National College *of* Ireland

MSc in Human Resource Management Dissertation

"Why Women in Ireland Leave Science, Technology, Engineering and Math (STEM) for Careers in Other Disciplines and Factors Which Could Aid their Retention"

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Kerry Warfield

21237794

ABSTRACT

The main objective of this study was to gain an in-depth understanding into why women leave STEM positions to pursue careers in other disciplines in Ireland.

Sub-objectives were to consider the challenges women face in STEM and to discover the factors which could facilitate their retention in the future. The study considers the field of gender equality and is based on the observation that women leave STEM to pursue alternative career positions. The research employs a qualitative, semi-structured interview designed to gain in-depth insights. Women working full-time in Ireland who progressed or rotated into a position outside of STEM participated. The results were analysed using theoretical thematic analysis.

The findings reveal women exit STEM to progress their careers. Underlying factors such as unclear career paths, limited opportunities, poor management, male dominance in leadership positions, unfair pay, poor work-life balance and a lack of female role models also impact on women's decisions to leave. Managements impact on employee experience and for retention was imperative. The challenges women face in STEM were gender stereotypes, pressure to prove themselves and unfair pay. The stereotypes most prevalent were benevolent sexism, assumptions that women were more communal focused and less competent in STEM than men. Some women believed these stereotypes resulted in their placement in 'softer' roles. The results reveal that alongside management, informal networking, mentorships, enhanced work-life balance, visible female leaders, role models and training could help to enhance retention.

The study concludes that women leave STEM for career progression. It is recommended future employers create clear career paths, have open career planning discussions, train employees and managers on gender stereotypes, create positive employee experiences, offer equal pay, enhance the availability and visibility of flexible work arrangements, offer parental supports, have informal networks, mentors, adequate female role models, provide technical training and introduce technical targets to enhance women's retention in STEM.

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TABLE OF CONTENTS

LIST OF ABBREVIATIONS

STEM	Science, Technology, Engineering and Math
DEI	Diversity, Equality and Inclusion
GPG	Gender Pay Gap
HR	Human Resources
IS	Imposter Syndrome
SRT	Social Role Theory
GLS	Gender Labour Segregation
RPM	Role Prioritisation Model
ERG	Employee Resource Group
KPI	Key Performance Indicator

CHAPTER 1: INTRODUCTION

This study considers the field of gender equality and provides an insight into why women leave STEM careers in Ireland to pursue non-STEM roles. It focuses on the challenges women face within STEM and the strategies or factors which can be considered for their retention. For the purposes of this dissertation, STEM can define jobs which focus on the fields of science, technology, engineering and math. Gender equality and the retention of women in STEM positions presents an international challenge however particularly to traditionally male dominated STEM businesses in Ireland. The implementation of legislation around GPG and the gender balance bill in Ireland sets precedence for future legislation which may be in the pipeline (The Gender Pay Gap Information Act, 2021; Irish Corporate Governance (Gender Balance) Bill, 2021). The introduction of legislation has shifted company and HR's thinking around gender equality, accelerated the need for STEM organisations to promote the training of women, improve their hiring and retention strategies. Advancing the retention of women in STEM will enable organisations to achieve better gender equality. This is particularly important for organisations in Ireland as reports such as the GPG report has a reputational impact and businesses want to create a positive psychological contract as individuals want to work for employers who have good employment practices (Guest and Conway, 2002, CIPD, 2022).

1.1 Background of Research

A plethora of studies identify a scarce female presence within STEM (Higher Education Authority, 2023; CSO, 2023; PwC, 2023; Department of Education, 2022). This can be explained further by existing theories such as Eagly and Wood's (2012) social role theory and Haines and Stroessner's (2019) role prioritisation model which are discussed in the literature review. Most research reveals that the issue is deep routed in female's early years and education which later translates to their career choices which contributes further to GLS (Martinez et al., 2023; Borrowman and Klasen, 2020). The industry also faces a skills shortage and an increased demand for STEM skillsets (Solas, 2022; Bureau of Labor, 2023). The problem is made more complex for organisations as women are more likely than men to leave their STEM careers to pursue non-STEM professions or to exit the workforce completely, especially earlier in their careers (Glass et al., 2013; XU, 2008; Hunt, 2016; Frehill, 2011). Studies report the main challenges women in STEM face are IS, male

dominated cultures, tokenism, poor work-life balance and unfair pay (Clance and Imes, 1978; Clance and O'Toole, 1987; Ertl, Luttenberger and Paechter, 2017; Cyr et al., 2021; Kanter, 1977; McDonald, Toussaint and Schweiger, 2004; PwC, 2023; Yu and Hara, 2021). A number of quantitative studies maintain female turnover can be attributed to long working hours, dissatisfaction with pay, promotional opportunities, family, working conditions, discrimination, isolation of being a minority, changes in professional interests, lack of mentoring, networks, risk-taking environments and culture (Glass et al., 2013; Hunt, 2016; Frehill, 2011; Cech and Blair-Loy, 2019). However, relatively few existing studies examine why women leave STEM careers to pursue careers in other disciplines, the challenges they face and the strategies effective for their retention. In addition, the majority of reports on the challenges and retention strategies for women are inherent to women in the workforce and not industry specific to STEM. Hence this study alongside future research is needed. Further, studies recommend the following strategies to combat female turnover in STEM role models, mentoring, training and flexible work arrangements (Young et al., 2013; Dasgupta, 2011; Lockwood and Kunda, 1997; Morgenroth, Ryan and Peters, 2015; Popo-Olaniyan et al., 2022; Moss-Racusin et al., 2021; Cech and Blair-Loy, 2019). However, as reports of high female turnover are persistent today it is necessary to review their effectiveness and explore new strategies as those in existence may be outdated or ineffective.

1.2 Significance of Research Problem

This dissertation is significant as it focuses on gaining in-depth insights into what can be done in organisations today in Ireland to help reduce female turnover and enhance the retention of women in STEM. This is important in order for organisations to achieve and maintain gender equity. It is understood that whilst enhancing educational initiatives are beneficial for increasing women's participation in STEM, these initiatives will not reduce the high rates of female turnover reported in STEM today. As the majority of the existing research has focused on the research problem at a student level, in countries outside of Ireland and quantitatively there is a gap for the present study to examine the issue qualitatively by interviewing women who have left the industry to pursue non-STEM positions. Employing this strategy will be beneficial and add to existing literature as it will provide in-depth insights into the factors which impact women's decision to leave STEM, and which could enhance their retention in the future. Again, this will be beneficial as existing

studies focus on female turnover and retention in STEM in isolation. The study also seeks to advance current literature by allowing women to speak openly about the challenges they faced in STEM as much of the existing research is based on quantitative reports. The project is of special interest to businesses interested in attracting and retaining women in STEM, HR professionals and academics.

1.3 Research Questions and Objectives

The researcher hopes to answer the following research question (1) and sub-questions (2,3). Each of which are presented with the objective and sub-objectives they aim to fulfil.

1. Why do women in Ireland leave their STEM careers to pursue a position in other disciplines?

- To uncover the reasons why women in Ireland leave STEM to pursue positions in other disciplines.

2. What challenges do women face in their STEM positions?

- To identify and examine the existing challenges women face in STEM in Ireland.

3. What would facilitate women remaining in the STEM positions they left?

- To explore the strategies perceived as necessary and effective in order to retain women in STEM in Ireland.

In summary, the present study aims to uncover the reasons why women in STEM leave to pursue positions in other disciplines, to identify and examine the challenges they face and to explore the strategies perceived as necessary and effective to retain women in STEM in Ireland.

1.4 Outline of the study

Chapter 2 will examine the literature pertinent to the research objectives.

Chapter 3 considers the methodological approach undertaken. It acknowledges the aim of the research, its design, strategy, philosophy, data collection methods, how and why the samples were selected and data analyses. It will also provide an account of ethical considerations and limitations.

Chapter 4 presents the findings of the study as they occur after analysis.

Chapter 5 discusses and interprets the findings obtained, why and how they are relevant to the objectives of this study and how they relate to the findings of previous research.

Chapter 6 concludes the dissertation and provides recommendations.

1.5 Conclusion

This chapter has set the scene for the study, given a clear background, outlined the research's significance, questions and objectives.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

This chapter will review the literature available on the research topic of why women leave STEM careers in Ireland to pursue alternative positions and what could help aid their retention. It will discuss women in STEM, relevant theoretical concepts, female turnover within STEM, the pursuit of alternative career positions, the challenges women face within STEM, importance of fostering DEI and the strategies considered effective for retention.

2.2 Women in STEM

The Higher Education Authority (2023) reports a large gender gap in those entering higher education in Ireland as 43% of men study STEM compared to only 19% of women. Similarly, the CSO (2023) maintain Ireland has the largest gender differential in the EU (27.5%), as 53.5% of males per 1,000 and 26% of females aged 20-29 graduated in STEM. Research on women in STEM focuses predominantly on the issue from a student level outside of Ireland and not within the Irish workforce. A focus on the current generation and workforce in Ireland is important as the issue prevails. PwC (2023) reveals the proportion of females to males is lowest in STEM disciplines (engineering, construction, manufacturing and technology). This is supported further by the Department of Education (2022) as, although more Irish women have entered the workforce, it's reported less than one quarter (25%) of 120,000 people working in STEM in Ireland are women. The Equal Employment Opportunity Commission (EEOC; 2019) and Eagly (2021) state there are significantly fewer women in Technology and Engineering than expected. These figures correspond with the percentage of women reported to graduate (26%) irrespective of turnover (CSO, 2023). The OECD maintain they are consistent overtime (Encinas-Martin and Cherian, 2023). Further, Struthers and Strachan (2019) estimate 2-3% of qualified females pursue male-dominated trades.

Research refers to the importance of educating females in STEM and challenging gender stereotypes in individuals' early years and education however the impact of these strategies are not immediate, and education will not resolve later turnover issues (Martinez et al., 2023).

Borrowman and Klasen (2020) identify education as a factor increasing GLS. Department of Education (2022) recognise this in a STEM education policy statement and implementation plan however more interventions are required, and businesses located in Ireland are asked to support multiple interventions across various segments of the ecosystem. Regardless of increasing levels of educational investment studies report women tend to leave the industry at a higher rate than men. (Glass et al., 2013; Martinez et al., 2023; Borrowman and Klasen, 2020; Department of Education, 2022; XU, 2008) The STEM industry faces a skills shortage. Solas (2023) difficult-to-fill vacancies survey reports recruitment agencies struggle to fill 41% of science, engineering, and technology roles, 31% of construction, 11% Transport and Logistics and 7% of financial roles. These percentages increased on the previous year (SOLAS, 2022). Bureau of Labor (2023) also predict an increase in the number of vacancies in STEM 10.8% between 2022- 2032 - which may exacerbate the current skills shortage. Similarly, Women in STEM (2024) report an increase of 8% by 2025. Female underrepresentation poses issues in the labour market given demand versus supply and impacts on businesses hiring decisions due to the limited supply which is a matter concerning 64% of science, engineering and tech companies based in Ireland (Women in STEM, 2024). The issue is salient for Irish organisations as they face scrutiny on GPG, employment practices and their commitment to gender equality as reports have a reputational impact for attraction and retention and companies want to create a positive psychological contract (Guest and Conway, 2002; CIPD, 2022). The theoretical concepts underpinning the lack of women in STEM are discussed in the following section. These theories can help to explain stereotypical divisions of labour, possible reasons for female turnover and existing skills shortages.

2.3 Theories

2.3.1 Social Role Theory (SRT)

Social Role Theory (SRT) suggests that traditional divisions of labour contribute to the expectation that men and women ‘naturally’ have different traits which is important when considered STEM roles (Eagly and Crowley, 1986; Eagly and Wood, 2012). These gender stereotypes can be categorised as communal and agentic for women and men (Bakan, 1966). Gender stereotypes exist where individuating information is absent (Locksley et al., 1980).

In industrialised societies like Ireland, women are more likely to fill non-STEM roles such as caretaking in employment and at home because it is inferred that women are nurturing and caring (Eagly and Wood, 2012). Men are more likely to perform STEM, managerial and blue-collar jobs which are masterful, assertive, competitive and dominant. Labour market theories argue labour markets are institutionalised and not perfectly competitive due to limited mobility between markets exist because of physical sex differences as its assumed men's size and strength and women's reproductive ability makes activities more efficiently performed by one sex (Eagly and Wood, 2012). Biology combined with socialisation creates schemas which set gender role standards and societies expectations. These result in biases, stereotypes and alliances within STEM workforces as people internalise gender roles. (Eagly and Wood, 2012; Reich et al., 1973)

Eagly and Sczesmy (2019) imply that although gender roles and equality are changing, changes do not necessarily reflect changes in stereotype content overtime. SRT contributes to the existing study as females may exit STEM careers due to gender prejudice or to satisfy a self-fulfilling prophecy society created (Eagly and Wood, 2012, Wood and Eagly, 2002) Evidence of which exists in longitudinal research on GLS which reveals sectoral segregation is decreasing but occupational segregation is increasing particularly in urban areas due to an increase in female labour force participation resulting in a more even distribution of male and females across sectors but within a limited number of occupations in these sectors. Results of this study may not be generalisable as it utilises a select proportion of sectoral categories which provides rudimentary data on GLS that may not offer a holistic view. (Borrowman and Klasen, 2020)

SRT is criticised as it does not provide a framework for understanding the complexities involved in human subjectivity as all individuals are unique and have different beliefs, feeling and desires. It also provides an inadequate account of human agency as individuals have the power to make meaning for themselves (Eagly and Wood, 2012; Jackson, 1998) Further, it could be argued the theory is outdated as the division of labour and gender hierarchy has become weaker in industrialised societies due to a decline in the importance of sex differences as a result of lower birth rates and a decrease in the reliance of strength and size

to carry out manual labour (Eagly and Wood, 2012). Although Borrowman and Klasen's (2020) study on GLS would suggest otherwise. Lastly, SRT's contribution to gender bias in STEM and female turnover should not be considered in isolation of human agency and one's social and economic environment as theorists stress the importance of socialisation (which is different for everyone) in shaping gender roles (Kohlberg and Kramer, 1969; Bandura, 1977). This theory is useful for the present study as it may help to explain why women choose to exit STEM to pursue more communal roles. The section which follows discussions the Role Prioritisation Model (RPM) which may also help to understand how women who augment rather than go against gender roles receive praise rather than punishment and is useful for understanding how women in STEM could weaken traditional gender stereotypes.

2.3.2 Role Prioritisation Model

Haines and Stroessner's (2019) RPM explains the conditions under which benefits and penalties arise due to perceived fulfilment or neglect of communal and agentic gender roles. It builds on SRT and proposes that behaviours suggesting low prioritisation of traditional gender roles produce harsh judgements. Larger costs for women are observed when compared to men working in gender stereotype-incongruent domains (Heyder and Kortzak, 2024). Rudman and Glick (1999) maintain women in power may be judged for lacking feminine niceness when they act authoritatively. For mothers, Crosby et al. (2004) 'maternal wall bias' explains women are judged as less committed when its perceived caregiving is prioritised over work.

The model posits a successful balance of role prioritisation avoids backlash and those who choose to disregard gender norms maintain greater gender equality (Haines and Stroessner's, 2019) RPM adds to existing theories as it provides a basis for understanding the societal pressures women face at work should they violate gender norms and prioritise agentic behaviour or attempt to balance both (Eagly and Wood, 2012; Eagly and Karau, 2002). If an imbalance is perceived between professional and gender roles then gender bias about why a woman is filling a certain role and not whether they are filling a role may influence a women's decision to leave a STEM career or pursue a role at work which assumes more communal characteristics such as caregiving, friendliness, kindness or being concerned with

others' goals. (Haines and Stroessner, 2019) RPM supports women engaging in non-traditional roles, provides a greater understanding of gender bias and how women can avoid negative evaluations for gender atypical behaviour. It seeks to contribute to an understanding of how women may weaken traditional gender stereotypes.

2.4 Female Turnover in STEM

A factor adding to the complexity of the lack of females within STEM is females' retention within these disciplines. A plethora of research suggests women in STEM are more likely to leave the discipline or pursue non-STEM professions especially earlier in their careers (Glass et al, 2013; XU, 2008; Hunt, 2016; Frehill, 2011). Frehill (2011) report that post-graduate female engineers in the US are retained at 70% and males 86%. Sterling et al. (2020) and Ellis et al report female turnover can be explained partially by confidence. Hunt (2016) argue over half of the differential gender gap in exit rates can be attributed to dissatisfaction around pay and promotional rates. However, these results may be outdated as they are drawn from survey data in 2003 and 2010. Hunt (2016) proposes a lack of mentoring, networks or discrimination are more likely explanations for female exits. Several studies cite caring for family interrupts STEM participation for females when compared to males and females in non-STEM roles (Cech and Blair-Loy, 2019; Glass et al., 2013; Frehill, 2011). Also, marriage (84%) and a second child increase the odds of turnover for STEM women (395%) when compared with professional women (147%) (Glass et al., 2013). Contrarily, some studies do not consider family factors to account for the differential loss when compared to females in other professions but instead report it should be considered a secondary reason for female turnover (Glass et al., 2013; Hunt, 2016; Frehill, 2011). As mentioned, a large proportion of research on female turnover in STEM is focused on a student level or post-graduation in a work context. It also appears to focus on women who leave STEM to exit the workforce opposed to those who pursue a career in a non-STEM discipline. Adding further to the research gap for the present study (XU, 2008; Hunt, 2016; Frehill, 2011; Sterling et al., 2020; Ellis et al., 2016).

2.5 Pursuit of Alternative Career Positions

Glass et al.'s (2013) research appears to be the only study which infers women in STEM-related occupations are more likely to leave their field and pursue a career in another discipline when compared to women in other professions. The quantitative study determined women in STEM were more likely (31.5%) to exit into another field when compared to non-STEM professionals (6%) especially within their first 5 years of employment. Female retention in professional occupations was reported higher (62%) than female retention within STEM (52.3%). Women who had an advanced degree in STEM or non-STEM field were also more likely to leave. The research also revealed women who left STEM were less likely to return. Twenty one percent of women moved into the management of scientific or technical work, however, the majority moved into non-professional jobs. Investments in rewards such as training, flexible scheduling and telecommuting which generally generate commitment fail to build commitment among women in STEM (Glass et al., 2013). Parental leave (39%-44%), high job satisfaction (34%) and aging (15%) were the most significant factors reducing field leaving. It identified an opportunity for future research to explain the large difference in women's exit from STEM to professional fields. Limitations of the study include the difficulty coding for women who left their STEM career for management or administrative roles within a STEM field as they were considered the professional sector. Again, the reliability and validity of the results today are unknown. They may not be replicable as data is drawn from the National Longitudinal Survey of Youth from 1979-2008 which sampled 1,258 men and women in the U.S (Glass et al., 2013). Additionally, a limitation of the study is that it is quantitative and does not gain a rich understanding of why women leave STEM which is important to capture to tailor effective responses.

2.7 Women in STEM Leadership

There has been considerable progress in the presence of women at executive senior level however there is still a disparity and hierarchical segregation amongst females in managerial roles (Eagly, 2021). The U.S. Bureau of Labor Statistics (2023) report 76% of HR managers and 10% of construction managers are female. In Ireland, the rise of new legislation increases pressure for businesses to have a female presence at board level (Irish Corporate Governance (Gender Balance) Bill, 2021). The EEOC (2019) report 25.9% of all STEM leaders were women. Even less, the World Economic Forum (2023) states 12% of women occupy top

positions in technology companies. Although fewer women are reported to work in STEM and move into management this cohort is an important focus as statistics reflect women exiting technical careers and progressing into management. However, it also highlights female underrepresentation in high-paying, management and leadership roles. Academics identify key factors favouring and limiting female selection.

Eagly et al. (1992) meta-analytic review of 61 studies suggests women demonstrate more transformational leadership styles than men emphasising the benefit of their presence at a senior executive level developing strategy although transactional leadership is considered effective in emergency situations. Women are also more likely to reduce health and safety risks an important element within STEM disciplines (Franczak and Margolis, 2022). Nonetheless, female leaders were evaluated less favourably when leadership was carried out in stereotypically masculine styles (autocratic) or when leaders occupied male-dominated roles and evaluators were male (Eagly et al., 1992). Similar reasons were cited in a qualitative study examining women's decisions to leave corporate leadership (Frkal and Criscione-Naylor, 2021). Further, there are significant benefits for fostering DEI in STEM which are discussed in following section.

2.8 DEI

Legislation such as the Gender Pay Gap Information Act (2021) inspires other initiatives such as the gender Governance (Gender Balance) Bill (2021) which accelerates the need for Irish businesses to increase female representation, foster a gender diverse and inclusive culture (Struthers and Strachan, 2019; Glass et al., 2013). Businesses set key performance indicators around gender targets to expedite DEI and create a diverse and inclusive workforce and environment (Franczak and Margolis, 2022). Bell et al. (2011) ascertain a diverse and inclusive workforce is productive and innovative as diverse teams bring new skills, experiences and perspectives leading to better informed decisions. Lintstock (2023) provides evidence suggesting gender balance contributes to board effectiveness. Further, Hunt et al (2015) posit gender-diverse organisations report an increase of 15% on financial returns.

2.9 Vertical and Horizontal Segregation

Women also face vertical or horizontal segregation. Vertical segregation represents a preference for men in positions of high pay and authority. Horizontal segregation refers to the concentration of women and men in occupations that differ in skills and demands (Eagly, 2021). According to U.S. studies women's representation increases in roles requiring social contribution and flexibility whereas men's exceeds in occupations requiring physical strength, competition, maths and technical skills (Cortes and Pan, 2018; Levanon and Grusky, 2016). Kahn and Ginther (2018) summarise, women prefer LPS (psychology, life and social sciences excluding economics) and men GEMP (geoscience, economics, engineering, math, computing and physical science) careers. Eagly (2021) maintains causes associated with GLS can be discriminatory and in some cases may affect individual's from pursuing their own preferences. to act individually and make their own choices. Research examining competitiveness as a trait posits women more than men prefer to avoid competition (Buser et al., 2017; Niederle, 2017). Croson and Gneezy (2009) maintain women are more risk-adverse and less likely to negotiate pay or advancement adding further to GLS. Women only apply for a job when they meet 100% qualifications whilst men apply when they meet 60% (Mohr, 2014). Women are also 30% less likely to be called to interview than an equally qualified male counterpart due to gender bias and organisational stereotypes in recruitment (González et al., 2019). Player et al. (2019) determine through two experiments women are less likely to be promoted into top positions as proof of past and current performance is more likely to be considered whereas future leadership potential is for men. The opposite is true for men, as they do not encounter greater hiring discrimination than women in majority female occupations (Koch et al., 2015). The section which follows discusses further the key challenges women face within STEM based on the literature reviewed; IS, macho culture, tokenism, work-life balance and unfair pay.

2.10 Challenges

2.10.1 Imposter Syndrome

IS can be defined as "*the persistent inability to believe that one's success is deserved or has been legitimately achieved as a result of one's own efforts or skills*" (Oxford English Dictionary, 2024). Even though it is a gender-neutral phenomenon earlier research infers

women are more likely to experience IS (Clance and Imes, 1978; Clance and O'Toole, 1987). As discussed earlier, a women is unlikely to apply for a job for which she did not meet all criteria (Mohr, 2014). IS is prevalent among high-achieving women in male-dominated STEM industries as women internalise gendered stereotypes and perceive themselves as less competent in traditionally male-dominated disciplines. (Clance and Imes, 1978; Clance and O'Toole, 1987; Ertl et al., 2017) Regardless, studies show men and women do not differ significantly on their competence in STEM disciplines (Blondeau and Awad, 2018). Interestingly, although IS is discussed as a challenge for women in STEM Blondeau and Awad (2018) reveal it only influenced retention for males and not females at a student level. For women, their self-reported interest in STEM was the only factor which significantly affected their future regardless of self-efficacy, GPA and feelings of IS.

2.10.2 Macho Culture

Macho culture which explains workplace cultures where men dominate are 91.1% biased and discriminatory against women (O'Conrad, Abdallah and Ross, 2021). At a student level, 61% of women in STEM reported experiencing gender bias within a year (Robnett, 2016). Leaper et al (2019) observed similar results for gender bias (60.9%) and sexual harassment (78.1%) which related negatively to STEM motivation and career aspirations. El-Hout et al (2021) contend STEM preferences are shaped by cultural factors and not merely biology. Masculine defaults exist when traits and characteristics associated with the male gender roles are valued, rewarded and perceived as standard. These masculine defaults may prevent women from entering and succeeding in majority male fields (Cheryan and Markus, 2020). In a quantitative study, Cyr et al (2021) examine 1,247 STEM professionals and determine cross-gender social exclusion is linked to negative work-place outcomes in terms of engagement, efficacy, social identity threat and perceived support via lower social fit. The stronger men's stereotypic associations were the more likely they were to include fewer female colleagues. The research suggests fostering positive cross-gender social relationships to promote women's professional success in STEM disciplines. (Cyr et al, 2021)

2.10.3 Tokenism

Tokenism is an artificial experience achieved by including a limited number of people in a minority group in positions due to their characteristics (gender, age, race, religion, etc.) accepted as disadvantage or different from the dominant group (Kanter, 1977). Women report negatively about being a gender-token in male dominated work groups which may be applicable to STEM disciplines were women are a minority (Kanter, 1977; McDonald et al, 2004). Token female managers experienced increased visibility, performance pressures, social isolation, and adjustments to stereotypes (Kanter, 1977). They also reveal they were more likely to have their errors amplified, be isolated and be fixed into positions undermining their status (Kanter, 1977).

2.10.4 Work-Life Balance

Work-life balance is reported the top challenge women in STEM face alongside gender bias or discrimination (56.3%) and high stress levels (50.9%) (O'Conrad et al, 2021). Women experience greater work-family conflict as they spend more time per week (12 hours) caregiving and carrying out household responsibilities (Moyser and Burlock, 2018). STEM professions are seen as demanding as there are strict deadlines and time-consuming. O'Conrad et al (2021) determined women desire flexible work schedules (77.7%), childcare assistance (59.8%) and workplace accommodations for example nursing rooms (57.1%). Similarly, findings from a global Deloitte (2023) reveal organisation's ability or inability to offer women flexibility around when they work instead of where is a key factor for engagement and retention. Women believed asking for flexible work schedules would affect their promotional opportunities (97%) and that if arrangements were granted workloads would not be adjusted accordingly (95%) (Deloitte, 2023).

2.10.5 Unfair Pay

According to Eurostat (2022) in Ireland there is a 9.3% gap in how women are paid compared to men compared to a 12.7% EU average. PwC's (2023) GPG analysis which examined 500 Irish companies revealed a higher GPG of 12.6% with the widest gaps in STEM disciplines (finance, banking (18.9%), insurance (22.9%) and construction (21%). Key contributing

factors include a high number of males in senior roles, an average proportion of 45% of females in the workforce and the ‘motherhood penalty’ and ‘fatherhood wage premium’ which reveals working mothers experience an economic penalty of approximately 5% per child which persists when controlling for human capital, position, hours and workplace flexibility whilst at the same time, fathers receive a 5% increase especially if they are the sole earner in the family (PwC, 2023; Yu and Hara, 2021; Fuller, 2018; Perterson et al, 2010; Kmec, 2011; Wetzels and Zorlu, 2003; Glauber, 2008; Allen at al, 2002). The gap could be explained further by productivity discrimination based on parenthood status or as parenthood strengthens gender roles and men may feel greater responsibility to provide for the family. (Yu and Hara, 2021) The research is beneficial for understanding the challenges women in particular mother's face within STEM in terms of earnings and growth across firms.

2.11 Retention Strategies

This section will discuss the key strategies for retaining women in STEM.

2.11.1 Role Models, Employee Resource Groups and Mentoring

Utilisation of role models, ERG’s and mentorship programs to support career development are reported as some of the most efficient interventions for attraction and retention backed by empirical evidence. Halliday et al (2022) examined 5,578 employees perceived supervisor support (PSS) and psychological safety (PS) as factors which help aid retention across a variety of industries and countries. The study found PS partially mediated the relationship between PSS and turnover intentions which provides a basis for understanding how mentorship can help reduce turnover.

Hernandez et al (2017) reported mentorship was one of the best predictors of women’s involvement in STEM. Research demonstrates female role models and mentors increases females belonging and self-efficacy in STEM (Young et al, 2013; Dasgupta, 2011; Lockwood and Kunda, 1997; Morgenroth et al, 2015). Brue (2019) revealed that for women in STEM leadership most support for handling work-life conflict came from mentors, female colleagues or significant others. O’Brien et al (2017) and Ramsey et al (2013) agree and

ascertain even slight exposure to role models or mentors can heighten students' interest and identification in STEM. Again, the majority of the research conducted focused on students and not employees.

2.11.2 Training

Workforce training, workshops or immersive experiences to reduce bias are other strategies to promote job openings and retention (Popo-Olaniyan et al, 2022; Moss-Racusin et al., 2021). Moss-Racusin et al. (2021) recommend policies that protect against bias in hiring and promotion to prevent the spread of gender bias and stereotypes at key decision points as they empower staff to become conscious of their beliefs and behaviours. Roemer et al (2020) used a co-create, build, and engage framework to retain female students in STEM degrees and after a bias literacy workshop was held increases in self-efficacy and confidence could be observed. Flory (2021) indicate that companies signalling interest in employee diversity has a strong positive effect on interest in openings. Creating advertisements that do not discourage underrepresented groups is important (Moss-Racusin et al., 2021). Gaucher et al. (2011) and Stout and Dasgupta (2011) found gender exclusive language or language associated with masculine stereotypes such as ‘dominant’ and ‘competitive’ deter female applicants from applying.

2.11.3 Flexible Working

Research implies that family friendly initiatives such as offering parental leave and flexible work arrangements are beneficial to attract and retain women into STEM careers (Popo-Olaniyan et al, 2022; Moss-Racusin et al., 2021). Sixty percent of women would quit if they did not have access flexibility in their workplace and hours (EY, 2021). As discussed, gender differences within STEM can be attributed to work-family conflict (Cech and Blair-Loy, 2019).

2.12 Conclusion

The primary aim of this chapter was to review the literature available on why women leave STEM for careers in other disciplines and factors which should be considered for their retention. It has discussed women in STEM in Ireland, female turnover within STEM and the pursuit of alternative career positions, the challenges women are faced with in STEM, 2 key relevant theoretical concepts, benefits of fostering DEI and the key strategies known as effective for retention.

CHAPTER 3: METHODOLOGY

3.1 Introduction

This chapter will detail the methodological approach undertaken. It will discuss the research philosophy, design, strategy and method. It will disclose the sampling selected and set out the methods used for data collection and analysis. It will also discuss ethical issues and limitations.

3.2 Research Philosophy

Researchers can adopt a 'deductive' or 'inductive' approach to research (Robson and McCartan, 2015). This dissertation adopted an inductive approach as it collected data to explore a phenomenon, identify themes and patterns and build a conceptual framework (Saunders et al, 2016). This approach to theory development was chosen as the literature discussed in chapter 2 focused on the research problem primarily from a deductive quantitative approach and the researcher identified a gap for exploratory research to examine why women left STEM and what strategies could have assisted in their retention. Additionally, Byrman and Bell (2015) maintain that a deductive approach is difficult to apply where there is little research on a topic.

The five main research philosophies are positivism, critical realism, interpretivism, postmodernism and pragmatism (Saunders et al, 2016). This dissertation is underpinned by interpretivism. This research philosophy was chosen as the research endorsed subjectivism, social constructionism and a regulation perspective which desired to regulate women's experiences in STEM (Saunders et al, 2016). Social constructionism maintains reality is constructed through social interaction in which individuals create shared meanings and realities. Understanding the core concepts of social constructionism is important for evaluating its impact on methodology (Andrews, 2012). The research epistemological foundation stems from the theories discussed in chapter 2 and focused on narratives, perceptions and interpretations of women who left their STEM career. It also attempted to gain new understandings and world views of the challenges women faced and strategies considered effective for retaining women in STEM in Ireland. The ontological assumptions

associated with the chosen research philosophy appreciated complexity, richness, social construction through culture, language and multiple realities which was necessary to understand why a high cohort are reported to exit STEM to pursue careers in other disciplines. Interpretivism provides an important epistemology and ontology for the foundation of this study for interpreting and understanding the views of women who left STEM as there is no one true reality that will apply to each woman who left STEM to pursue a career in a non-STEM discipline in Ireland. (Saunders et al, 2016) Bury (1986) states *"there is no way of judging one account of reality as better than another"* (p.165). This research recognised all opinions on an equal platform.

Other research philosophies were considered but not chosen. Positivism is associated with a deductive approach to research and utilises quantitative methods of analysis. As the dissertation aimed to explore why women in Ireland left STEM track careers, the challenges they faced and factors which could aid their retention the philosophy would not have allowed the researcher to gain the insights needed to answer the research questions asked. Critical realism, postmodernism and pragmatism were not undertaken due to the time constraints associated with the project's completion. Critical realism involves analysis of pre-existing structures and emerging agency, postmodernism involves in-depth investigations of anomalies, silences and absences and pragmatism typically adopts mixed methods. (Saunders et al, 2016) As the researcher worked full-time adopting these research philosophies would not have been feasible.

3.3 Research Design

The study adopted a cross-sectional qualitative research design. The discussion of cross-sectional design is usually placed in the context of quantitative research however a cross-sectional design can involve the collection of data by questionnaire or semi-structured interview (Bryman and Bell, 2015). A cross-sectional qualitative design was chosen as existing literature does not determine through qualitative methods why women exit STEM for careers in other disciplines at a higher rate than men and the factors which could have been more effective for their retention. Qualitative research has been criticised for being 'airy fairy' or not 'real' however methods a high-quality rigorous analysis will be applied to the

data (Laubschagne, 2003; Braun and Clarke, 2006). This design was also necessary to gain the insights needed to answer the research questions asked which will help inform future quantitative studies. The cross-sectional design involved the collection of data on more than one case at a single point in time in order to collect quantitative or quantifiable data in connection with two or more variables, which are then examined to identify patterns of association. It was understood that should a relationship be discovered between variables that it does not imply causation but rather there is a relationship between the variables. (Bryman and Bell, 2015) Due to the time constraints associated with the completion of the project a longitudinal or experimental research design would not have been feasible as women in STEM in Ireland would have to be repeatedly examined throughout their career in order to gain valuable insights.

3.4 Research Strategy

The study employs an interview strategy. An interview strategy was chosen to allow the researcher to gain in-depth insights into why women exited their STEM careers, what challenges they faced and what retention strategies could help Irish organisations with females' retention in STEM in the future. A focus group strategy was not chosen due to the risks associated with participants discomfort, lack of control over proceedings and group effects (Bryman and Bell, 2015). The interview strategy assisted with the formulation of qualitative data necessary to answer the research questions asked.

3.5 Research Method

The research adopts in-depth semi-structured interviews which consisted of 18 preliminary questions divided into 2 sub-sections (see appendix 1). Bryman and Bell (2015) maintain interviewing is a prominent method of data gathering within a feminist research framework as it is usually less invasive. The researcher was able to prepare interviewees for sensitive and complex content (Kumar, 2005). As there were no pre-determined measures questions were developed considering the theories and concepts reviewed in chapter 2. The first section of the interview focused on interviewee's 'Turnover and Challenges' in STEM and consisted of 12 questions which attempted to answer the first 2 research questions. The second section focused on 'Retention' and attempted to answer the third research question. It asked 6

questions which explored the strategies effective for retaining women in STEM. Open-ended questions allowed the interviewer to build a rapport (Saunders et al, 2016). The semi-structured nature of the interviews allowed interviewees to feel comfortable and gave them the flexibility to respond on their own terms in a unique manner. The interviewer also had the opportunity to ask follow-up, probing, interpreting questions not included in the guide if a topic of interest relevant to the wider research question arose. (Bryman and Bell, 2015; Walle, 2015) The researcher understood an adequately powered study had a high likelihood of finding sufficient themes of the desired prevalence (Fugard and Potts, 2015). A pilot interview was undertaken in June 2024 which helped the researcher minimise problems of misinterpretation and assess the time it would take to collect the data (Creswell, 2007). Feedback from both the pilot interview and researcher's supervisor was taken into consideration upon the final draft of the interview guide.

3.6 Sampling and Selection

The sample selected was women, aged 18 years or over, working full-time in Ireland who progressed or rotated into a position outside of STEM. The exclusion criteria were males, females under the age of 18, part-time employees and those not previously employed within a STEM discipline. This criteria was decided as in Ireland persons aged 18 plus are considered an adult. Part-time employee responses were avoided as full-time employees were more likely to be heavily involved with work. A non-probability purposive volunteer sampling strategy was employed, and interviewees identified a desire to participate in the study (Saunders et al, 2016). The strategy involved both self-selection and snowball sampling techniques as a post was distributed on 3 social platforms. Resharing of the post occurred which meant a snowball sample was generated. These sampling techniques were chosen as the researcher was unable to randomly identify and access women who worked full-time and left a STEM role to pursue a career in another discipline.

The sampling strategy undertaken resulted in a sample size of 10. Gubrium and Holstein (2002) state for a qualitative study to be published the minimum number of interviews is typically between 20- 30 however Braun and Clarke (2013) recommend 6- 10 interviews for smaller research projects. Bryman and Bell (2015) and Sandelowski (1995) maintain it is

difficult to specify a minimum sample size for qualitative research. The sample size achieved was appropriate as it was small enough for the researcher to manage and large enough to provide new understandings of women's experience. Details of the sample interviewed using pseudonyms for the purpose of anonymity are presented in table 1.

Table 1: Details of the Sample Interviewed

Interviewee ID	Pseudonym	Age (in years)	STEM Discipline	Years of Experience in STEM	Current Discipline
HA11OE	Amy	54	Electrician	21	HR
CR01EN	Emily	48	Civil Engineering	10- 12	Public Relations
MA12RS	Jessica	59	Procurement	3.5	HR
RE08ER	Eva	39	Electrical Engineering	4	Governance
OM07LA	Ciara	43	Control Room Operations, Procurement & Power Station Manager	15	HR
SW07ON	Eimear	54	Finance	25	HR
MU12RA	Inez	49	Electrician & Electrical Engineering	22	Strategic Management
ON12AH	Sharon	49	Mechanical Engineer	14	HR
BR01NE	Hazel	45	Mechanical Engineer	15	Strategic Management
ST02NA	Anne	46	Electrical Engineering	13	Facilities

3.7 Positionality Statement

The researcher acknowledges personal values may influence the research direction and the conclusions drawn from the data. Clarifying one's value position helps to decide what is appropriate ethically. (Saunders et al, 2016) The lead researcher values gender equality, women's presence, opportunities and retention within STEM disciplines. The researcher adopts this value position as they are a member of the recruitment team in the HR department of one of Ireland's leading STEM organisations which will herein be referred to as Company A. In recent years, the researcher has witnessed enhanced recruitment efforts to increase female representation and has also noticed female transitions from STEM to non-STEM roles. These experiences sparked the researcher's interest in studying the research topic of why women exit STEM to pursue careers in non-STEM disciplines and factors which could aid their retention as it is understood the retention of current and future cohorts of women is significant for achieving gender balance in Irish organisations. As a result, the researcher was conscious their presence may influence responses.

3.8 Data Collection

Interviews took place between the 01/07/2024–17/07/2024 and were recorded using Microsoft Teams and transcribed verbatim upon consent. A post was shared by the researcher on LinkedIn (22/06/2024), on company A's Viva Engage site (24/06/2024) and internal communications employee noticeboard (25/06/2024). Senior Management in Company A were briefed on the proposed research and permission was granted to advertise the study on internal sites. The researcher was aware of the threat non-response bias posed and tried to limit non-response stemming from non-contact by accepting volunteers for 3 consecutive weeks (Denscombe, 2014). Once volunteers contacted the researcher an information sheet, debriefing and consent from were sent out and returned (see appendices 3- 5). Encrypted meetings were then set up with their own meeting ID and passcode to ensure confidentiality. Interviews typically lasted between 16 minutes to 1 hour. The interviewer probed and asked interviewees additional questions when significant replies developed (Byrman, 2004). Technical errors in the transcripts generated by Microsoft Teams were manually checked and corrected to transcribed verbatim before proceeding to analysis.

3.9 Data Analysis

Braun and Clarkes (2006) six-step thematic analysis was used to analyse the data collected during the interview process. This approach was adopted as it is considered particularly suited to phenomenology. It also provided the researcher with an accessible, systematic procedure for identifying, analysing and reporting reoccurring themes within the data. Transcripts were used to code the data by themes. A code can be described as a tag or label which describes the content of the data gathered during a study. Theoretical thematic analysis was used to analyse the data as the researcher was concerned with addressing specific research questions. The data collected was coded to capture concepts relative to the research questions and content in the literature review. A common pitfall whilst using this method is for researchers to use the research questions as themes. The researcher was mindful to avoid this whilst carrying out the analysis. Codes were analysed to determine similarities, differences, patterns and structures. 6 themes and subsequent sub-themes were developed. Each of which are presented and analysed in detail in chapter 4. An advantage of thematic analysis is that it is flexible, accessible and summarises key themes from thick descriptions. It also can be employed to several ways of analysing qualitative data. A disadvantage of theoretical analysis is that it does not specify its procedures at the same level of detail as grounded theory. Like other methods of analysing qualitative data, it is also subjected to researcher's bias. (Braun and Clarke, 2006; Braun and Clarke, 2016; Bryman and Bell, 2015)

3.10 Ethical Considerations

In January 2024 a research proposal was submitted and in March 2024 ethical approval was granted by the National College of Ireland Research Ethics Committee. Discussions about ethics in research can be broken down into informed consent and debriefing, potential harm, anonymity and confidentiality (Saunders et al, 2016; Bryman and Bell, 2015) Participants were given these rights as part of an ethical research process.

Consent was achieved by issuing an information sheet, debriefing and consent from about participation rights and data usage ahead of interviews (see appendices 3- 5). Participation was voluntary. Participants were informed of their right to withdraw from the study during the interview without penalty. Participants were also informed of their right to withdraw up to

a week after their interview by emailing the researcher their code number, at which point their data would be deleted. Participants were provided with full information and the researcher adopted an overt method to ethical considerations throughout the research process.

As the dissertation circumferences aspects of individuals gender, the researcher assessed the possibility of psychological harm. Contact details and links to useful contacts in the debriefing form were provided. The researcher also made themselves aware of questions that could impact negatively on self-esteem and made interviewees feel comfortable by having a discussion prior to the interview.

Anonymity and confidentiality was ensured by allowing participants to create their own unique ID when signing the consent. Interview recordings were labelled with a code ID generated to ensure confidentiality. Recordings were used to create transcriptions and then deleted. Transcriptions were anonymised and stored under the unique IDs on a password-protected computer. Participants consent forms and anonymised transcriptions will be retained and managed in accordance with the NCI data retention policy and will be deleted after 5 years.

3.11 Limitations

The following limitations should be considered as they pose a threat to the validity and reliability the research conducted. The sample selected may not be representative of the proportion of females who left STEM to pursue careers in other disciplines in Ireland as this percentage is unknown. To combat this all opinions were recognised on an equal platform. Lee (1993) states a snowball sampling technique may result in a homogenous sample. The researcher was unable to put a timeframe in which participants last worked in STEM. The average age of the sample interviewed was 49. The researcher acknowledges interviewees experienced very different conditions as the STEM landscape and the focus on gender equity has transformed in the last number of years. The researcher considered women who left STEM for a management role within STEM a non-STEM role. Glass et al (2013) also lists this as a limitation as it could be argued management in STEM can be considered a STEM role.

The researcher was also weary of the general power dynamic in interviews as the interviewer occupies a position of power which may influence responses. These effects were minimised by ensuring no undue pressure was exerted on interviewees and each were given the right to the withdraw. The researcher acknowledges intra-interviewer and intra-interviewer variability and the possibility of self-presentation bias whereby interviewees may respond in a way which are socially desirable instead of revealing their actual response as additional limitations. (Bryman and Bell, 2015)

3.12 Conclusion

This chapter discussed the methodological approach undertaken. It outlined the research philosophy, design, strategy and method. It described the sampling method and provided a summary of the sample selected. It presented the researcher's positionality and set out the methods employed for data collection and analysis. It also considered ethics and the limitations of the study.

CHAPTER 4: FINDINGS AND ANALYSIS

4.1 Introduction

This chapter will present the findings from the 10 interviews conducted. As discussed in chapter 3, the interview data were codified into themes and sub-themes using thematic analysis. The results are summarised in Table 1. The findings are presented to answer the research questions asked (see table 1). Interviews typically lasted 1 hour. Six main themes were identified. The themes alongside sub-themes are discussed in detail in this chapter.

Table 2: Interview findings

Research Question	Themes	Sub-themes	Mentioned in
1. Why do women in Ireland leave their STEM careers to pursue a position in other disciplines?	Career Progression	Natural Progression, Unclear Career Paths in STEM and Limited Opportunities	8 interviews
	Management	Managements Impact on Employee Experience, Vertical Segregation, Management's Role in Retention	8 interviews
2. What challenges did women face in their STEM positions?	Gender Stereotypes	Women as a Minority, Gender Roles, Tokenism	8 interviews
	Pressure to Prove Yourself		8 interviews
	Pay	Unfair Pay, Motherhood Penalty	8 interviews
3. What would facilitate women remaining in	Retention Mechanisms	Mentorships and Informal Networking,	9 interviews

the STEM positions they left?		Work-Life Balance (Flexibility and Parental Supports), Female Leaders and Role Models, Training,	

4.2 Career Progression

When interviewees were asked why they chose to leave their STEM positions 8 interviewees referred to career progression. The data suggested most interviewees left their technical roles in order to progress in their careers. It appeared interviewees were interested in advancing their careers and decided to exit STEM as they enjoyed variety, wanted to widen their scope and build on their existing skillsets. Emily mentioned *"I needed… to move into another aspect and get more experience on my CV… this helped me to widen my knowledge base"*. The majority of interviewees did not leave STEM for negative reasons. In fact, 7 interviewees reported they would consider reapplying to STEM in the future. Interviewees referred to their move as a *"natural progression"*. However, at a deeper level women explained that there were unclear career paths and limited opportunities within STEM. This implies Irish organisations could improve and enhance retention by creating clear and apparent STEM opportunities and career paths. Both natural progression and unclear career paths with limited opportunities are identified as subsequent sub-themes and are discussed in detail in the following sections.

4.2.1 Natural Progression

Seven interviewees referred to natural progression as one of the main reasons why they chose to exit their STEM role. Amy said, "*the natural progression was really to become a HR Business Partner*" and Sharon stated, *"I wasn't stepping away from STEM, I was bringing STEM with me, with people skills to become a people manager… this is progression for me*". Similarly, Inez commented "*I didn't actually consciously move out of it. It's… a natural evolution..."*. Interviewees explained they progressed naturally into people management, and

5 interviewees felt like they continued to use their STEM capabilities in their non-STEM roles. Eva remarked, "*I think the knowledge I gained during my time in engineering helped me… I find… technical aspects easier to understand*". Interviewees recognised their STEM backgrounds were beneficial and contributed to their credibility and understanding in their existing roles. Emily said, "*with STEM you don't lose it, you bring it with you… you use it in other aspects, even if it is just to understand a conversation*". Some interviewees reported missing the technical aspects of their STEM role, for example Inez said "*I do feel like I lost a skill I spent four years doing finite analysis and I never use it. It's a pity*". This suggested some women would like to use their technical ability to a greater extent in their current role and perhaps would remain in STEM if there was opportunity for technical progression.

4.2.2 Unclear Career Paths and Limited Opportunities

Four interviewees felt that their career paths were unclear in their STEM positions and that opportunities for progression were limited. Interviewees reported organisations had few technical and managerial roles within STEM for women to progress to and that opportunities usually meant progressing into a management role. Emily said, "w*hen we say retaining women in technical roles, the options that we have for promotion don't necessarily lead us that way*". Emily felt she was *"limited… outside of management"* and that *"there isn't promotional roles staying as an engineer if you're moving up, you're moving into management".* She explained *"there is only a small number of roles that you can stay in purely technical if you want to be promoted*".

Similarly, Hazel felt opportunities in STEM were *"highly contested"* and it was evident potential career paths were not made apparent or discussed with interviewees. Hazel said, "*if you could see a path way of how you might progress… I think you would be more inclined to go back to STEM… I felt like I was pigeonholed in one niche specialist area*". In 2 instances Inez and Hazel reported subconsciously moving roles which highlighted the lack of transparency in STEM career paths. Interviewees recommended organisations improve how they support women in STEM with career planning for retention. Ciara stated "*I think we could support women back into STEM by developing career paths. They have to be clear"* and Inez said "*I think career planning, proper career planning and real conversations would*

help women to remain in STEM. For me, the move out… wasn't a conscious decision". Reiterating, in the future career planning, open discussions and increased opportunities could help Irish organisations retain women in STEM.

4.3 Management

Management was a recurring theme and partially answered each of the research questions asked. Poor management was referred to as a reason for why women left STEM and was also listed as a challenge by Jessica and Anne. These references helped to answer the first 2 research questions asked both in terms of women's decision to leave and the challenges women face in STEM. Furthermore, it seemed management impacted positively on women's experience in STEM which perhaps contributed to their longevity in STEM positions as on average interviewees had an estimated 14.5 years of experience in STEM (see table 1, chapter 3). Amy, Jessica and Eimear referred to the importance of management for retention. These responses help to answer the third research question regarding female retention in STEM as they imply management has a major influence on women's experience and retention within STEM in Irish organisations.

Eight interviewees discussed management's impact on their experience within STEM. A proportion of interviewees were complimentary of their managers and reflected fondly on positive employee experiences. However, as mentioned poor management was referred to as a challenge and as a reason for why they chose to exit STEM. Others referred to vertical segregation or males dominating managerial positions. Overall, management was an important feature for female retention. To summarise these findings, managements impact on employee experience, vertical segregation and management's role in retention were determined sub-themes and are presented using quotations in the following sections.

4.3.1 Management's Impact on Employee Experience

It was evident that management had a profound impact on employees' experience. Seven interviewees referred to having managers who helped create a positive experience for them in STEM. Ciara said, "*my experience was positive… people were very supportive I had an*

excellent manager" and Hazel remarked "*if you can get a good manager or mentor that's great. That makes all the difference*". Ciara summarised the impact management can have for employee's experience "*You and I might go into a STEM role and have completely different experiences… based on the culture in that area or the line manager. We don't all have the same employee experience. You might report to a manager that has a good working knowledge of what supports are available. Equally you might have a manager that's less experienced…*".

Two interviewees had a very different experience and reported negative experiences with management. In both these instances poor management impacted their decisions to leave STEM. Amy claimed the challenges she faced were down to *"bad management*". Jessica explained "*The area I was working in wasn't very organised and some of the processes weren't very developed. It was reliant on this is the way we did it before… there's no issues… I found that frustrating… it led me… to work somewhere different. Thing's have changed since… new management has come in… it's improved".* These responses reinforce management's role in supporting and retaining women within STEM.

4.3.2 Vertical Segregation

Three interviewees reflected on their experience in STEM and referred to the large number of men in managerial positions. The data suggested women felt they reached a glass ceiling and were intimidated by their managers. Jessica reported male managers ultimately impacted her decision to leave STEM she said, "*all the males in the room were making the decisions at the time… it would have been part of the reason I moved on.*". Sharon also commented on a *"stark"* contrast when she "*looked up to the top of the organisation"* as *"there was just a wilderness of men in suits*". These responses implied vertical segregation or a male dominance in management positions impacted on interviewees progression and retention in STEM.

4.3.3 Management's Role for Retention

When interviewees were asked about retention strategies for women in STEM, 3 interviewees referred to management's role for retaining females in STEM. When considered in tandem with earlier mentions of manager's impact on females experiences it is evident how important managers are for female retention within STEM.

Amy: "*You needed to be led from the top… the increase of numbers of females… over the last three or four years is certainly… influenced hugely by… support from very senior managers and directors*"

Eimear: "*Promotion is nice but it's not what motivates me… I think your manager is a very important part of your role… if you have a manager who you can talk to… it works*"

4.4 Gender Stereotypes

Interviewees were asked about their experience in STEM, the majority felt their gender was a minority. Eight interviewees referred to gender stereotypes they experienced. The stereotypes most apparent from the data gathered were benevolent sexism, assumptions about women being more communal focused than men and that women are less competent than men in STEM. Sharon, Emily, Amy and Inez referred to positive male attitudes which reinforced gender roles and ensured male dominance as men would sometimes assume they were not in a technical role or would try to *"mind"* them at work. Eimear, Eva and Ciara mentioned that it would be assumed they would perform communal tasks at work such as organising tea, coffee and taking minutes. Further, Emily and Inez felt they were placed in communal roles as a result of their gender and in some instances, interviewees felt they were perceived as less competent in STEM. Overall, participants expressed challenges in relation to their gender and why they got the job (tokenism). Women as a minority, gender roles and tokenism were identified as sub-themes and are discussed in the following three sections.

4.4.1 Women as a Minority

Eight out of the 10 participants felt that their gender was a minority when they worked in STEM. Interviewees report most of who they dealt with whilst they worked in STEM were men. Two interviewees mentioned engineering was a particularly male dominated area. Eva said *"the engineering industry is top heavy with men. Very few women go into it especially the electrical engineering side.*". Sharon mentioned benevolent sexism impacted her experience in STEM as she would be introduced as the *"lady engineer"* and it was sometimes assumed she was not an engineer. Sharon explained one time "*this guy said he wanted to speak to the HV planner… I said she's speaking, and he said is it yourself? Good girl*". Emily had a similar instance occur where it was assumed that 'she' the manager would be a 'he'. Sharon also mentioned being a minority in engineering affected her experience as *"out of care"* her male counterparts would want to *"mind"* and *"look after"* her which she mentioned if she did not call out would have a negative impact on development as you may have not gain expertise *"because somebody thinks they have to protect you"*.

On the contrary, 2 interviewees saw their gender being a minority as a positive and as an opportunity to contribute female attributes in STEM. Sharon said, "*women are a minority in engineering, right but there's a huge opportunity for me in that… because of my female attributes in terms of how I deal with problems and my kind of my more people focused approach and I know it's a generalisation to say that*". Inez explained *"I think women are more… goal oriented… opposed to mad keen to deliver huge, big, exciting projects. I mean obviously we love delivering exciting projects. But to try and keep it realistic and keep it to what we're supposed to be doing. And I think you need that balance you need".* This highlighted the benefits of gender diversity in STEM.

4.4.2 Gender Roles

Eight interviewees mentioned assumptions associated with their gender roles were a challenge for them and contributed to a negative experience. Interviewees expressed their male counterparts felt they should not be in STEM or that male colleagues would mind them at work. Other interviewees reported their colleagues felt that they should carry out communal tasks at work as a result of their gender.

Amy: "*It wasn't that they didn't think I had the ability to be there… they felt that it was a man's role and that they should be doing the heavy lifting. They were trying to help me, but I would have to call that out and say I'm able to do this… if I need help… I'll ask."*

"*It's an old-fashioned way they feel it's not a suitable role for females because they think they are the protectors or minders. It's not like they don't see us as equal… it's their desire to protect, mind or nurture the female person.*"

Ciara: "*Sometimes particularly if you're the only woman in the room, there an expectation that you will take the minutes, organise the tea and coffee.*"

Three interviewees believed females were placed in 'softer' roles as a result of their gender which insinuated they were less competent in STEM. Emily said, "*it's a suspicion I have that because I was a female I was moved into that direction rather than the other… the other candidate got the technical role he was probably not as suited in the managers eyes to the soft skills in the role I got"* and "*I think there was a push for me to go into that area because it was perceived more female*". Similarly, Anne mentioned, "*I really had to fight my way into getting out on site… I think gender played a role in that*". Inez also remarked, "*I notice this… women tend to get put into managing programmes, people or change nearly softer roles. Do you know what I mean?*" and suggested "*maybe it's an unconscious bias that women are better at softer roles*".

4.4.3 Tokenism

Four interviewees referred to feeling like they were a 'token' or 'novelty' female in their organisation. Two interviewees felt that their position as women in STEM in their organisations was used sometimes to the company's advantage to promote gender equality. Emily said, "*One of the guys called me the token female, it used to be a bit of banter. We used to have a great laugh about it because look, there is that tick the box exercise that all companies try to increase the gender diversity".* Eva commented *"I think a lot of companies tend to roll out the women during events to make it look like they are all equal opportunities*

and look to be honest most of them probably are to a degree." Inez felt there were negative effects associated with feeling like this she said "*being a novelty can wear you down. You eventually get sick of being a token, when you are with your own crew you don't notice it but when you go to another building site or customers house, and they are like oh aren't you great? And you're going like I am. I'm amazing. Now, can we get on with it like?*". These responses implied women in STEM in Ireland experienced benevolent sexism and were assumed to be imposters and more communal focused.

4.5 Pressure to Prove Yourself

Eight interviewees specified the pressure they felt to prove themselves as a challenge they faced in STEM. Four interviewees mentioned they felt they needed to prove themselves in STEM sometimes more than their male counterpart which suggested women were perceived as less competent than men in STEM. It could be argued that this pressure came from women themselves as it was evident some of the women lacked confidence in their STEM ability. Inez said, "*You feel like you're constantly trying to prove yourself or not let the side down, you know…*". Ciara mentioned ""*I had to kind of prove myself a little bit more… my capability a little bit more… I had to be a bit more on my guard maybe… I did have to change the way I showed up*." Anne also felt she needed to prove herself "*maybe five times more than a man*".

Two interviewees also pointed out the need to be personally resilient as a woman in STEM which implied women in STEM felt pressure to prove themselves as strong and competent. Amy said, "*You do need to be strong, personally confident, resilient to be able to say well look, you know, I'm here the same as you to do the same job we're equally capable to do this".* Similarly, Inez reflected "*You have to learn to stand up for yourself and to not allow things to happen… Theres a resilience and you have to be able to identify it*". The data gathered suggested that there were additional pressures on women in STEM in Ireland.

4.6 Pay

Six interviewees felt that their pay was impacted negatively by their gender. Three interviewees felt that they were paid unfairly, and another 3 interviewees referred to the impact they felt motherhood has on their promotional opportunities, pay and bonuses. These findings imply gender and motherhood impact on women's pay, progression and retention in STEM. Unfair pay and motherhood penalty were identified as sub-themes and are discussed in the following 2 sub-sections.

4.6.2 Unfair Pay

Three interviewees referred to a pay disparity. Two participants felt that they joined on different terms. Eimear said "*the salary I was offered I thought was fine but then this other guy started. I assumed we would be earning the same, but he was on €3,000- €4,000 more than me"* and Anne recalled "*I came in on different terms and conditions that my male students did. I was brought in on a temporary contract and they all got permanent contracts.*" Ciara disclosed unfair pay ultimately impacted her decision to leave STEM she said, "*I didn't feel like I was paid fairly… it would have been a reason why I left*". This data suggested equal terms and conditions could enhance women's retention in STEM.

4.6.2 Motherhood Penalty

Two interviewees expressed the negative effects they felt maternity leave had on promotion pay and bonus. Inez acknowledged "*reduced hours and parental leave probably effects your chance of bonuses or getting your grades".* Hazel recalled "*when I was pregnant… I took my foot off the pedal during those years… I stepped back because I knew I wanted to start a family…. I wasn't focused on my career. That's a personal decision I made… that has probably affected my career… and salary because… I didn't go for the promotions*". Juxtaposed, Emily had a different experience and was offered a promotion when she returned from maternity leave, she said "*I moved into a promotion role after coming back from maternity leave… which I probably didn't really want when I was returning… as I was trying to get my head together.*". These findings imply women in Ireland are inclined to make career

decisions when becoming a mother which can impact on their pay, progression and retention in STEM.

4.7 Retention Mechanisms

The final theme identified was retention mechanisms. Interviewees gave ideas for what initiatives they felt would have facilitated them remaining in STEM. The following four mechanisms were discussed and determined sub-themes: mentorships, work life balance, visible female leaders and role models, and training. Encouragement from family members was also mentioned as a factor which helped enhance retention and was included as a fifth sub-theme.

4.7.1 Mentorships and Informal Networking

Five interviewees referred to mentoring and networking. Three interviewees preferred informal networking and suggested having informal mentors. Hazel said she sometimes felt companies were just doing formal networking events "*for the sake of doing it*". Emily suggested "*mentoring probably would be good… a buddy system?... I think that would be helpful for women to see what their options are whereas now I would think the only options I see are to move into a managerial role and that might not necessarily be in a technical area… we could sell that better*". She said, it didn't have "*to be a formal mentorship*" that a *"a list of names"* matched *"to different levels"* so women could have *"a fireside chat"*. She reported that women don't have that *"linkage"* and that *"they don't know who to contact"* so the initiative would be beneficial. Similarly, Inez stated, "*informal female networks"* are important and that "*peer to peer support rather than formal mentoring would be good*". It was also suggested by 2 interviewees that mentors for women could be male or female. Emily said, *"I'm talking about women reaching out to men as well as women".* This data suggested women in STEM prefer informal mentorships and networking with either male or female colleagues.

4.7.2 Work-Life Balance (Flexibility and Parental Supports)

Six interviewees referred to the importance of work-life balance, flexibility and having parental supports in place. Ciara mentioned the need for parental supports to be made more explicit which implied that information regarding flexible work arrangement and parental supports were not visible, shared freely and perhaps women were not encouraged to avail of these supports. She said " *I think for STEM, in particular, there could be parental policies. It's not that they are not there but I think they need to be more explicit…".* This was also supported when Anne mentioned "*coming back to work after a change at home… trying to juggle all the demands… it can impact your confidence. Support for people who felt they needed to have reaffirmation is important*".

Four interviewees also explained that not having work-life balance in their STEM role impacted their decision to leave. Anne mentioned she was unsure if she could go back to STEM as the flexibility in her non-STEM role was *"too important"* for her. Hazel also remarked "*it's just that flexibility… I'm not sure if organisations understand how important that is to women and working mothers … just that 20 minutes in the morning to get your kids to school and get back… it's so important because otherwise it's just all about work.*" This data suggested women felt enhanced and apparent flexibility could encourage women's retention in STEM in Ireland as it would allow them to achieve a greater work-life balance which was valuable to them.

4.7.3 Female Leaders and Role Models

Six interviewees referred to female leaders and role models. Three interviewees highlighted the lack of female role models (Eva, Jessica and Hazel). Although this did not seem to impact their decisions to leave except in one case (Jessica). Jessica recalled "*It was like the men were there it impacted my decision to leave*". Three interviewees (Sharon, Inez and Eimear) reported the benefits of having female leaders modelling healthy work behaviours for females' retention. Sharon suggested "*I think what I would like to see is the people… modelling the right… behaviors, showing work life balance behaviors and that they prioritize*

their wellbeing that they prioritize a good positive balance because everybody looks up and sees what does my manager do?... The bonus then for women, is… they look up and see that it is possible for them to move up the ladder".

4.7.4 Training

Four interviewees expressed retraining, technical training and managerial training as a factor which could aid retention. Eva expressed an interest in retraining in STEM however decided not to as she would have to go back as a graduate. She said "*I was as long out of it as I was in it. I would have to go back as a graduate engineer on like base level salary. So, I couldn't.*" Inez identified a lack of technical training and noted the potential benefits of introducing hard goals for women in STEM. She remarked organisations could "*encourage a bit more technical training for engineers… unless you're in a specialist role, technical training isn't encouraged or promoted… It's all management and soft skills".* She explained that *"It's seldom you get to go off and improve your understanding of harmonics"* and that *"KPI's for engineers should include hard KPI's".* Two interviewees (Hazel and Sharon) emphasised the benefits of manager training for development and for enhancing employee experience. Hazel said "*Training for managers is important… a lot of your work life happiness comes from your manager. How your manager supports your and brings you along with them is important*". Overall, interviewees perceived training as valuable for retention however saw an opportunity for Irish companies to enhance technical training.

4.8 Conclusion

This chapter presented an analysis of the themes identified from the interviews conducted that addressed the main research questions of why women in Ireland leave STEM to pursue careers in other disciplines. Also, what challenges they faced in STEM and what would help facilitate retention in the future.

Findings revealed women exited STEM to progress but also because of unclear career paths, limited opportunities, poor management, vertical segregation, unfair pay, and poor work-life balance and a lack of female role models.

The main challenges women faced were in relation to gender stereotypes, pressure to prove themselves and unfair pay.

The retention mechanisms recommended included informal mentorships and networking, better work-life balance, female leaders and role models, technical and managerial training. Encouragement from family members was also seen as a factor which enhanced women's retention. These themes are discussed in the context of literature in the following Discussion chapter.

CHAPTER 5: DISCUSSION

5.1 Introduction

The main objective of this dissertation was to understand why women in Ireland leave STEM careers to pursue positions in other disciplines. Sub-questions aimed to determine the challenges women faced in their STEM positions and to discover what retention strategies would facilitate them remaining in the STEM positions they left. This chapter critically discusses the findings based on the interviews undertaken, in the context of previous research in order to answer the research questions. Strengths, limitations and practical implications are considered. Suggestions for future research are also stated.

5.2 Why Women in Ireland Leave STEM to Pursue Careers in Other Disciplines

The results of this study add to existing research as they provide qualitative insights for understanding quantitative studies which suggest women exit STEM at a higher rate than men (Glass et al., 2013; XU, 2008; Hunt, 2016; Frehill, 2011). The research provides an understanding for why women are 31.5% more likely to exit STEM to pursue an alternative career when compared to non-STEM professionals (Glass et al., 2013). The most substantive finding was the majority of women interviewed exited STEM to progress their careers. Most interviewees progressed into management roles in STEM organisations. This finding partially supports Glass et al (2013) observation that 21% of women who exit STEM move into managerial roles within STEM. However, unlike Glass et al. (2013) the sample selected in this study did not suggest women moved into non-professional roles when they exited STEM.

While it can be seen as positive that women 'naturally' progressed into management, interviews uncovered that there were underlying factors which impacted interviewees decisions to exit STEM and hindered their retention: unclear career paths, limited opportunities, poor management, vertical segregation, unfair pay, poor work-life balance and a lack of female role models. Most interviewees reported that they would reconsider applying for a STEM position again in the future and expressed that they enjoyed being able to utilise their STEM skillsets to understand technicalities in their non-STEM roles. Which suggested opportunities for their retention in the future. These findings differed from Glass et al.'s

(2013) research which maintained women were less likely to return to STEM once they left. Differences in results may be explained by the samples age, size or location.

Results of the study partially supported Hunt's (2016) argument that over half of the differential gender gap in exit rates could be explained by dissatisfaction around pay and promotional rates as 4 out of 10 interviewees reported they exited STEM due to unclear career paths and limited opportunities. One interviewee revealed they left STEM because of unfair pay. The study did not defend Hunt's (2016) proposition that women exit STEM due to a lack of mentoring, networks or discrimination as interviewees did not disclose these factors impacted their decision to leave but instead mentioned them as challenges and areas which could improve future retention. These findings enhance existing knowledge as unlike Hunt's (2016) study this research sampled women who exited STEM careers and not college courses. It also adds, dissatisfaction around promotional rates can be attributed to unclear career paths and limited opportunities within STEM.

Managements impact on employee experience for supporting and retaining women in STEM was a significant finding of this research. Interviewees commented on the impact their managers had on their experience. Although the impact was positive for the majority, negative experiences contributed to the reason why 1 interviewee decided to exit STEM. These findings can be supported by Halliday et al.'s (2022) study which found PSS and PS were significant factors which supported female retention. On the contrary, negative experiences as a result of poor management strengthens the infamous statement 'people leave managers, not jobs or companies' which is supported by research that maintains 57% of employees quit their jobs because of poor management (Buckingham and Coffman, 1999; DDI, 2019).

This study also illustrated the negative impact of vertical segregation as 2 interviewees were intimidated by males' dominance in leadership positions and reported it impacted on their progression and retention within STEM. This result strengthened the findings of Frkal and Criscione-Naylor's (2021) qualitative study which determined male dominance as a reason why women left corporate leadership. It supported Eagly et al.'s (1992) findings which

ascertained women were evaluated less favourably when evaluators are male. It also confirmed Cyr et al.'s (2021) research which contended cross-gender social exclusion in STEM is linked to negative work-place outcomes.

One interviewee disclosed unfair pay impacted their decision to exit STEM. This finding added to the existing research as although a GPG in STEM in Ireland is reported studies do not infer the impact of unfair pay on female turnover (PwC, 2023). Additionally, this study agreed with Cech and Blair-Loy (2019), Glass et al (2013) and Frehill's (2011) research which argued family as a secondary reason for female turnover and a factor which interrupted STEM participation. Interviewees revealed having a family and poor work-life balance impacted their decision to leave and would discourage them from applying to STEM in the future. Further, a lack of female role models impacted 1 interviewees decision to leave STEM. Which adds to existing literature as studies ascertained exposure to female mentors can enhance females' interest in STEM however do not determine its impact on turnover (O'Brien et al 2017; Ramsey et al, 2013). In summary, this study supported existing understandings about why women exit STEM to pursue non-STEM positions in terms of male's dominance in leadership positions, and poor work-life balance. It has also advanced knowledge as it uncovered reasons not previously stated in literature: career progression, unclear career paths, limited opportunities, poor management and unfair pay.

5.3 Challenges Women Face in STEM

Secondly, this study revealed the main challenges women faced in STEM were poor management (as discussed earlier), gender stereotypes (women as a minority, gender roles, tokenism), pressure to prove themselves and unfair pay (motherhood penalty). This study uncovered that the gender stereotypes women experienced in STEM in Ireland were benevolent sexism, assumptions that women were more communal focused and less competent in STEM than men. The discovery of these stereotypes were unanticipated. Traditional beliefs explained in SRT may help to understand why women reported experiencing these gender stereotypes alongside the additional challenges they faced: women as a minority, tokenism and pressure to prove themselves. (Eagly and Wood, 2012)

More specifically, the study discovered women as a minority was a challenge due to the gender stereotypes mentioned. This was most prevalent for women who worked in engineering. Which could be explained by reports which revealed women were outnumbered in engineering (EEOC, 2019; Eagly, 2021). Juxtaposed, interviewees reported being a minority as an advantage which strengthened the findings of existing studies which determined the benefits of a gender diverse workforce (Bell et al., 2011; Lintstock, 2023; Hunt et al., 2015; Eagly et al., 1992; Franczak and Margolis, 2022). Interestingly, interviewees believed they were placed into 'softer' positions as a result of their gender which again suggested the gender stereotypes exist Irish organisations. Alongside SRT these stereotypes could be supported by Eagly's (2021) concept of horizontal segregation whereby it was observed women and men tend to be concentrated in occupations that differ in skills and demands (Cortes and Pan, 2018; Levanon and Grusky, 2016). Further, studies in the past have shown men and women do not differ significantly on their competence in STEM so this stereotype should not exist (Blondeau and Awad, 2018). The findings of this study also strengthen Eagly's (2021) research which maintained GLS can affect individuals from pursuing their own preferences as interviewees expressed an interest in STEM positions but instead inferred that they were placed into 'softer' positions.

Interviewees also discussed they felt like a 'token' and 'novelty' female, and it wore them down. These findings related to research which contended women report negatively about being a gender-token in male dominated work groups (Kanter, 1977; McDonald et al., 2004). The study found the majority of interviewees felt pressure to prove themselves more than their male counterparts in their STEM roles. These findings contradicted earlier research which determined IS is prevalent amongst women in STEM as it appeared women did not feel like 'imposters' in STEM but instead felt additional pressure to prove themselves because they were a minority or in some cases perceived as less competent (Clance and Imes, 1978; Clance and O'Toole, 1987; Ertl et al., 2017). These results could be explained by Kanter's (1977) research which revealed women were more likely to have their errors amplified, be isolated and be fixed into positions which undermined their status in male dominated workplaces.

Lastly, this study implied women in Ireland were less inclined to make career decisions which may progress their career when they are starting a family which impacted negatively on their pay, progression and retention in STEM. Interviewees discussed the negative effects on pay for taking a step back in their career or availing of reduced hours whilst starting a family and child-rearing. These findings confirmed women experienced the 'motherhood penalty' in STEM in Ireland and also alluded to the effect of role prioritisation on pay (PwC, 2023; Yu and Hara, 2021; Fuller, 2018; Perterson et al., 2010; Kmec, 2011; Wetzels and Zorlu, 2003; Glauber, 2008; Allen at al., 2002; Haines and Stroessner's, 2019). To summarise, the study provided a basis which confirmed women face the following challenges in STEM in Ireland: poor management, gender stereotypes, women as a minority, gender roles, tokenism, pressure to prove themselves and unfair pay. The results also added to existing literature as they revealed the key stereotypes which underpinned the challenges faced by women in STEM in Ireland were benevolent sexism, assumptions about gender roles and that women were less competent than men.

5.4 Retaining Women in STEM

Thirdly, this study provided an insight into 4 retention mechanisms which Irish companies could employ to reduce female turnover in STEM: informal mentorships and networking, work-life balance (flexibility and parental supports), visible female leaders and role models, and training. Support from management was also mentioned as factor which could help enhance female retention. The revelation that women preferred informal peer-to-peer support from male or female colleagues over formal mentorships and networking events added to existing literature. It also supported results of previous studies which determined mentorships and support from female colleagues increased women's sense of belonging and self-efficacy in STEM (Young et al., 2013; Dasgupta, 2011; Lockwood and Kunda, 1997; Morgenroth et al., 2015; Brue, 2019).

As regards work-life balance (flexibility and parental supports), previous studies mentioned that flexibility was beneficial to attract and retain women in STEM (EY, 2021, Olaniyan et al., 2022; Moss-Racusin et al., 2021).The results of this study discovered that parental supports in STEM in Ireland were not visible. Findings indicated women in STEM in Ireland

faced work-life-family conflict when attempting to prioritise their roles (Haines and Stroessner, 2019). Achieving better work-life-balance through flexibility and visible parental supports could therefore be considered detrimental to female retention in STEM. Additionally, interviewees reported enhanced visibility of female leaders and role models could help to assist with female retention in STEM. Again, this was supported by previous research which ascertained exposure to female role models heightens interest and identification in STEM (O'Brien et al., 2017; Ramsey et al., 2013).

Interviewees mentioned retraining, technical training and managerial training as factors which could aid female retention as interviewees reported a lack of technical training opportunities alongside technical KPI's. Retraining and technical training opportunities for the retention of women was not stated in previous literature. However, the impact of managerial training for reducing gender bias was supported (Popo-Olaniyan et al, 2022; Moss-Racusin, 2021; Roemer et al., 2020; Gaucher et al., 2011).

5.5 Strengths and Limitations

Strengths and further limitations of the study can be identified after evaluating the key findings of this research study in the context of existing literature:

- Method: A major strength of this study is that it is qualitative and is able to offer in-depth insights on a research problem which is heavily reliant on quantitative research.
- Sample: A limitation of the study is its sample size as it is small and is not representative of the entire female population in Ireland who have exited their STEM careers to pursue non-STEM positions. Additionally, the sample selected does not represent each STEM discipline equally. The sample interviewed could also be seen as a strength as participants had on average 14.5 years of experience in STEM. For some, it had also been a number of years since they last worked in STEM so they may have had more adequate time to reflect on their experiences. However, this could also be seen as a limitation as findings may be outdated.
- Existing literature: There is a lack of research on why women leave STEM and pursue non-STEM roles. Most research focuses on female exits within STEM at a student

level, outside of Ireland or on women who left STEM to exit the workforce which may not be comparable for this dissertation.

5.6 Future Research

The strengths and limitations provide a framework for future research. Existing studies do not quantitatively or qualitatively examine why women exit STEM to pursue careers in other disciplines in Ireland. Advanced knowledge on how many women in Ireland leave STEM roles to pursue careers in other disciplines and why would help inform future quantitative and qualitative studies. It would also be interesting to see if similar results for this study could be replicated on a larger sample who vacated STEM positions within the last 5-10 years as results would be more current. Further, it would be beneficial if future studies could distinguish between those in STEM management positions and in non-STEM roles as this would uncover reasons for female exits outside of natural STEM progression. Future research should also look at enhancing STEM career paths and opportunities and provide greater insights into the gender stereotypes women report experiencing in STEM.

5.7 Conclusion

The aim of this chapter was to discuss the findings which occurred as a result of the interviews conducted. These findings were linked to the findings of previous research. Practical implications, strengths, limitations and future research were then discussed.

CHAPTER 6: CONCLUSIONS

This research adds to existing literature in answering the main research question as it provides an in-depth insight into why women leave STEM to pursue careers in alternative disciplines and identifies key areas which Irish organisations could improve upon. This is beneficial as existing research examines the problem quantitatively, at a student or post-graduate level or by sampling women who have chosen to exit the work force as opposed to those who remain in full-time employment in non-STEM roles. On top of that, this study advances the reasons why women exit STEM to pursue non-STEM positions. Whilst most interviewees reported a 'natural' progression the study revealed that there were factors which hindered women's retention and impacted upon their decisions to leave. Some which were not previously stated in literature career progression, unclear career paths, limited opportunities, poor management, vertical segregation, unfair pay, poor work-life balance and a lack of female role models.

The study revealed the main challenges women faced in STEM. Some overlapped with the factors impacting women's decisions to leave. These included poor management, gender stereotypes, pressure to prove themselves and unfair pay. It also reported women in STEM in Ireland experienced the following 3 gender stereotypes benevolent sexism, assumptions that women were more communal focused and less competent in STEM than men. In some instances, women believed that these stereotypes resulted in them being placed in 'softer' positions contributing to horizontal segregation. Alongside management women suggested 4 retention mechanisms to help prevent female turnover with STEM. These were informal mentorships and networking, work-life balance (enhancing flexibility and parental supports), visible female leader's, role models and training.

To a degree, it could be concluded that management play a crucial role in preventing the turnover of future female STEM cohorts. This is because management partially answered each of the research questions asked. It is believed that alongside HR in Irish organisations management can enhance the retention of females in STEM, reduce the GPG and create an equal, diverse and inclusive workforce which could fill critical STEM positions in a skills shortage with competent females. The following recommendations were made in light of the research findings creation of clear career paths, open career planning discussions, training for

employees and line managers on gender stereotypes, creating positive employee experiences, equal pay, enhanced availability and visibility of flexible work arrangements and parental supports, informal networks and mentorships, adequate female role models, technical training and the introduction of technical KPI's.

6.1 Recommendations and Implications of Findings

The table provides a framework for recommendations, costings and timeframes for items which could help Irish organisations improve female retention in STEM.

Table 3: Framework for recommendations

Item	Proposal	Value Add	Implementer	Estimated Cost and Timeframe
1) Creation of clear career paths	Review existing career paths in STEM	Increased opportunities for women to progress within STEM, creates female role models	Organisational Design and HR Business Partners	Low, free outside of labour cost Timeframe depends on the size of the organisation
2) Open career planning discussions	Quarterly career planning conversations	Enhanced transparency and visibility of career paths	Line Manager	Low, free outside of labour cost Timeframe: 30 minutes per quarter
3) Line manager training on	Short online learning module	Creates an awareness of impact of	Learning and Development Team	High, €10-€30 per person

how to help create positive employee experience for female retention		employee experience on retention		Timeframe: 30 minutes
4) Pay review	Pay review for women in STEM	Equal pay	HR manager, Line manager, Reward and Benefits Team, Finance	Low, free outside of labour cost Timeframe depends on the size of the organisation, usually a time-consuming process
5) Mandatory training on gender equality and stereotypes in STEM	Short online learning module	Creates an awareness of the gender stereotypes and assumptions uncovered	Learning and Development Team	High, €10-€30 per person. Timeframe: 30 minutes
6) Enhanced availability and visibility of flexible work arrangements and parental supports	SharePoint site with flexible work arrangements and parental supports clearly outlined with	Enhanced work-life balance for women in STEM	Reward and Benefits Team and Managers	Low, free outside of labour cost Estimated timeframe for creation 1-2 weeks

	application forms			
7) Informal mentorships and networks	Online buddy system	Peer to peer support Fireside chats	HR Business Partners	Low, free outside of labour cost Estimated timeframe for creation and implementation 3-6 months
8) Technical training opportunities	Onsite and online training opportunities	Women gain additional technical competence	Learning and Development Team	High, depends on STEM discipline and course Timeframe depends on the training course
9) Introduction of technical KPI's	Set technical targets	Encourage growth in technical competence	HR Business Partners and Line Managers	Low, free outside of labour cost Timeframe: agreed and reviewed twice a year

6.3 Personal Learning Statement

Upon the completion of this dissertation the researcher has taken away many learnings. These can be broken down into personal, educational and professional learnings. Firstly, throughout

the Master's in HR the researcher has improved their ability to multi-task, prioritise and maintain a healthy 'work-life-study balance'. The researcher understands the purpose of planning her personal, work and study life to prevent work overload and potential burn out. She also recognises personally when she may become stressed and realises when it is necessary and beneficial for her to take a break and say 'no' or 'later' to friends, family, colleagues and classmates. The researcher has a greater appreciation of 'time' although it was reduced, her hobbies, interests, amazing colleagues, family and friends each helped to enhance her morale at different points throughout the year. Personally, the researcher is more self-aware and has improved her time management skills.

Secondly, the researcher has taken away educational learnings. Throughout the last year the researcher has enhanced her knowledge of HR by keeping up with the CIPD, reading relevant journal articles and books. Although it took some time to select a research direction choosing gender equality within STEM gave her an opportunity to improve her knowledge of DEI which she had previously limited exposure to. She appreciates organisations DEI efforts and individuals working in roles where gender inequality exists. Further, the researcher has learnt to appreciate the complexities associated with completing qualitative research. She has also learnt that the research process is not linear and reflects on her ability to define a research problem, synthesise readings, analyse large amounts of data, present findings and draw conclusions which add to existing literature.

Lastly, the researcher has gained considerable professional experience and knowledge of gender equality and retention which she will take throughout the entirety of her career. The researcher understands DEI will be paramount to the future of HR as Irish legislation changes. As a result, she is more mindful of the importance of gender equality when recruiting future STEM cohorts and is constantly looking for ways to improve. She has also developed new professional connections through conducting the study which has allowed her to develop new understandings of work and as a result a much-improved appreciation for women's careers and individual experiences. Combined, this learning experience has been a valuable tool to the researcher in her personal, educational and professional life. HR is not simply a part of my life… it truly is my life 24/7.

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APPENDICES

Appendix 1: Interview Guide

Interview Questions

Title: "Why Women in Ireland Leave Science, Technology, Engineering and Math (STEM) for Careers in Other Disciplines and Factors Which Could Aid their Retention"

Turnover and Challenges:

1. What is your age in years?
2. How long did you work in a STEM role for?
3. What kind of STEM role did you work in?
4. What was your experience working in a STEM role?
5. What were the challenges you faced (if any)?
6. What were the positive aspects (if any)?
7. Why did you choose to leave STEM to pursue a career in another discipline?
8. Do you think a change in your professional interests impacted your decision to leave STEM?
9. Did you see promotional opportunities in your STEM role? If not, did this impact your decision to leave?
10. Did you feel you were paid fairly in comparison to your male counterparts? If not, did this impact your decision to leave?
11. Did you feel like your gender was a minority working in STEM? If yes, did this impact your decision to leave?
12. Do you think your gender influenced your experience in STEM? If yes, in what way?

Retention:

1. Do you think your organisation supported women in STEM? If yes, what supports were in place and did the supports encourage you to stay in your specialist role?
2. What initiatives would have facilitated you remaining in the area of STEM and the position you left?

3. Are there any benefits to your new role that weren't present in the STEM position you left?
4. Did you feel there were adequate female role models or mentors in your STEM role? If not, do you think this impacted your decision to leave? If yes, did you find this beneficial?
5. Would you consider applying for a STEM position again?
6. What supports or changes would encourage you to apply for a STEM position again?

Appendix 2: Information Sheet

Participant Information Sheet

Research Title:

"Why Women in Ireland Leave Science, Technology, Engineering and Math (STEM) for Careers in Other Disciplines and Factors Which Could Aid their Retention"

Dear Participant,

I am inviting you to take part in important research on why women in Ireland leave their STEM roles to pursue careers in other disciplines. The objective of the research is to gain an in depth understanding into why women leave STEM positions to pursue careers in other disciplines in Ireland. The research will also consider the challenges women face within STEM and the factors which would help aid their retention. If you consent to take part, you will participate in a semi-structured interview where you will be asked about your experience working in STEM, challenges you faced, your decision to leave, your new role and factors which would have assisted with your retention in STEM. This research is part of the requirement for the completion of my Master of Human Resource Management at the National College of Ireland.

The focus of the research is to examine why women choose to leave STEM and how businesses could increase their retention. This research may help inform the implementation

of strategies to promote the retention of women in STEM disciplines in Ireland and so your input is highly valuable.

To be eligible to participate in this study you must identify as a women, be aged 18 years or over, be working full-time in Ireland and have progressed or rotated into a position outside of STEM (e.g. scientist, IT professional, electrician, mechanic, engineer).

The interview is estimated to take approx. 45- 60 mins of your time. Interviews will be recorded through Microsoft Teams and all personal data will be kept confidential. Your consent form will be stored securely separately to your data. The interview recording will be labelled with a code number generated by you in the interview. This recording will be used to create a transcription of the interview stored under the generated code number. Once this transcription is complete the recording will be deleted. The transcription will therefore be anonymised and stored under its code number on a password-protected computer accessible only to the lead researcher.

A report of the study will be produced to meet course requirements and may be submitted for publication, but the data will be anonymised, and no individual participants will be identifiable. Your transcription data and consent form will be retained and managed in accordance with the NCI data retention policy and deleted after 5 years.

Participation in this research is voluntary. You do not have to disclose any sensitive information and you can choose not to answer a question if you wish. You can withdraw from the study at any point during the interview for any reason without penalty. You can also choose to withdraw up to a week after your interview by emailing the lead researcher via the contact details provided below and providing your code number, at which point your data will be deleted.

At the conclusion of this study, you will receive further information about the nature of this research. Should you have any concerns or need clarification at any point, you may ask the

lead researcher or reach out to them through the following email: x21237794@student.ncirl.ie.

Thank you.

Kerry Warfield

Lead Researcher

Appendix 3: Debriefing Form

Further Information

This study was conducted to gain an in depth understanding into why women leave STEM positions to pursue careers in other disciplines in Ireland, consider the challenges women face within STEM and the factors which would help aid their retention. This research may help inform the implementation of further strategies to promote the retention of women in STEM disciplines in Ireland and so your input is highly valuable.

Again, we wish to reassure you that the information you provided will be anonymized under a code number and will be treated with strict confidentiality. No individual will be identifiable. If you do not want wish to participate you can let the researcher know up to one week after your interview by providing your ID code via email, at which point your data will be deleted. You will be unable to withdraw after this period as the study analysis will have begun.

We would like to thank you for your participation. Should you have any further questions, you may reach out to the lead researcher Kerry Warfield at the following e- mail address: x21237794@student.ncirl.ie.

If you have been affected by any of the topics addressed in this study, please reach out for support to the Samaritans on freephone 116 123 or email jo@samaritans.ie; support is also available at AWARE Support Line freephone 1800 80 48 48 or support mail supportmail@aware.ie.

Thank you.

Kerry Warfield
Lead Researcher.

Appendix 4: Consent Form

Consent Form

Research Title:

"Why Women in Ireland Leave Science, Technology, Engineering and Maths (STEM) for Careers in Other Disciplines and Factors Which Could Aid their Retention"

Thank you for reading the information sheet about the interview study. If you are happy to participate then please complete and sign the form below. Please tick the boxes below to confirm that you agree with each statement.

I confirm that I have read and understood the information sheet and have had the opportunity to ask questions.	☐
I understand that my participation is voluntary and that I am free to withdraw at any time up to one-week post-interview without giving any reason and without there being any negative consequences. In addition, should I not wish to answer any question or questions, I am free to decline.	☐
I understand that my responses will be kept strictly confidential. I understand that my name will not be linked with the research materials and will not be identified or identifiable in the report or reports that result from the research.	☐
I agree for this interview to be recorded on MS Teams. I understand that the recording made of this interview will be used only for analysis and that text extracts from the interview, from which I would not be personally identified, may be used in any conference presentation, report or journal article developed as a result of the research. I understand that no other use will be made of the recording, and that no one outside the research team will be allowed access the original recording which will be deleted once transcription is complete.	☐

I agree to take part in this interview.

Name of participant:	Date:	Signature:
Kerry Warfield Lead Researcher	24th June 2024 Date	Kerry Warfield Signature

To generate ID code: Tell us the first two letters of your mother's maiden or surname; the month you were born in numbers and the last two letters of your name. For example, if your mother's maiden name was Murphy, your birth month was October and the last two letters of your name were IE your code would be MU10IE.

ID code:

Appendix 5: Transcript

Transcript

1 July 2024, 09:07am

Interviewer started transcription

So thanks very much for joining Anne. So the study is on why women in Ireland leave STEM track careers for dis other disciplines and factors which could aid their attention. So there's a couple of questions that won't last longer than 30/40 minutes. The first question is could you give us like a rough, a kind of idea of your age?

HA11OE
So I'm 54.

Interviewer
OK, perfect.
And how long did you work in a stem role? For what kind of stem role was it?

HA11OE
No, I so I (Ctrl) rted my career as a trainee linesman, climbing poles, putting up overhead network.
Again, industry at that time. But in the early 90s, it wasn't a position that legally ESP could on the basis of insurance have me in because of the SHAWW Act or it was the Factors Act at the time. The females were only legally allowed lift two stone and therefore ESB couldnt have me in.
SHAWW Act came in in 1996, which changed that it meant that the individual could make that call themselves, which meant that then ESP were free to to to have females across any function or any discipline. But so I then moved into clerical admin and I suppose that probably you wouldn't deem a stem, but from then from there I went back into IT.
So IT support local support roll out of the first iteration of of desktop computers from Dublin terminals and all that so that.
Probably was more stem rolled, you know was IT it was that support and installation of the hardware but also then support of the people.
To learn how to actually use the the equipment and from that then I managed a