineering and career success among women engineers. However, the geographical context of such works is mostly limited to Europe, the United States, and Australia, among others. Studies on Asia are limited, and worryingly, studies on Malaysia are very scarce. This work attempts to set the stage for a contemporary study in this deficit area.

Empowerment studies with respect to women in engineering are very limited. For instance, the impact of structural empowerment on work engagement has been less studied compared to psychological empowerment, with most research focusing primarily on healthcare environments. The interplay between structural empowerment and career progression for female empowerment is very limited in the literature (Monje-Amor *et al,* 2021). Besides, so far, no study has examined the effectiveness of structural empowerment as a tool that could be applied to break career progression barriers among female engineers in Malaysia. Though there is evidence of considerable research in the gender literature covering areas such as empowerment, female advocacy, affirmative action; feminine strategy development; none of the studies have focused on career barriers facing female engineers in middle-level management, particularly in the Malaysian context.

It would appear that female engineers, despite their strategic significance to the Malaysian economy, have not garnered sufficient attention from researchers. This lack of focus may be attributed to their anonymization and stereotyping within the engineering sector. Extensive searches conducted in the libraries of the University of East London, as well as other prominent libraries in London and Malaysia, failed to produce relevant or up-to-date literature specifically addressing middle-level female engineers and empowerment. Recognising this critical gap, the author undertook this investigation to contribute to the existing body of knowledge.

How the Research Gap has been filled

As mentioned in Chapter 1 under the Research Gap Section, the author's MPhil study had certain limitations, which this doctoral thesis has sought to address. In this PhD study therefore, the researcher clearly defined the study variables based on literature and identified the most common barriers in the engineering sector limiting women to include: gender stereotyping, technical skills limitation [not included in the previous thesis], work-life balance, negative perception [not specified in the previous thesis], and misogynistic management [not included in the previous thesis) that encapsulates glass ceiling and other inappropriate management styles. The revised female engineers' career barriers in this study therefore provided tailored factors that can be easily reproduced in other jurisdictions.

During the MPhil Study by the author, simple linear regression analysis was carried out to investigate the relationship between the career barriers and career progression, without the inclusion of some intervening variables. Though the MPhil study sought to test whether empowerment could be used as a mitigating mechanism for the career barriers, it was actually not tested with appropriate statistical or regression models. In the MPhil study, the researcher should have examined the moderating effect of empowerment on the

relationship between career barriers and career progression of female engineers in Malaysia. By so doing, the researcher could have confirmed whether the negative effect of the barriers on progression might increase or decrease by the inclusion of empowerment as a moderator in the regression model. Given that this was not done in the MPhil study, this PhD study has provided statistical evidence of empowerment as a mechanism to mitigate the barriers and promote progression to top management levels among middle-level female engineers in Malaysia. Additionally, in this PhD study, clearly defined dimensions of empowerment were adopted: structural, psychological and self-efficacy. These specific dimensions made the findings more definitive than in the case of the MPhil study. Besides, unlike the MPhil study, this study utilised the qualitative aspect to triangulate the quantitative findings, leading to validation of the conceptual model of the study. Given the findings of the survey, the model was validated by testing the findings on selected engineers in the sector, confirming the reliability and verifiability of the findings. Notwithstanding its limitations, the MPhil study provided a sound basis for this PhD study.

The internal context for this research was supplied by engineering or manufacturing organisations in Malaysia, while the external context was shaped by the Malaysian economy. The focus of the study was specifically on middle-management female leaders, deliberately excluding both upper management and junior female employees. The study employed various theoretical frameworks, including concepts such as Social Exchange, the Glass Ceiling, Empowerment, and relevant gender literature, to develop a conceptual framework that formed the basis of the research. Utilising a cross-sectional design, the research utilised a mixed methods approach due to the complex nature of the questions and objectives, insights from previous studies, and the desire to ensure rigor. Initially, quantitative data was gathered to pinpoint critical factors, followed by a qualitative phase that aimed to further explain and clarify the quantitative results. A survey involving 120 middle -level female engineers were conducted for the quantitative aspect using questionnaires, while the qualitative segment gathered data through semi-structured interviews with 20 middle – level female engineers. Data analysis for the quantitative section was performed using statistical techniques with SPSS, while thematic analysis was applied to the qualitative data.

7.4.2 Theoretical Contribution

The main theoretical contribution of this thesis is that it is probably the first major research with strong theoretical underpinnings to be conducted on middle-level female engineers in the research focuses on Malaysia, exploring how women can be supported in advancing their careers. This work significantly enhances the field of gender and empowerment studies. It adds to the understanding of empowerment by identifying

obstacles to career advancement. By analysing the main hindrances, the study provides valuable insights into the progression of female engineers, offering relevant information for policymakers and industry stakeholders. Additionally, the updated conceptual framework serves as a tool for understanding and assessing the factors influencing empowerment, as well as a method for evaluating or predicting career advancement for female engineers in Malaysia.

From a methodological perspective, the study showcases the effectiveness of mixed methods in researching the career development of female engineers, yielding valuable findings. The author is not aware of any previous research on this topic within Malaysia that has utilised mixed methods across such a comprehensive scope. The mixed approach brings together the strengths of both qualitative and quantitative research.

A key theoretical contribution of this study lies in its successful integration of established models such as Social Exchange Theory (SET), the Glass Ceiling Theory, and a multidimensional empowerment theory, leading to an empirically validated framework for understanding career progression. These three major theories contributed uniquely by providing the theoretical context for the research. The research has provided a new understanding of `empowerment' in career progression by suggesting that 'empowerment' can be further leveraged from the 'spiritual' dimension for a clearer understanding of its impact on career progression. The study furthermore discovered artificial intelligence (AI) as a potential career barrier that can seriously threaten middle-level female engineers' career progression. Though the threat of AI to career progression is a threat to both male and female engineers, the study suggested that female engineers are at a higher risk The study also brought to the fore, the need for female engineers to consider 'Spiritual Empowerment' as a motivational force in seeking career progression.

7.5 Implications of the Study

7.5.1 Policy Implications

From the national policy perspective, though the Malaysian Government has made deliberate efforts to increase career development prospects for women, the Government can do more at the national level in terms of policy directions on education; culture; the economy, and technology that allow women to prosper in their career. It is the view of the researcher that an environment that is welcoming and supportive of female engineers needs to be created through national policy. This will improve their career opportunities and benefit the nation's technological and economic development.

To effectively combat gender discrimination, the government should strengthen and enforce legislation about gender equality. Organisations should be required to submit data on gender diversity and progress made toward achieving gender equality. The government could also implement incentives or subsidies for companies that show that they are making a major effort to advance female engineers.

Regarding workplace policies and practices, regulators should encourage businesses to provide remote work opportunities and flexible work schedules to help female engineers manage work and family responsibilities. Organisations must be encouraged to adopt equal and extended parental leave policies that accommodate both parents, which will also lessen career impacts on women. Furthermore, the Government ought to implement stringent anti-harassment measures and offer training programs to foster a secure and encouraging workplace atmosphere.
Regulators must in various ways support leadership and mentorship programs such as leadership training programs tailored for women to prepare them for senior and leadership roles in engineering. Also, mentorship programs can be implemented where experienced female engineers can guide and support younger female engineers in their career progression.

Regarding cultural and social initiatives, Malaysia can support national awareness campaigns aimed at debunking stereotypes and highlighting the contributions of women in engineering. The state can also engage with communities to change societal attitudes towards women in engineering and promote the value of diversity in the workforce.

It is very significant for government to establish partnerships between government agencies, educational institutions, and private sector companies to promote industry collaboration and develop initiatives aimed at supporting female engineers. Awards and recognition programs for companies and individuals who contribute significantly to the professional development of female engineers may be set up.

At the national level, it will be imperative for Government to provide funding for studies to identify the specific challenges faced by female engineers in the country and develop evidence-based policies. This could involve the collection and analysis of data on gender diversity in engineering to monitor progress and identify areas for improvement. It will further be appropriate if national policy encourages networking and professional development by facilitating the establishment and activities of professional associations tailored for female engineers. Perhaps these associations will provide networking and professional development opportunities.

Author has proposed below action plan to enhance engineering managers' representation in leadership roles in Malaysia's manufacturing sector.

Strategic Action Plan to Enhance Female Engineering Managers' Representation in Leadership Roles in Malaysia's Manufacturing Sector

Establish Regulatory and Policy Foundations

Action 1:
The Ministry of Human Resources in collaboration with the Ministry of Investment, Trade and Industry (MITI), shall introduce a regulatory framework mandating: A minimum threshold of 30% female representation in key engineering leadership roles (e.g., Head of Engineering, Plant Director, R&D Lead) by the year 2027.
Action 2:
Integrate this directive within the Malaysian Code on Corporate Governance (MCCG) and align with both the National Women's Policy (NPW) and the targets set in the 12th Malaysia Plan for gender equity.

Establish Baselines and Reporting Standards

Action 3:
Manufacturing companies with over 150 employees must: Conduct annual assessments of gender composition in engineering leadership. Report these metrics to Malaysia Productivity Corporation (MPC) or TalentCorp (Talent Corporation Malaysia) for national benchmarking.
Action 4:
Launch a publicly accessible Gender Representation Index for the manufacturing sector, similar in transparency to ESG (Environmental, Social, and Governance) reporting Bursa Malaysia which is the stock exchange in Malaysia.

Enforcement through Incentives and Sanctions

Action 5:
Encourage compliance through structured incentives, including: Tax incentives and hiring grants facilitated by Human Resource Development Corporation for organisations meeting or exceeding representation targets. Priority access to government-funded procurement and innovation schemes via Ministry of International Trade and Industry and SME (Small Medium Enterprise) Corp.
Action 6:
Implement progressive penalties after an introductory compliance window:

Warnings issued to publicly listed firms through Bursa Malaysia (stock exchange in Malaysia). Diminish eligibility for government-linked projects or preferential foreign investment treatments.

Strengthen the Talent Pipeline for Future Female Leaders

Action 7:
Expand scholarship programs and leadership development pathways for women through collaborations with the Council of Trust for the People or the Council of Trust for Indigenous People (MARA), the Public Service Department Malaysia (JP), the Petroliam Nasional Berhad sponsorship program, and technical institutions such as Universiti Teknologi Malaysia, Universiti Malaysia Pahang Al-Sultan Abdullah, and Universiti Malaysia.
Action 8:
Create Women in Manufacturing Engineering leadership accelerators and mentoring platforms, led by Federation of Malaysian Manufacturers (FMM) and the Institution of Engineers Malaysia (IEM).

Organisational Policies to Support Advancement

Action 9:
Implement gender-neutral recruitment and advancement frameworks and structured leadership training and career mapping tailored to women engineers. Returnships programs to reintegrate women returning from career breaks or maternity leave.
Action 10:
Promote retention through policies that support, flexible work arrangements. On-site childcare services and Workplace safety and harassment prevention protocols.

Shifting Norms and Public Awareness

Action 11:
Coordinate a nationwide awareness campaign titled “Women Lead Engineering”, spearheaded by Ministry of International Trade and Industry (MITI), Forum Economy Malaysia (FEM), and Malaysia Digital Economy Corporation (MDEC), to promote visibility and normalise women’s leadership in engineering.
Action 12:
Leverage storytelling in media, highlight industrial success stories, and establish national awards to celebrate outstanding female engineering leaders.

Monitoring, Accountability, and Ongoing Review

Action 13:
Establish a National Gender Equity in STEM Task Force, under the oversight of Ministry of Human Resources and Ministry of International Trade and Industry to oversee implementation. Review and adjust targets as needed. Collect and analyse both qualitative and quantitative feedback.
Action 14:
Produce an annual publication titled “Progress in Women’s Engineering Leadership in Malaysia”, highlighting achievements, challenges, and sectoral benchmarks.

7.5.2 Managerial Implications

At the managerial level, enhancing career progression for female engineers in Malaysia requires a multifaceted approach that addresses administrative, structural and cultural barriers. It is the view of the researcher that through effective leadership, engineering firms in Malaysia can create a more comprehensive environment that supports the career progression of female engineers, eventually leading to a more diverse and innovative workforce.

Top management can promote an inclusive organisational culture by regularly offering all employees with training on unconscious bias, diversity, and inclusion. They can develop and enforce policies that promote respect, equity, and inclusion in the workplace. For instance, CEOs can institute inclusive hiring practices by adopting blind recruitment processes to minimise unconscious bias. They can as well ensure that hiring panels are diverse to promote fairness and inclusivity.

Organizational Leadership can promote Work-Life balance by providing remote work options and flexible working hours to meet a range of needs. Comprehensive parental leave policies that support both mothers and fathers can be implemented. CEOs can establish official mentorship programs where experienced female engineers mentor junior female engineers and also encourage senior leaders to actively sponsor high-potential female engineers for career advancement opportunities.

Corporate policies may help female engineers have clear career pathway by outlining and sharing the requirement for promotions and career advancements. The policies may also provide continuous professional development opportunities, such as workshops, courses, and certifications. Company policy may allow for provision of financing for female engineers to attend relevant conferences and workshops as well as support their engagement in industry networks and organizations.

Organisational leadership may consider providing opportunities for women to assume leadership roles in projects and teams, as well as leadership development programs specifically designed for female engineers. Heads of engineering institutions must set measurable targets for gender diversity at different levels of the organisation and provide regular report on their progress towards achieving these gender diversity and inclusion goals.

CEOs should create a confidential and safe channel for feedback and concerns in order to assist the development of a supportive environment. They should also establish internal support groups or networks which encourage female employees to share experiences and support each other. Organisational leadership should consider conducting open and equitable compensation policies and conducting regular pay equity audits to ensure fair compensation across all levels.

7.5.3 Practical Implications

It is the opinion of the researcher that practically, the engineering professional associations in Malaysia and Board of Engineers Malaysia can play a crucial role in improving career progression opportunities for female engineers. The engineering associations must significantly enhance the career progression opportunities for female engineers, to ensure a more inclusive and equitable engineering profession.

For example, they can put in place mentorship and sponsorship programs by establishing structured mentorship programs that connect young female engineers with experienced professionals who can provide guidance, support, and career advice. They can also encourage senior engineers and leaders to actively sponsor and campaign for the advancement of female engineers within their organisations.

Practically, networking events, including conferences, workshops, and informal meetups, can be specifically designed to bring together female engineers and industry leaders. They can also create online platforms and forums where female engineers can connect, share experiences, and support each other professionally.

The view of the researcher is that engineering associations should prioritise the professional development of their members by offering leadership training and continuing education. The programs should be developed to empower female engineers with the skills necessary to advance to senior and executive roles. Additionally, they could provide access to continuing education opportunities, such as courses, certifications, and seminars, to help female engineers stay updated with the latest industry trends and advancements.

Another practical implication of the study is that Engineering professional associations have the opportunity to promote gender equality in the engineering profession, by advocating policies and practices that support female engineers. The Associations could also initiate awareness campaigns to highlight the achievements of female engineers and promote the benefits of gender diversity in the engineering field. The researcher proposes that the Industry Associations should conduct and publish industry research on the career progression of female engineers, identifying barriers and proposing solutions. It is recommended that they collect and analyse data on the participation and advancement of female engineers within the profession to inform policy and program development.

Professional engineering associations can practically promote inclusive policies and best practices guidelines, and share guidelines on issues like flexible work schedule, parental leave, and anti-harassment in order to create an inclusive workplace. They can also offer training programs on diversity, equity, and inclusion for members and organisations. Furthermore, the Associations may establish awards and recognition programs to celebrate

the achievements and contributions of female engineers in Malaysia. They could also promote successful female engineers as role models through profiles in newsletters, websites, and at events.

Practically and directly, engineering associations can work with educational institutions, for instance, by collaborating with universities and schools to promote engineering careers among young women and support their transition into the profession. They can also collaborate with engineering firms and companies to develop programs and initiatives that support female engineers advance in their careers. The Associations can also create peer support groups for female engineers to discuss difficulties, share resources, and offer support to one another. Career counselling and coaching services can also be offered to help female engineers navigate their career paths and overcome obstacles. The Associations can establish resource libraries with articles, books, and videos, that address the specific needs and challenges of female engineers. Newsletters, journals, and reports can also be published featuring articles on career development, success stories, and industry news pertinent to female engineers.

7.6 Author's Reflections

Overall, this research has successfully examined the extent to which career barriers can be mitigated by empowerment mechanisms to facilitate career progression among middle-level female engineers in Malaysia. By identifying a significant gap in the existing literature, the study has provided valuable insights to address this void. The research questions initially posed have been thoroughly answered, contributing to new knowledge as outlined earlier.

Conducted with both scholarly rigor and practical relevance, the study has yielded conclusions that, while not broadly generalisable, offer a foundation for future research. Moreover, the findings present a useful tool for policymakers, engineering practitioners, and other relevant stakeholders, supporting evidence-based decision-making. Through the adoption of a multi-model approach in developing the conceptual framework, the author has demonstrated the value of integrating multiple perspectives to solve complex problems effectively. The use of a mixed methods approach further highlights the author’s analytical and intuitive ability to synthesise concepts and ideas in a meaningful manner to generate robust outcomes.

While the author acknowledges the limitations posed by the small sample sizes and the qualitative dimension of the research, which restrict the generalisability of findings across countries, the strategic importance of the engineering sector amplifies the significance of this study. A notable realization from this process is the profound power of “empowerment” within social and organisational contexts. The research reinforces the author’s conviction that managing female engineering talent transcends affirmative action for underrepresented

groups; rather, it constitutes a pivotal effort toward achieving social justice, enhancing societal contributions through engineering, and advancing engineering talent development.

The author is particularly intrigued by the transformative potential of "empowerment," which, when activated by engineering organisations or female engineers themselves, has the capacity to dismantle career barriers and catalyse career progression. "Empowerment," therefore, emerges as a concept of immense value—perhaps even more powerful than gold.

Despite significant investments in promoting female engineers, the disproportionately high attrition of female talent remains a pressing concern, representing a potential loss to national development (Jang & Kyun, 2021). The study concludes that in an era where engineering talent plays a critical role in determining a nation's international competitiveness, it is imperative to promote and nurture engineering talent across both genders. This effort should not be regarded merely as part of affirmative action but as a fundamental pursuit of social justice and societal contribution within the engineering domain. To minimise the loss of investments and enhance national competitiveness, a sustainable approach to managing female engineers must be prioritised.

7.7 Recommendations

Based on the findings, discussion and conclusions of the study, the researcher makes the following recommendations to Human Resource Managers of manufacturing or engineering organisations, female engineers and male engineers operating in Malaysia.

7.7.1 Human Resource Managers

Human Resource (HR) managers can play a crucial role in enhancing career progression for female engineers. The following are recommendations to HR Mangers of engineering organisations to break career barriers for female engineers. It is the view of the researcher that by implementing these recommendations, HR managers can create a more supportive and equitable environment for female engineers, enhancing their career progression and contributing to a more diverse and innovative workforce in the engineering sector. Figure 7.2 is a Framework for developing Human Resource Strategies that Human Resource Managers could implement.

Figure 7.2; Framework for Developing Human Resource Strategies to break Career Barriers

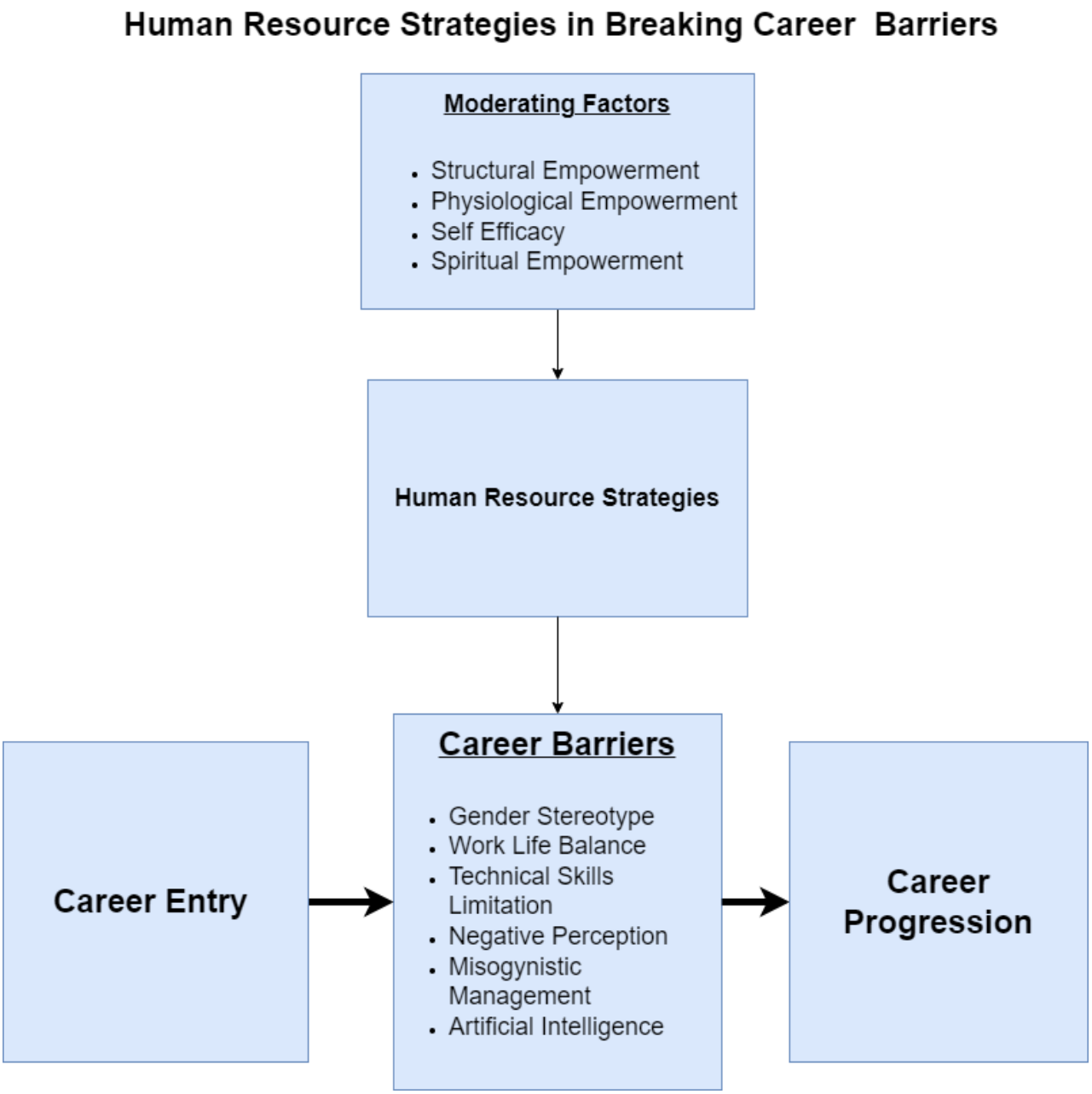


Figure 7.3: Human Resource Strategies in Managing Gender Stereotyping Career Barrier

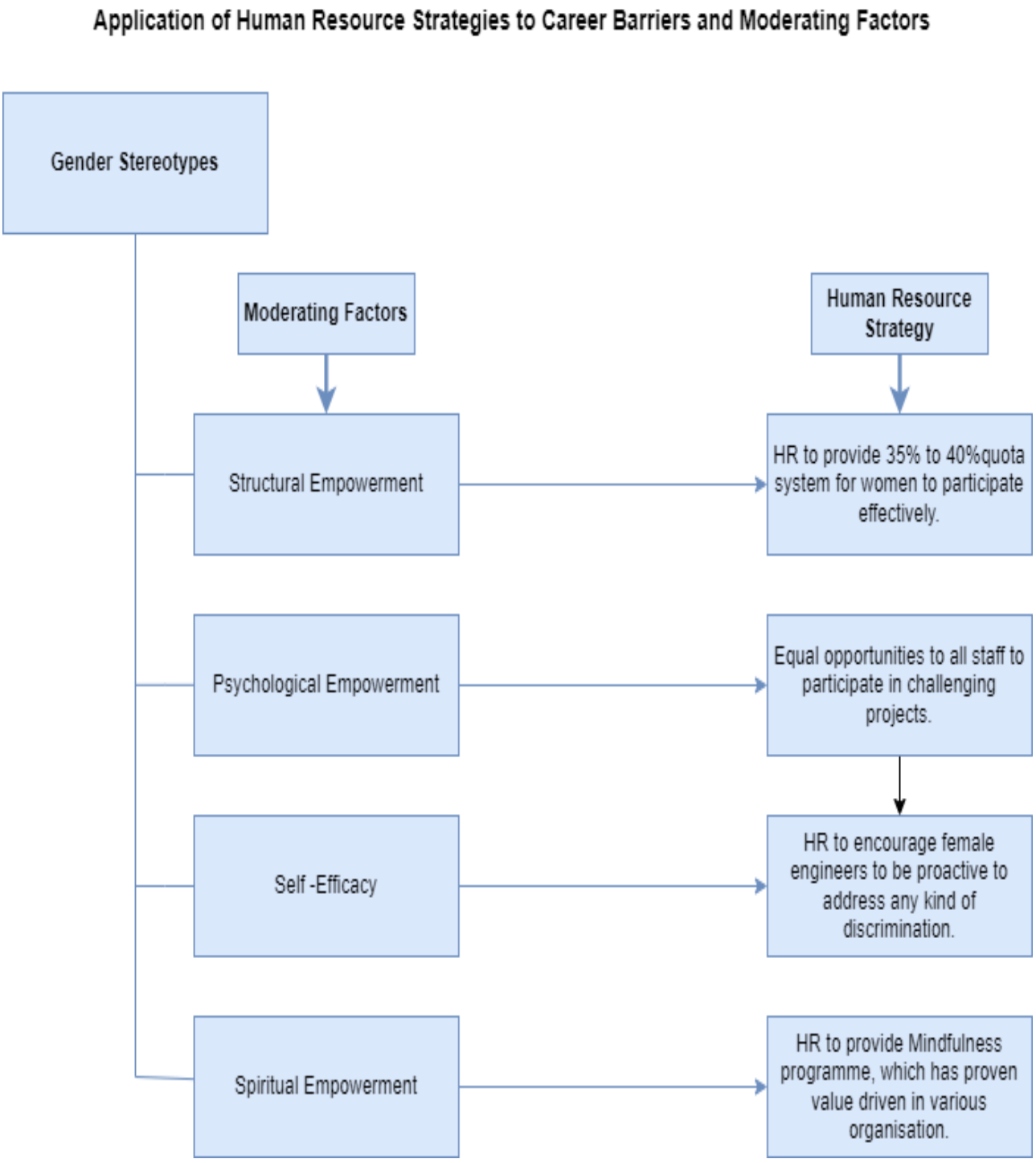


Figure 7.4: Human Resource Strategies in Managing Work-Life-Balance Career Barrier

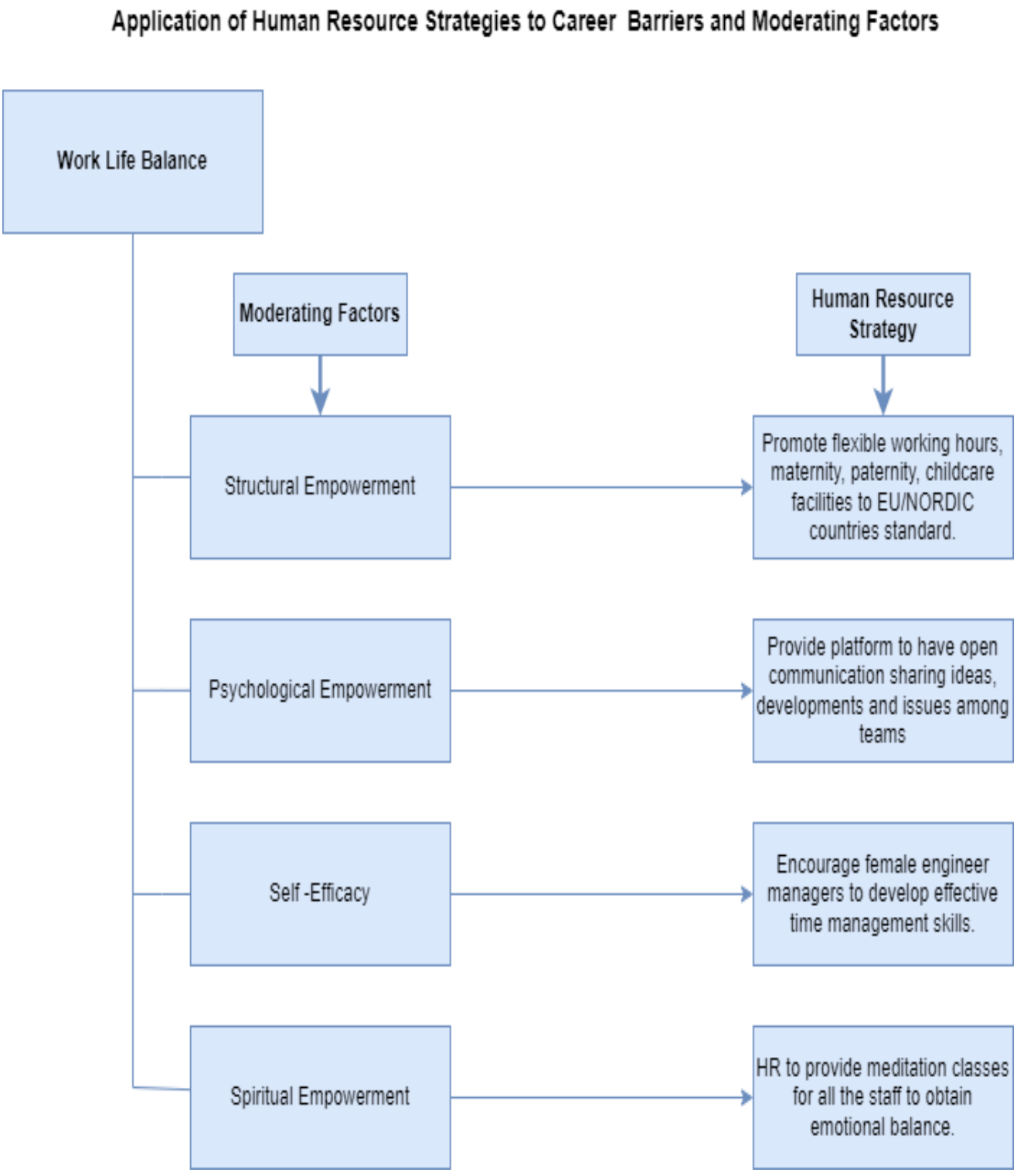


Figure 7.5: Human Resource Strategies in Managing Technical Skills Limitation Barrier

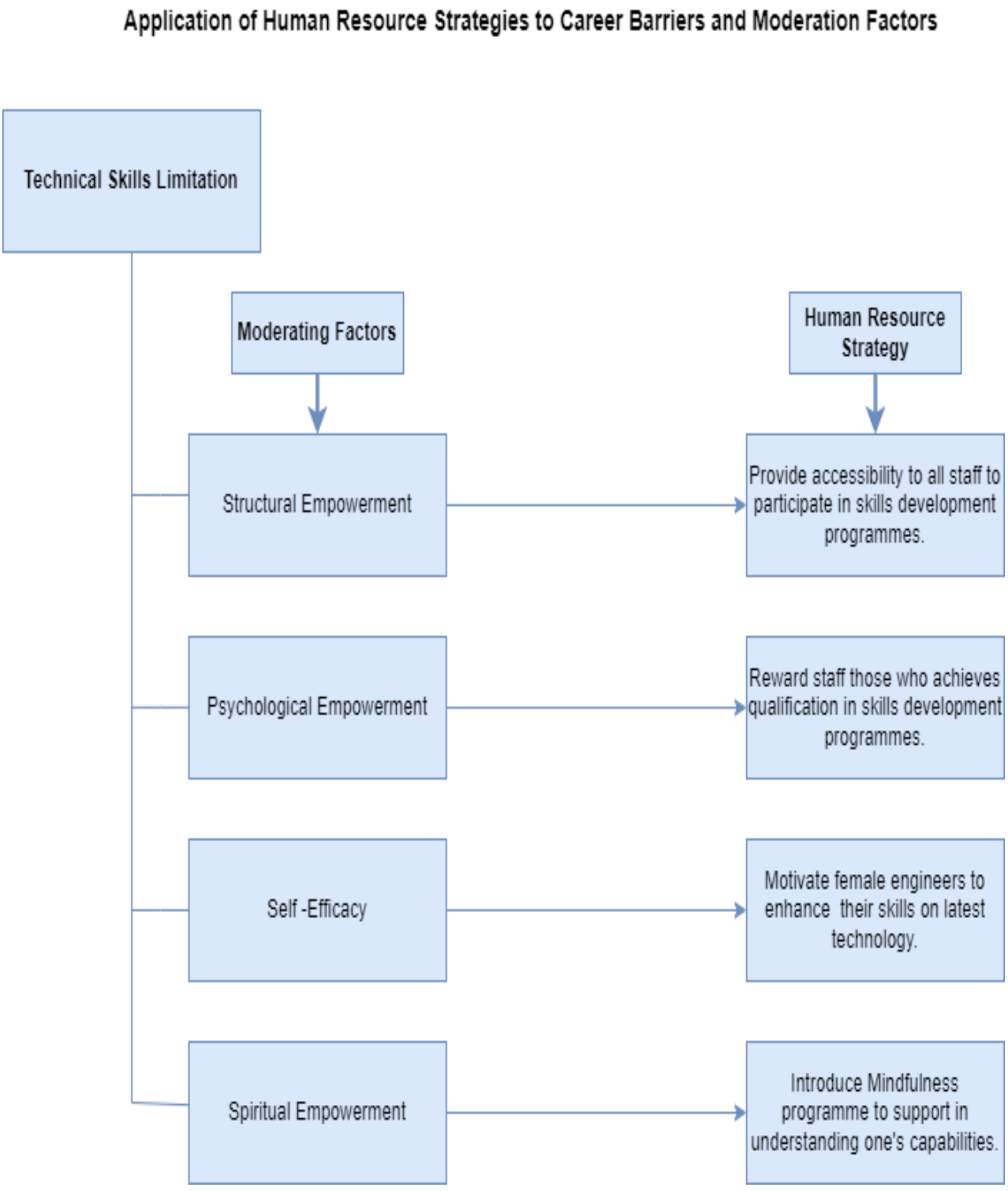


Figure 7.6 : Human Resource Strategies in Managing Negative Perception Career Barrier

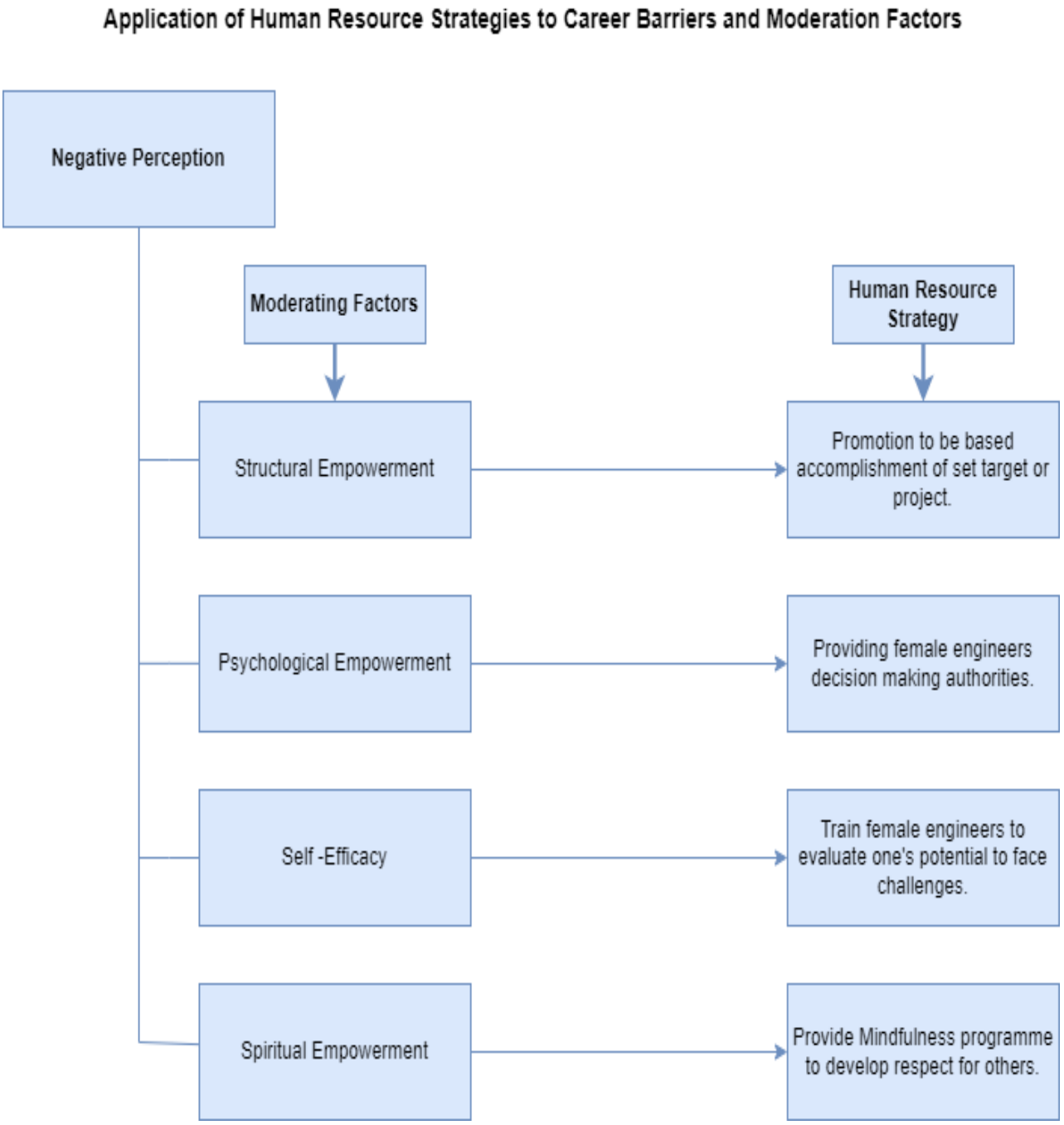


Figure 7.7: Human Resource Strategies in Managing Misogynistic Management Career Barrier

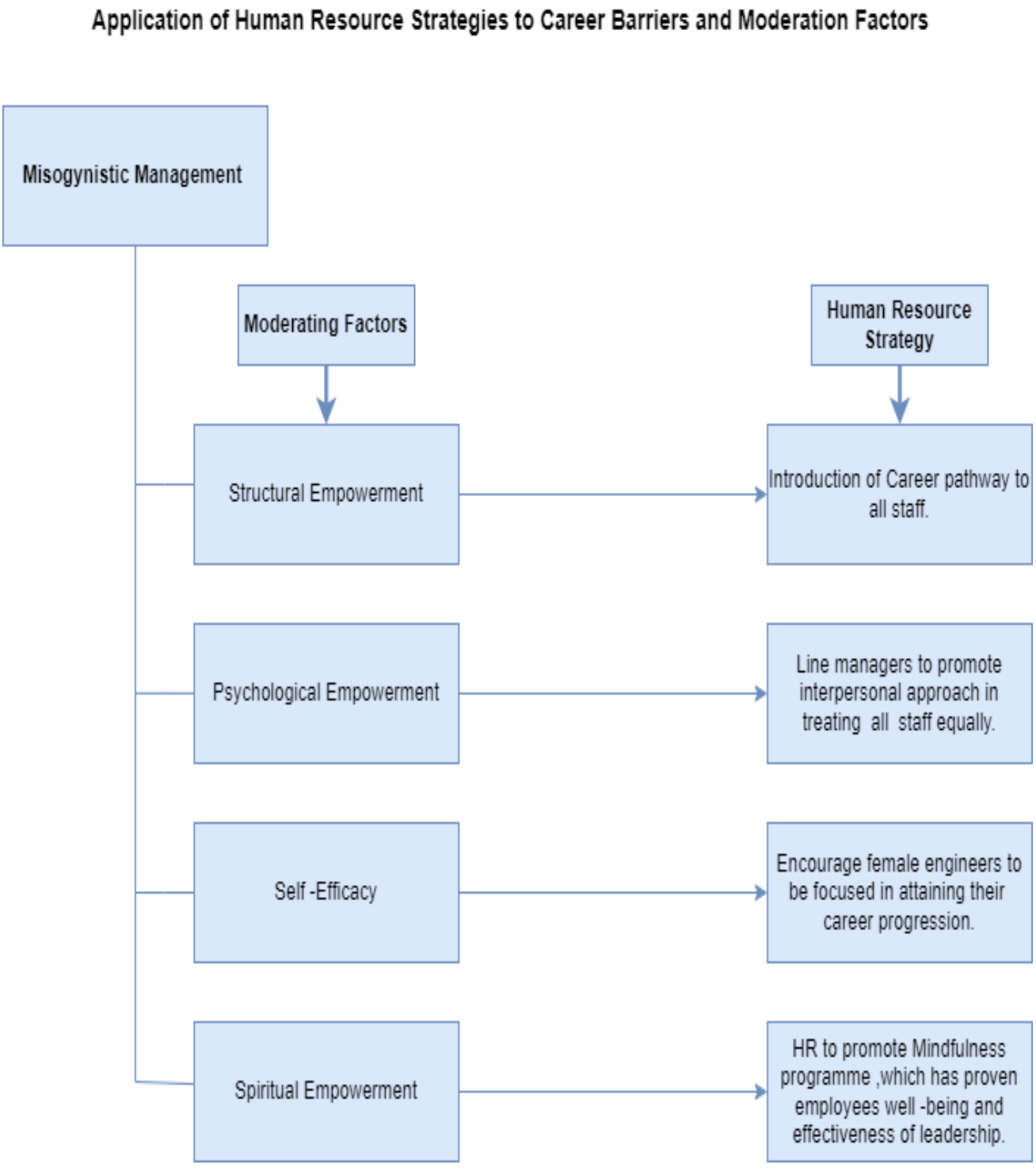
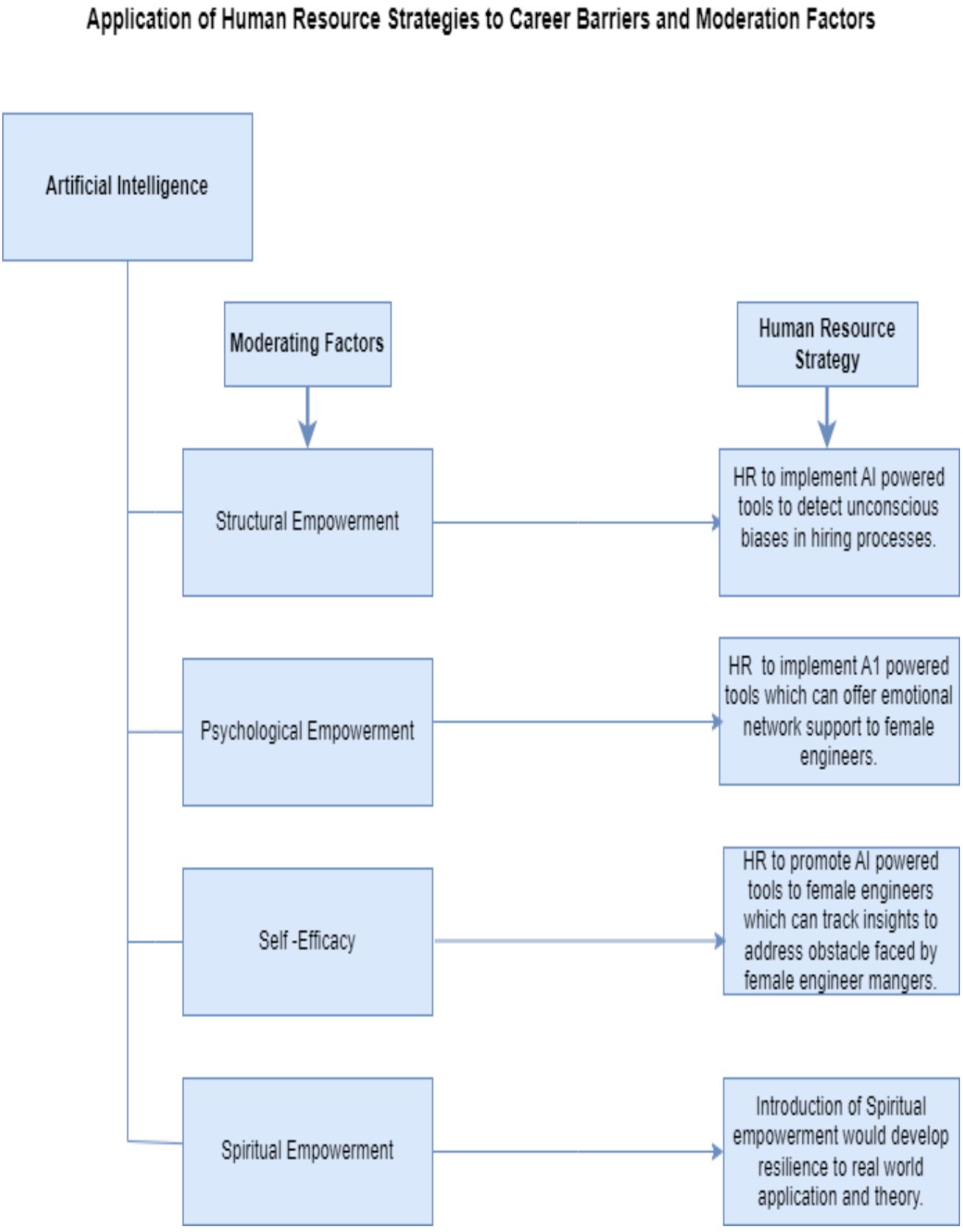


Figure 7.8: Human Resource Strategies in Managing Artificial Intelligence Career Barrier



Beyond the above HR strategies, Human Resource Managers should create and implement inclusive recruitment policies that prohibit gender bias in job descriptions and encourage applications from women. They should always actively seek to create a diverse pool of candidates for all positions. HR should monitor and report on gender diversity and set and track gender diversity targets at different levels of the organisation. They should regularly report on progress towards these goals and adjust strategies as needed. For instance, they can perform regular audits to identify, and address pay disparities and implement and communicate transparent pay structures and promotion criteria. The researcher is of the view that it is the responsibility of HR to create avenues for middle -level female engineers and junior female engineers to voice concerns and encourage feedback to promote continual progress in organizations. HR should regularly review and improve policies and practices based on feedback and industry best practices.

The author's rationale for proposing a quota of 35-40% women in leadership roles aligns with global findings and practices that emphasise the importance of reaching a 'critical mass' to foster meaningful change in leadership diversity. Research shows that when women hold about one-third or more of decision-making positions, their influence grows significantly, helping to shift organisational culture away from token representation (Kanter, 1977; Dahlerup, 1988).Studies in gender and organisational behaviour suggest that attaining roughly 30 to 40 percent female representation is essential to transform group interactions, challenge stereotypes, and promote inclusive organizational policies (Kanter, 1977; Dahlerup, 1988).Several nations with established gender diversity regulations in top management, including Norway, France, and Spain, have set similar quotas near 40%, which have positively impacted gender equality and corporate governance (Dahlerup, 1988).In Southeast Asia, several countries adopt comparable female leadership targets to expedite gender balance in sectors historically dominated by men (TalentCorp Malaysia, 2022).Recent data from Malaysia's Department of Statistics and TalentCorp show that women occupy less than 30% of leadership roles within manufacturing. Establishing a 35-40% quota represents an ambitious yet attainable objective that aligns with national strategies like the 12th Malaysia Plan (RMK-12), which emphasises women's empowerment and gender equity (Malaysia Department of Statistics, 2023; TalentCorp Malaysia, 2022).This quota also supports Malaysia's adherence to the National Policy on Women and inter-national commitments such as the United Nations Sustainable Development Goals (United Nations, 2015).While the Malaysian Code on Corporate Governance (MCCG) promotes leadership diversity, it currently does not mandate specific targets. Setting a 35-40% quota could help establish clearer goals in line with international best practices (Malaysian Code on Corporate Governance [MCCG], 2021).

Concerning training and development, HR could assist in mentorship initiatives that connect junior and middle -level female engineers with senior leaders. HR should encourage executives to support and champion for high-potential female engineers and develop clear career pathways and progression plans for them. They could provide resources and assistance to middle – level female engineers as they prepare for promotions and regularly conduct diversity and inclusion training for all employees and enforce strict policies against harassment and discrimination.

It is recommended by the researcher that HR should implement flexible work arrangements to promote Work-Life Balance by offering flexible working hours, remote work options, and part-time roles to accommodate different needs. They can also provide strong parental leave policies and assistance to returning parents. In order to help new female engineers integrate into the company culture, HR should put in place socialization programs that address specific challenges faced by female engineers by pairing new female engineers with experienced colleagues.

It is further recommended that HR offer female engineer opportunities for continuous learning through training and development programs that are tailored to enhance leadership and technical skills for middle- level female engineers and junior female engineers. They should advocate for the organization to provide financial support for further education and certifications. HR managers can also create networking opportunities within the industry and encourage participation in professional associations and industry events.

The author has designed the training proposal below to enhance self-efficacy among female engineering managers.

Training Proposal: Enhancing Self-Efficacy in Female Engineering Managers

Strengthening Leadership Confidence: A Development Program for Female Engineering Managers

2. Purpose:

To foster greater self-belief and leadership capabilities in female engineers through targeted skill-building in communication, emotional intelligence, strategic exposure, and technical leadership.

3. Target Audience:

Experienced female engineers—mid to senior level—working in technical or manufacturing settings, who currently hold or are preparing for leadership positions.

4. Duration:

3 to 6 months (customisable and modular for flexible delivery)

5. Learning Delivery Format:

- Hybrid structure (self-paced online content + facilitated group sessions)
- Peer support groups for shared learning
- Monthly goal reviews with direct supervisors

6. Measuring Impact:

- Benchmarking self-efficacy at program entry and completion
- Visibility and engagement metrics (e.g., leadership roles, technical presentations)
- Career progression tracking (promotions, retention)
- Qualitative reflections from participants and their teams

7. Program Components:

Module	Focus Area	Core Intent	Key Learning Methods
1	Confidence via Technical Mastery	Strengthening confidence in managing complex engineering tasks and leading innovation	Project simulations, case studies, technical reflection circles
2	Learning from Others	Gain insight and inspiration from established female leaders	Role model interactions, mentoring sessions, leadership video journals
3	Communicating with Impact	Cultivate clear, confident, and assertive communication styles	Dialogue practice labs, peer review exercises, communication coaching
4	Emotional Intelligence for Leaders	Build resilience, emotional awareness, and personal regulation	Resilience coaching, mindfulness sessions, imposter syndrome support
5	Long-Term Growth Planning	Transform program insights into career momentum and sustainability	Leadership action planning, peer-led networks, internal mentoring

8. Long-Term Integration Strategies:

- Embed as part of annual HR and leadership development cycles
- Establish a formal support network for female engineering leaders
- Offer internal recognition through badges, awards, or celebratory events

9. Optional Enhancements:

- Certification in “Adaptive Leadership in Technical Fields”
- Fast-tracking in internal succession planning pipelines

7.7.2 Female Engineers

Female engineers were the subject of the study. As a result, the researcher believes that female engineers in Malaysia should take proactive steps to position themselves for career progression. By taking the following recommended proactive steps, female engineers in Malaysia can effectively position themselves for career progression, achieve their professional goals, and contribute to the advancement of the engineering field.

Firstly, middle -level female engineers and junior female engineers should pursue continuous learning and professional development by enrolling in advanced degrees, certifications, or specialized training relevant to their field. They should enhance their skill by continuously updating and expanding their technical skills and stay current with industry trends. They should enhance their Leadership and Soft Skills by engaging in leadership development programs to build managerial and leadership capabilities and focus on enhancing communication, teamwork, and negotiation skills. They should take initiative and seek challenges by volunteering for challenging projects and cross-functional teams to get various experiences. They should take the initiative in proposing new ideas and improvements within your organization. Female engineers should seek regular feedback from supervisors, peers, and mentors to identify areas for improvement. On the other hand, they should act on feedback to continuously improve your skills and performance.

Secondly, middle -level female engineers should develop an effective communication skill to be able to talk about their achievements and contributions to their supervisors and mentors which is essential to achieving their career goals and aspirations. Maintain a Professional Online Presence by creating an online portfolio showcasing their work and accomplishments as well as updating their LinkedIn profile with their skills, experience, and achievements.

Thirdly, middle -level female engineer managers should strengthen their professional network by attending industry conferences, seminars, and workshops to network with peers and leaders. They should join and actively participate in professional associations and organisations, as well as seek out to connect with mentors who may offer guidance and support. Building relationships with senior leaders who can advocate for their career advancement is also important. They should be very much informed and involved in Industry trends by regularly reading industry publications and staying updated on the latest trends and contributing to industry discussions through writing articles, blogs, or participating in forums.

Fourthly, it is crucial for middle level female engineers to focus on achieving a healthy balance between work and personal life in order to prevent exhaustion and support their long-term career development. They need to emphasize self-care and wellness to stay productive and motivated.

Finally, middle – level female engineers should seek growth opportunities within their organisations, such as leadership programs or special projects. They should be open to opportunities outside their current organization if they align with their career goals. Furthermore, they should be resilient and persistent. Should develop

resilience to deal with obstacles and setbacks in their career? They should stay persistent and determined in pursuing your career goals despite obstacles.

7.7.3 Male Engineers

The researcher considers that male engineers can play a crucial role in enhancing the career progression of female engineers in Malaysia through various supportive actions and behaviours. By actively participating in the following, male engineers can significantly contribute to the career advancement of their female counterparts, leading to the creation of a more equitable and dynamic engineering workforce in Malaysia.
The researcher is of the firm belief that male engineers can push for organisational policies that promote gender equality, such as flexible working hours, parental leave, and equal pay. They should promote unbiased recruitment and promotion processes, as well as develop a workplace culture that values diversity and inclusivity, where female engineers feel respected and valued. Additionally, they can challenge and address any instances of gender bias or discrimination in the workplace.

Male engineers can show their commitment to gender equality through actions and behaviours. They can work on projects alongside female engineers, ensuring equal opportunities for leadership roles and exposure. For instance, they can share knowledge and technical expertise to help female engineers grow their skills and confidence. In several ways, they can act as mentors to female engineers, providing guidance, sharing experiences, and offering career advice. They can also serve as sponsors who actively advocate for the promotion and advancement of female engineers within the organisation.

It is recommended to male engineers to recognise and support female colleagues' efforts to balance work and personal responsibilities, and show respect, fairness, and inclusiveness in all professional interactions. Encourage a healthy work-life balance for all employees, recognising its importance for overall job satisfaction and productivity.

7.8 Limitations & Suggestions for Future Research

The research was a mixed-method study with limitations such as limited generalization. A future study could consider the quantitative method for more robust and far-reaching generalizable outcomes. Since the subject of gender stereotyping and gender discrimination are dynamic, perhaps the researcher could have considered the longitudinal rather than the cross-sectional approach that was employed. This approach could have traced historical changes and developments in the field to have enriched the analysis. Future research may consider addressing the above limitations.

Empowerment served as a moderating factor to diminish the impact of obstacles on the advancement of female engineers in their careers. Future research should explore empowerment as a mediator in the relationship between these barriers and career progression to determine its effectiveness in offering policy recommendations for managers, government officials, and other stakeholders.

Many theories with several dimensions were used in developing the study's conceptual framework. This multi-dimensional approach has limitations including the introduction of several variables in the study. This at times makes it difficult to see the impact of a singular theory on the study. Future studies may focus on one theory to assess its impact on the study outcomes.

The study's findings exhibit limited generalisability due to certain methodological constraints. While the deductive nature of the study allows for some level of generalization, the extent remains restricted. Notably, all scales within the research instrument demonstrated high reliability, as evidenced by Cronbach's alpha coefficients exceeding the established threshold of 0.70. Nevertheless, the limited sample size of 120 engineers imposes constraints on the broader applicability of the results. Additionally, the incorporation of qualitative methods further reduces the study's generalizability.

The validation phase involved female engineers selected through non-probability purposive sampling, utilising a relatively small sample of 20 participants. This sampling approach and sample size further restrict the extent to which the findings can be generalized.

To address these limitations, future research could adopt a purely quantitative methodology to enhance the generalizability of findings. Moreover, the study presents propositions that warrant further investigation in subsequent research. The propositions are as follows:

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Appendix I

University Research Ethics Committee (UREC Approval Letter)

Applications for the Approval of Experimental
Programmes Involving Human Participants

Information to Participants and Forms of Consent and Undertaking

University of East London
University of East London
Docklands campus
Engineering Faculty
University Way
London
E16 2RD

Research Integrity

The University adheres to its responsibility to promote and support the highest standard of rigour and integrity in all aspects of research; observing the appropriate ethical, legal and professional frameworks.
The University is committed to preserving your dignity, rights, safety and wellbeing and as such it is a mandatory requirement of the University that formal ethical approval, from the appropriate Research Ethics Committee, is granted before research with human participants or human data commences.

The Principal Investigator/Director of Studies

Dr Subramaniam Arunachalam
University of East London
Docklands campus
Engineering Faculty
University Way
London
E16 2RD
s.arunachalam@uel.ac.uk

Student researcher

Parameswary Muthiah
University of East London
Docklands campus
Engineering Faculty
University Way
London
E16 2RD
U1742376@uel.ac.uk

Consent to Participate in a Research Study

The purpose of this letter is to provide you with the information that you need to consider in deciding whether to participate in this study.

Project Title

THE ROLE OF EMPOWERMENT IN BREAKING CAREER BARRIERS AMONG MIDDLE-LEVEL FEMALE ENGINEERS IN MALAYSIA

Project Description

Middle level female engineers in Malaysia encounter barriers which hinder or slow down their career progression and their ultimate goal of attaining higher positions in their organizational hierarchy. The research will focus on how middle level female engineers of manufacturing organizations in Malaysia can be empowered in order to overcome the barriers that impede their career progression.
To achieve the above aim, the study will seek to achieve the following research objectives:

1. To identify career barriers confronting middle-level female engineers in Malaysia.
2. To ascertain empowerment factors that can be used as tools in breaking career barriers of middle-level female engineers in Malaysia.
3. To assess the relationship between career barriers and career progression.
4. To examine the moderating effect of empowerment on the relationship between career barriers and career progression.
5. To develop a model that illustrates the efficacy of empowerment as a tool to break career barriers for career progression among female engineers in Malaysia.

Middle level engineers are not usually involved in strategic decision making in their organisation. Examples of middle level managers in the engineering sector include team leaders, section leaders, operations managers, product line managers, operational research managers & project line managers.

The actual target participants for the research will include team leaders, section leaders, operation managers, product line managers, operational research managers and product line managers.

Although male engineers are not known to face barriers however, to sustain gender equality, male engineers with insight and experience in gender and empowerment issues will also be included in the research. The sample size of the population will therefore include men.

Contribution required as participants

Participants will be required to participate in the research process by completing an online questionnaire which will require them to respond to all the questions asked (which will be related to career barriers, career progression and empowerment)

Explanation of what the participants will be asked to do

I will be distributing online questionnaires to the candidates to obtain quantitative information. Each and every candidate will be required to fill in very simple questionnaire and submit through a given link. I will be making appointments with team leaders, section leaders, operation managers, product line managers, operational research managers and product line managers to arrange for one-to-one interviews in order to obtain qualitative information. I will be interviewing relating to career progression and empowerment.

Description of any hazard or risk

1. There is the possibility of fire hazard occurring. In case of fire, displayed signs and clear emergency exits will enable participants to escape to the nearest converging point under the direction of fire marshals.
2. There is the possibility of participants encountering health issues such as headache, dizziness, during the interview. I will make sure first aid facilities are displayed in the interview room. I will also alert suitable persons /HR of the potential risk prior to the interview.
3. There is the possibility of **tripping hazards as** some areas may be raised corners due to underneath cables. To reduce the risk, I will personally examine the room prior to the interview. If there is any concern regarding tripping hazards uneven floor warning sign will be displayed
4. **There is the possibility of noise as** interviews will take place in the manufacturing companies. Next to the interview room employees will be working on machineries and other equipment. Candidates may have headache and other noise related issues. To reduce the noise levels, I will request for a sound proof room or room which is away from the factory slot.

Confidentiality of the Data

Data will be collected by making use of online questionnaire, semi-structure telephone and face to face interviews. Microsoft Forms software will be used to create online questionnaire. Microsoft Forms confirms any information that can identify an individual and efficiently compose a *personal* response *to every* single survey respondent.

All the questionnaire responses will be exported, to a spreadsheet and will be analysed by SPSS software.

Telephone interviews will be recorded by making use of iPhone feature -screen recording. Face to face interview will be audio recorded. The transcript will be word processed and saved on UEL data managed device and researcher personal laptop. No personal sensitive data will be collected. Data such as organisation's name and candidates' job title will be saved in coded language. Anonymisation takes place during the analysis stage. Collected information will be saved securely without glitches by installing powerful anti-virus software – Kaspersky in researcher's laptop.
Thesis will be long –term value to be preserved. All other data will be securely deleted by using DBAN Hard Drive ERASER and Data Clearing Utility. As soon as the publication of the thesis deletion of all the data will take place immediately.

Location

Research will be carried out in Malaysia and U.K. I will carry out the research in manufacturing companies.

Remuneration

Participation in this research process will entirely be on a voluntary basis.

Disclaimer

I will issue the following disclaimer: Your participation in this study is entirely voluntary, and you are free to withdraw at any time during the research. Should you choose to withdraw from the programme you may do so without disadvantage to yourself and without any obligation to give a reason. Please note that your data can be withdrawn up to the point of data analysis – after this point it may not be possible.

UNIVERSITY OF EAST LONDON

Consent to Participate in a Programme Involving the Use of Human Participants.
Please tick as appropriate:

	YES	NO
I have read the information leaflet relating to the above programme of research in which I have been asked to participate and have been given a copy to keep. The nature and purposes of the research have been explained to me, and I have had the opportunity to discuss the details and ask questions about this information. I understand what is being proposed and the procedures in which I will be involved have been explained to me.		
I am allowed to ask any questions regarding the study, and I have the right to withdraw from this study without giving any explanation.		
I have given permission the interview can be audio recorded, and I understand that I can instruct the researcher to stop the recording at any time.		
I understand that my involvement in this study, and particular data from this research, will remain strictly confidential as far as possible. Only the researchers involved in the study will have access to the data.		
It has been explained to me what will happen once the programme has been completed.		
I am aware of the information obtained in this study will be published as explained and I will not be identified		
I understand that my participation in this study is entirely voluntary, and I am free to withdraw at any time during the research without disadvantage to myself and without being obliged to give any reason. I understand that my data can be withdrawn up to the point of data analysis and that after this point it may not be possible.		
I hereby freely and fully consent to participate in the study which has been fully explained to me and for the information obtained to be used in relevant research publications.		

Participant's Name (BLOCK CAPITALS) …….
Participant's Signature …….
Investigator's Name (BLOCK CAPITALS) ……..
Investigator's Signature ……..
Date: …….

Appendix II

RESEARCH QUESTIONNAIRE

Dear Respondent,

The following questionnaire seeks to investigate career barriers in engineering, empowerment and career progression of female engineers in Malaysia. Your views as a female engineer on this research is being sought.

Purpose

The research is conducted as a requirement for the completion of a PhD programme at East London University in the United Kingdom. The information gathered through this questionnaire will be used as an empirical study on the subject matter only.

Anonymity and Confidentiality

Please note that the responses you will provide will be managed anonymously and confidentially. The research outcomes and reports will not refer to any individual. The researcher will take sole ownership of the completed questionnaire and destroy it after the completion of work.

Thank you very much for your time!

Section I: Demographic Information

Kindly tick appropriately

1. Gender: [ ] Male [ ] Female

2. Age: [ ] 20-30 years [ ] 31-40 years [ ] 41-50 years [ ] 51-60 years

3. Marital status: [ ] Single [ ] Married [ ] Separated [ ] Divorced

4. Highest educational level:
   [ ] High School [ ] Professional Certificate [ ] Diploma/College certificate
   [ ] Undergraduate Degree [ ] Post-graduate Degree
   [ ] Other (Kindly Specify) _____

5. How long have you been working as an engineer in this company?
   (a) Less than 1 year [ ] (b)1 - 4 years [ ] (c) 5 - 9 years [ ] (d) Above 10 years [ ]

Section II: Career Barriers in Engineering

1. The following statements are concerned with the career barriers in engineering that affect female engineers. Please read the statements carefully and on a scale from 1 "strongly disagree" to 5 "strongly agree" indicate the extent to which you agree or disagree.

1 = strongly disagree, 2 = disagree, 3 = somewhat agree, 4 = agree 5 = strongly agree

CAREER BARRIERS					
Gender Stereotyping					
Female engineers' voices are not heard from the top-level management	**1**[ ]	**2**[ ]	**3**[ ]	**4**[ ]	**5**[ ]
Female engineers lack equal opportunity at work places	**1**[ ]	**2**[ ]	**3**[ ]	**4**[ ]	**5**[ ]
Female engineers are mostly not allowed to take major tasks.	**1**[ ]	**2**[ ]	**3**[ ]	**4**[ ]	**5**[ ]
The construction industry is just not meant for women	**1**[ ]	**2**[ ]	**3**[ ]	**4**[ ]	**5**[ ]
Female engineers have high family commitment example(Child Care) and therefore cannot work effectively	**1**[ ]	**2**[ ]	**3**[ ]	**4**[ ]	**5**[ ]
Female Engineers are weaker and make slow progress	**1**[ ]	**2**[ ]	**3**[ ]	**4**[ ]	**5**[ ]
Female Engineers receive lower salary compared to male workers	**1**[ ]	**2**[ ]	**3**[ ]	**4**[ ]	**5**[ ]
Work Life Balance					
Female engineers, enjoy flexible working hours	**1**[ ]	**2**[ ]	**3**[ ]	**4**[ ]	**5**[ ]
My organization pays for maternity leave for females	**1**[ ]	**2**[ ]	**3**[ ]	**4**[ ]	**5**[ ]
My organization is lenient on female family issues	**1**[ ]	**2**[ ]	**3**[ ]	**4**[ ]	**5**[ ]
Females have access to family support programs in my organization	**1**[ ]	**2**[ ]	**3**[ ]	**4**[ ]	**5**[ ]
I have the opportunity to return to the same job after maternity or paternity leave	**1**[ ]	**2**[ ]	**3**[ ]	**4**[ ]	**5**[ ]
Technical Skills Limitation					
Women generally lack technical knowledge and skills	**1**[ ]	**2**[ ]	**3**[ ]	**4**[ ]	**5**[ ]
Female engineers cannot easily understand and apply technical skills.	**1**[ ]	**2**[ ]	**3**[ ]	**4**[ ]	**5**[ ]
It is easier to train male engineers than female engineers.	**1**[ ]	**2**[ ]	**3**[ ]	**4**[ ]	**5**[ ]
It is much difficult for women to practice engineering skills efficiently than men	**1**[ ]	**2**[ ]	**3**[ ]	**4**[ ]	**5**[ ]
Women cannot focus on key technical processes as they are pre-occupied with other issues.	**1**[ ]	**2**[ ]	**3**[ ]	**4**[ ]	**5**[ ]
Perception					
Higher hierarchal positions are meant for men only.	**1**[ ]	**2**[ ]	**3**[ ]	**4**[ ]	**5**[ ]

Women are physically weaker to compete with men in the engineering sector.	**1**[ ]	**2**[ ]	**3**[ ]	**4**[ ]	**5**[ ]
The social image of engineers and the culture of engineering is masculine.	**1**[ ]	**2**[ ]	**3**[ ]	**4**[ ]	**5**[ ]
Peculiar female challenges and family responsibilities limit female engineers from excelling at work	**1**[ ]	**2**[ ]	**3**[ ]	**4**[ ]	**5**[ ]
Women are too emotional to lead effectively	**1**[ ]	**2**[ ]	**3**[ ]	**4**[ ]	**5**[ ]
There are events and conditions in my organization that make career progress difficult for women	**1**[ ]	**2**[ ]	**3**[ ]	**4**[ ]	**5**[ ]
Misogynistic Management					
Within my organization, there are biases about women's capabilities which frustrate their career advancement.	**1**[ ]	**2**[ ]	**3**[ ]	**4**[ ]	**5**[ ]
Female engineers are able to explore and demonstrate their potential through mentorship support in my Organisation	**1**[ ]	**2**[ ]	**3**[ ]	**4**[ ]	**5**[ ]
There are inadequate support systems for women to move upwards in the engineering field.	**1**[ ]	**2**[ ]	**3**[ ]	**4**[ ]	**5**[ ]
My organization provides well designed and scientifically validated tests to all candidates when recruiting	**1**[ ]	**2**[ ]	**3**[ ]	**4**[ ]	**5**[ ]
In my organization, there are policies not favorable to female engineers to attain career progression	**1**[ ]	**2**[ ]	**3**[ ]	**4**[ ]	**5**[ ]
The recruitment policies in my organization favour men more than women	**1**[ ]	**2**[ ]	**3**[ ]	**4**[ ]	**5**[ ]

2. In your view, which of the above five career barriers facing female engineers is the strongest and why?

3. Apart from the five career barriers listed above, mention other career barriers you are aware of that confront female engineers?

4. Do you think male engineers are confronted with the same career barriers as female engineers?
5. In your view, how can career barriers facing female engineers be resolved?

Section III: Empowerment

1. Kindly provide your views with respect to the following statements.

1 = strongly disagree 2 = disagree 3 = somewhat agree 4 = agree 5 = strongly agree

EMPOWERMENT					
Structural Empowerment					
Female engineers work in a very supportive work environment.	**1**[ ]	**2**[ ]	**3**[ ]	**4**[ ]	**5**[ ]
The compensation package attached to female engineers' job is satisfactory.	**1**[ ]	**2**[ ]	**3**[ ]	**4**[ ]	**5**[ ]
At your workplace, Female engineers have the required technical knowledge and expertise vital to be effective.	**1**[ ]	**2**[ ]	**3**[ ]	**4**[ ]	**5**[ ]

Female engineers regularly receive feedback and guidance from superiors and subordinates.	**1**[ ]	**2**[ ]	**3**[ ]	**4**[ ]	**5**[ ]
Your organisation permits flexibility in how Female engineers work.	**1**[ ]	**2**[ ]	**3**[ ]	**4**[ ]	**5**[ ]
Psychological Empowerment					
Female engineers feel that their work is important to achieve their targets.	**1**[ ]	**2**[ ]	**3**[ ]	**4**[ ]	**5**[ ]
Female engineers have the independence in determining how they accomplish their tasks	**1**[ ]	**2**[ ]	**3**[ ]	**4**[ ]	**5**[ ]
Female engineers decide on their own, how to carry out challenging tasks.	**1**[ ]	**2**[ ]	**3**[ ]	**4**[ ]	**5**[ ]
Female engineers have significant influence on what happens in their departments	**1**[ ]	**2**[ ]	**3**[ ]	**4**[ ]	**5**[ ]
Female engineers have a feeling of accomplishment from the work they do.	**1**[ ]	**2**[ ]	**3**[ ]	**4**[ ]	**5**[ ]
Self-efficacy Empowerment					
Female engineers enjoy tackling challenging problems.	**1**[ ]	**2**[ ]	**3**[ ]	**4**[ ]	**5**[ ]
Female engineers enjoy being involved in more innovative projects.	**1**[ ]	**2**[ ]	**3**[ ]	**4**[ ]	**5**[ ]
Female engineers prefer to resolve issues themselves	**1**[ ]	**2**[ ]	**3**[ ]	**4**[ ]	**5**[ ]
Female engineers are satisfied with the success they have achieved in their career.	**1**[ ]	**2**[ ]	**3**[ ]	**4**[ ]	**5**[ ]
Female engineers believe in their capability to perform tasks successfully	**1**[ ]	**2**[ ]	**3**[ ]	**4**[ ]	**5**[ ]

2. What is your view on the perception that male engineers are more empowered than female engineers in most organizations?

Section III: Career Progression

1. The following statements are about career progression. Please read the statements carefully and on a scale of 1 “strongly disagree” to 5 “strongly agree,” indicate the extent to which you agree or disagree.

1 = strongly disagree, 2 = disagree, 3 = somewhat agree, 4 = agree 5 = strongly agree

CAREER PROGRESSION					
Career progression opportunities are clearly communicated and advertised in my organization	**1**[ ]	**2**[ ]	**3**[ ]	**4**[ ]	**5**[ ]
Challenging projects are given to female engineers	**1**[ ]	**2**[ ]	**3**[ ]	**4**[ ]	**5**[ ]
More training on related work is provided for female Engineers	**1**[ ]	**2**[ ]	**3**[ ]	**4**[ ]	**5**[ ]
There is opportunity for further studies for Female engineers	**1**[ ]	**2**[ ]	**3**[ ]	**4**[ ]	**5**[ ]

Female engineers are selected into teams	**1**[ ]	**2**[ ]	**3**[ ]	**4**[ ]	**5**[ ]
Female engineers are given more responsibility	**1**[ ]	**2**[ ]	**3**[ ]	**4**[ ]	**5**[ ]
There is a structured promotional system which rewards hard work for female engineers	**1**[ ]	**2**[ ]	**3**[ ]	**4**[ ]	**5**[ ]
There is an active approach by my Organisation to encourage female engineers progress on the job	**1**[ ]	**2**[ ]	**3**[ ]	**4**[ ]	**5**[ ]
Female engineers are given the freedom to make sound decisions on major projects	**1**[ ]	**2**[ ]	**3**[ ]	**4**[ ]	**5**[ ]

2. Briefly suggest how Organizations can use empowerment to promote career progression of female engineers

Thank you for your cooperation!

Appendix III

INTERVIEW QUESTIONS

RQ1. Career barriers confronting middle-level female engineers in Malaysia

1a Please identify the career barriers confronting Female Engineers in Malaysia at their respective workplaces.

1b Follow-up Questions based on responses to the above question

RQ2. The relationship between career barriers and career progression

2a Please describe how each of the following career barriers may frustrate the career progression of female engineers in Malaysia

a) Gender Stereotyping
b) Work Life Balance
c) Technical Skills Limitation,
d) Negative Perception
e) Misogynistic Management

2b Follow-up Questions based on responses to the above question

RQ3. Empowerment factors that can be used as tools to break career barriers

3a. Please how do you understand the following empowerment factors?

a) Structural Empowerment
b) Psychological Empowerment
c) Self-Efficacy

3b. Follow-up Questions based on responses to the above question

RQ4. The moderating effect of empowerment on the relationship between career barriers and career progression.

4a. Describe how Structural Empowerment, Psychological Empowerment, and Self-Efficacy can be used to break career barriers.

4b. Follow-up Questions based on responses to the above question

Appendix IV

CONCEPTUAL FRAMEWORK VALIDATION INTERVIEW SCHEDULE

Introduction

The aim of this structured interview guide is to collect qualitative data from Human Resource managers in the selected Organizations to enable the researcher to carry out a validation on the topic: *The Role of Empowerment in Breaking Career Barriers among Middle-Level Female Engineers in Malaysia*. The interview will last no more than 20 minutes per participant.

Before the interview, the researcher will provide a brief background to the research including the explanation of key concepts, notably: Career Barriers (Gender Stereotyping, Work Life Balance, Technical Skills Limitation, Perception and Misogynistic Management), Structural Empowerment, Psychological Empowerment, Self-Efficacy and Career Progression. Additionally, the participants will be assured of confidentiality and anonymity.

An assessment of the variables aforementioned indicates that the career barriers can be mitigated using empowerment to promote career progression of female engineers in Malaysia. This interview would allow me to collect data to validate the model. Your sincere response to the questions below would be highly appreciated.

The role of empowerment in addressing the career barriers are matched against each barrier, expected policy decisions and targeted outcomes are outlined in the ensuing to guide the interview process.

Career Barriers	Empowerment strategies to mitigate the barriers	Targeted Outcome
	Structural empowerment Strategies	
Gender Stereotyping	1. Will you recommend a quota system for female engineers to participate effectively? a. If yes, what percentage quota? b. Should the quota system be implemented as a long term or a short-term policy? 2. Do you consider gender equality as top priority as policy? b. If yes, what is your view on allowing middle-level female engineers on development of policies and training programmes? 3. How transparent is the staff hiring process? 4. In which other way(s) could Structural Empowerment be used to address the issue of gender stereotyping in the organization?	
	Psychological Empowerment Strategies	

	1. Will you recommend that female engineers should be given equal opportunity to participate in challenging projects/tasks? a. If yes, as HR manager, how would you promote and facilitate female engineers' participation in challenging projects? 2. How will you stimulate a sense of belonging within the team that does not discriminate against female engineers? 3. In which other ways can the organisation employ Psychological Empowerment to manage gender stereotyping?	
	Self-efficacy Empowerment Strategies	
	1. Will you recommend career advancement policy to provide opportunity for female engineers to upgrade their knowledge? 2. How would you support female engineers to be assertive? 3. How would you support female engineers to be proactive to defend in any discriminatory situation?	
	4. In which other ways, do you think self-efficacy can be adopted as an approach to overcome gender stereotyping in the organisation?	
Work-Life Balance	**Structural Empowerment Strategies**	
	1. Will you recommend and implement flexible working hours policy for female engineers regarding maternity leave and childcare facilities to EU/NORDIC countries standard? 2. How would you ensure the wellness of female engineers?	
	3. In which other ways do you think structural empowerment could be employed as a tool to achieve Work-Life Balance for females' engineers in the organisation?	
	Psychological Empowerment Strategies	
	1. How would you spearhead the building of culture of trust in the organisation to motivate all the staff? 2. Will you recommend and implement regular open communication by manager-ideas, issues, and development?	
	3. In which other ways can the organization employ Psychological Empowerment to achieve Work-Life Balance for female engineers?	
	Self-efficacy Empowerment Strategies	

	1. Will you provide and continuously improve time management skills of female engineers given their extra-domestic responsibility? If yes, how would you do this? 2. How would you ensure that female engineers are well organised to achieve work-life balance? If yes, how would do this?	
	3. Please suggest which other means female workers can be empowered through Self-Efficacy to achieve work-life balance in the organisation.	
Technical Skills Limitation	**Structural Empowerment Strategies**	
	1. Will you recommend and implement accessibility to all staff to participate in skills development programme? 2. Will you encourage and provide equal opportunities for formal and informal networking by both male and female engineers? If yes, how would you do this? 3. Will you advocate for on-the-job training and mentoring programmes? If yes, how will you do this? 4. Will you recommend and implement sabbatical leave to all staff to further education? 5. In which other ways do you think Structural Empowerment could assist female engineers to overcome technical skills limitations they might encounter in the organisation?	
	Psychological Empowerment Strategies	
	1. Will you recommend and provide exclusive environment to participate in training and mentoring programmes? If yes, how would you do this? 2. Will you recommend and implement reward schemes such as promotion, bonus and allowance for staff (both male and female) who upgrade their qualifications? 3. Will you encourage female engineers to develop self-reflection portfolio to assess oneself to progress in career? 4. In your opinion, how else could Psychological Empowerment be used by the organisation to overcome Technical Skills Limitations of female engineers?	
	Self-efficacy Empowerment Strategies	
	1. How would you arouse female engineers' willingness to enhance skills and technologies? 2. In which other ways could Self-Efficacy be applied by female engineers to overcome Technical Skills Limitations in the organisation?	

Perception	**Structural Empowerment Strategies**	
	1. Will you recommend and ensure that female engineers are given independence in determining tasks? 2. What system will you recommend and implement to ensure that female engineers are not perceived to be physically weak to compete with their male counterparts? 3. Will you recommend and ensure that challenging projects/tasks are distributed to all the staff equally? 4. Will you recommend and ensure that top management positions are not reversed for only men in the organisation?	
	Psychological Empowerment Strategies	
	1. Will you recommend and ensure that both male and female engineers are equally allowed to participate in decision making? 2. Will you recommend and provide an organisational psychologist to disabuse the minds of female engineers that the culture of engineering is masculine? 2. Suggest other ways you think Psychological Empowerment can be adopted to enhance positive perception of female engineers?	
	Self-efficacy Empowerment Strategies	
	1. How would you empower female engineers to be emotionally tough to lead just as their male counterparts? 2. In which other ways do you think Self-efficacy Empowerment could be employed by female engineers to achieve positive perception in the organisation?	
Misogynistic management	**Structural Empowerment Strategies**	
	1. Will you recommend and introduce career pathway to all staff. 2. How would you address biasness about female engineers' capabilities to ease the frustration to progress in their career? 3. Will you recommend and implement support system for female engineers to move upwards in the management structure? 4. Should there be a quota system for the number of female engineers to be recruited as against male engineers? If yes, what appropriate quota will you recommend? 5. In which other ways do you think Structural Empowerment can be implemented to address Misogynistic Management to ensure career progression of female engineers in the organisation?	
	Psychological Empowerment Strategies	

	1. Will you recommend and implement grievance response system to support female engineers who are frustrated by unfair managerial treatment? 2. Will recommend and provide an organisational psychologist to female engineers who experience biasness in the organisation? 3. In which other ways do you think Psychological Empowerment can be used to ensure career progression of female engineers whom management is strongly prejudiced against?	
	Self-efficacy Empowerment Strategies	
	1. How would you empower female engineers to handle and overcome managerial biasness in the organisation? 2. How would ensure that female engineers do not feel inferior when management is misogynistic, or leadership is strongly prejudiced against them? 3. In which other ways do you think Self-efficacy Empowerment could be adopted by female staff to ensure their career progression in the organisation in the light of misogynistic management?	

Appendix V

University of East London

Pioneering Futures Since 1898

Dear Parameswary,

Application ID: ETH2324-0049

Original application ID: ETH2122-0247

Project title: The role of empowerment in breaking career barriers – a study of middle management female engineers in Malaysian manufacturing sector

Lead researcher: Miss Parameswary Muthiah

Your application to Ethics and Integrity Sub-Committee (EISC) was considered on the 9th January 2024.

The decision is: **Approved**

The Committee's response is based on the protocol described in the application form and supporting documentation.

Your project has received ethical approval for 4 years from the approval date.

If you have any questions regarding this application please contact your supervisor or the administrator for the Ethics and Integrity Sub-Committee.

Approval has been given for the submitted application only and the research must be conducted accordingly.

Should you wish to make any changes in connection with this research/consultancy project you must complete 'An application for approval of an amendment to an existing application'.

The approval of the proposed research/consultancy project applies to the following site.

Project site: **The field work will take place in Malaysia**

Principal Investigator / Local Collaborator: Miss Parameswary Muthiah

Approval is given on the understanding that the UEL Code of Practice for Research and the Code of Practice for Research Ethics is adhered to.□□

Any adverse events or reactions that occur in connection with this research/consultancy project should be reported using the University's form for Reporting an Adverse/Serious Adverse Event/Reaction.

The University will periodically audit a random sample of approved applications for ethical approval, to ensure that the projects are conducted in compliance with the consent given by the Ethics and Integrity Sub-Committee and to the highest standards of rigour and integrity.

Please note, it is your responsibility to retain this letter for your records.

With the Committee's best wishes for the success of the project.

Yours sincerely,

Fernanda Da Silva Hendriks

Research Ethics Support Officer

Docklands Campus
University Way
London E16 2RD

Stratford Campus
Water Lane
London E15 4LZ

University Square Stratford
Salway Road
London E15 1NF

+44 (0)20 8223 3000
sms@uel.ac.uk
uel.ac.uk

Appendix VI

University of East London

Pioneering Futures Since 1898

Dear Parameswary,

Application ID: ETH2122-0247

Project title: The role of empowerment in breaking career barriers – a study of middle management female engineers in Malaysian manufacturing sector

Lead researcher: Miss Parameswary Muthiah

Your application to Ethics and Integrity Sub-Committee (EISC) was considered on the 24th April 2023.

The decision is: **Approved**

The Committee's response is based on the protocol described in the application form and supporting documentation.

Your project has received ethical approval for 4 years from the approval date.

If you have any questions regarding this application please contact your supervisor or the administrator for the Ethics and Integrity Sub-Committee.

Approval has been given for the submitted application only and the research must be conducted accordingly.

Should you wish to make any changes in connection with this research/consultancy project you must complete 'An application for approval of an amendment to an existing application'.

The approval of the proposed research/consultancy project applies to the following site.

Project site: **The field work will take place in Malaysia**

Principal Investigator / Local Collaborator: Miss Parameswary Muthiah

Approval is given on the understanding that the UEL Code of Practice for Research and the Code of Practice for Research Ethics is adhered to.□□

Any adverse events or reactions that occur in connection with this research/consultancy project should be reported using the University's form for Reporting an Adverse/Serious Adverse Event/Reaction.

The University will periodically audit a random sample of approved applications for ethical approval, to ensure that the projects are conducted in compliance with the consent given by the Ethics and Integrity Sub-Committee and to the highest standards of rigour and integrity.

Please note, it is your responsibility to retain this letter for your records.

With the Committee's best wishes for the success of the project.

Yours sincerely,

Fernanda Pereira Da Silva

Administrative Officer for Research Governance

Docklands Campus
University Way
London E16 2RD

Stratford Campus
Water Lane
London E15 4LZ

University Square Stratford
Salway Road
London E15 1NF

+44 (0)20 8223 3000
srm@uel.ac.uk
uel.ac.uk

Appendix VII

University of East London

Pioneering Futures Since 1898

Dear Parameswary

Application ID: ETH1819-0044

Project title: The role of empowerment in breaking career barriers – a study of middle management female engineers in Malaysian manufacturing sector

Lead researcher: Miss Parameswary Muthiah

Your application to Research, Research Degrees and Ethics Sub-Committee meeting was considered on the 2nd of October 2019.

The decision is: **Approved**

The Committee's response is based on the protocol described in the application form and supporting documentation.

Your project has received ethical approval for 2 years from the approval date.

If you have any questions regarding this application please contact your supervisor or the secretary for the Research, Research Degrees and Ethics Sub-Committee meeting.

Approval has been given for the submitted application only and the research must be conducted accordingly.

Should you wish to make any changes in connection with this research project you must complete 'An application for approval of an amendment to an existing application'.

The approval of the proposed research applies to the following research site.

Research site: UK and Malaysia

Gatekeeper permission letter(s) received from:

- **Kejuruteraan Puncak Emas SDN.BHD.**
- **P.E.S. Systems (M) SDN.BHD.**
- **Boustead Naval Shipyard SDN.BHD.**

Principal Investigator / Local Collaborator: Miss Parameswary Muthiah

Approval is given on the understanding that the UEL Code of Practice for Research and the Code of Practice for Research Ethics is adhered to.□□

Any adverse events or reactions that occur in connection with this research project should be reported using the University's form for Reporting an Adverse/Serious Adverse Event/Reaction.

The University will periodically audit a random sample of approved applications for ethical approval, to ensure that the research projects are conducted in compliance with the consent given by the Research Ethics Committee and to the highest standards of rigour and integrity.

Please note, it is your responsibility to retain this letter for your records.

With the Committee's best wishes for the success of the project

Docklands Campus
University Way
London E16 2RD

Stratford Campus
Water Lane
London E15 4LZ

University Square Stratford
Salway Road
London E15 1NF

+44 (0)20 8223 3000
sms@uel.ac.uk
uel.ac.uk

Yours sincerely

Fernanda Silva

Research, Research Degrees and Ethics Sub-Committee

University of East London

Pioneering Futures Since 1898

Docklands Campus
University Way
London E16 2RD

Stratford Campus
Water Lane
London E15 4LZ

University Square Stratford
Salway Road
London E15 1NF

+44 (0)20 8223 3000
srrm@uel.ac.uk
uel.ac.uk

Appendix VIII

Articles submitted by Author

* **Title of Article 1**:

Exploring the efficacy of structural empowerment in breaking career progression barriers among female engineers in Malaysia.

Accepted for publication in May 09,2025

Journal: European Journal of Management Studies, ISSN:2183-4172

Impact Factor: 1.3

Publisher: Emerald

***Title of Article 2**:

Assessing the career progression barriers among female engineers in Malaysia

Expected for publication August 2025

Journal: European Journal of Management Studies, ISSN:0969-9988

Impact Factor: 4.2

Publisher: Emerald

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