Women in leadership:

Are levels of workplace psychological safety related to bias towards women's authority and the number of women in visible leadership roles, within Irish technology organisations.

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A dissertation submitted in partial fulfilment of a

Master of Business Administration

National College of Ireland

Submitted to the National College of Ireland, School of Business, August 2022

Abstract

Purpose

Barriers to women's representation in visible leadership is well documented, alongside women's higher levels of education and academic success. Bias towards women's authority is starting to be more comprehensively examined. Solutions to accelerate women's careers into visible leadership roles is less pervasive, presenting opportunities for more protracted studies to narrow down the clues to evidence corrective actions to take, to solve this inequity. One such area could be psychological safety, observational studies rose in popularity at the turn of the century, however from a neuroscientific perspective it is a relatively new frontier. This research explores the question, are levels of workplace psychological safety related to bias towards women's authority and the number of women holding visible leadership roles, within a context of Irish high-tech organisations, an area previously unstudied. The ambition is to contribute potential or partial findings, to answer the question, how can more women break through into visible leadership in meaningful, sustainable, and scalable ways?

Design and methodology

Taking a quantitative approach, using an anonymous online survey, issued through social media and own network. The case criteria being humans employed full-time in high-tech organisations in Ireland, over age of eighteen years. This method was deemed most appropriate based on other relevant studies of psychological safety and the gender authority gap. The findings were analysed to identify themes, significant correlations, and contradictions, then evaluated alongside the secondary data of existing literature comparatively, to determine recommendations for further research.

Findings

Meta-analysis over decades outlines the blocks to women's advancement, revealing a gap in the research for solutions; to identify practical initiatives that progressive organisations can put in place to drive gender balance in visible leadership. Research reveals compelling evidence showing the commercial benefits that diversity in leadership brings, from increased and sustainable profits to higher performing, profoundly engaged teams, rich innovation, reduced corporate scandal and lesser likelihood of high-risk behaviours in executive leadership teams and/or boards. The findings indicate that accelerating women into visible leadership is also an organisational choice. And psychological safety matters, to both women and men.

Value

There is a gap in existing studies for actionable solutions, particularly encompassing psychological safety. In an Irish high-tech context, minimal research studies were identified on women's leadership in tech. The gender authority gap is becoming more understood by leaders, but little action is taken by organisations to address it. Women's leadership is integral to contemporary, 21st century organisational success and yet so much of it is still not understood. The value of this study is in contributing to explorations into potential solutions for this crucial societal and moral conundrum.

Submission of Thesis and Dissertation

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Dedication

This dissertation is dedicated to the women who have gone before who have dug deep, with courage, resilience, and determination to cut a surer path for the rest of us, to the women continuing to carve out space for us all, lifting us up to stand shoulder to shoulder with them, to the women coming up that will finally break the glass ceiling.

To my phenomenal husband Declan who has done his own master's journey by osmosis, for being my biggest cheerleader and providing unwavering support, encouragement, and inspiration. If the world were filled with more men like you, there would be no need for this dissertation topic, we would already all be equal, lifting each other up, to be our best selves; like we do for each other – thank you Declan!

Acknowledgements

Thank you to Dr. Colette Darcy for meeting with me before signing up to do the MBA, giving encouragement and confidence to take the leap of faith that it could be done! Also, for your support and guidance in this the final leg of the course. As Dean and as a tremendous leader, the School of Business is in brilliant hands with you at the helm.

Thank you to Dr. Lynn Farrell for being a great thought partner and a superb supervisor, understanding how to guide the train of thoughts in the requisite path, through empowerment and encouragement to mentor this student on a self-discovery journey through this dissertation.

Thank you to the MBA class of 2020-2022 for your thought partnership, funny moments, and challenging debates; you made this one incredible (online) experience.

Thank you to my many work colleagues who contributed in varying ways over the past two years, notably my female colleagues who are in the arena with me, who have helped expand my thinking and in challenging me to grow as a person with psychological safety and fight every day to make the workplace more equitable for all women. Special thanks to Dr Andrea Johnson & Martina Campbell, who gave me considerable time, support and created endless space for me to explore many of my hypotheses and firm up my thinking. You both demonstrate exemplary leadership, forge psychological safe spaces with intention and create shared success in abundance.

Last but far from least, thank you to my family and friends, who have not seen much of me in the last two years, when they have it has been a lot of MBA talk, thank you for your patience and kindness. To my niece Martha and nephew Mylo, my grown-up schoolwork is now finished, thank you for asking nearly every week if I am still doing homework, you've both inspired me to strive for more and to keep going. I am now available to fully resume Aunty duties.

"Feminism has never been about getting a job for one woman. It's about making life more fair for women everywhere. It's not about a piece of the existing pie; there are too many of us for that. It's about baking a new pie." -Gloria Steinem.

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CWB	Counterproductive work behaviours
DEI	Diversity, equality, and inclusion
GAM	Gender authority measure
ICT	Information and communications technology
I-O	Industrial-organisational
IoT	Internet of Things
PS	Psychological safety
STEM	Science, Technology, Engineering and Maths

Chapter 1: Introduction

1.1 Background to the study: Women in leadership today

Journalists and experts regularly celebrate how women's intrinsic leadership qualities align for the modern era, remarking that women's time as leaders has arrived (Eagly, 2007). The data, however, evidences a different experience and lived reality for women in leadership.

In 1987, one CEO in the United States (US) S&P500 was a woman (Loden, 1987), by the turn of the millennium expected progress failed to deliver, when in 2000 only three female CEO's led large public companies in the US (Ibarra and Hansen, 2009). Another decade on, participation hit a 3% mix of female CEOs in US Fortune 500 companies (Kellerman, 2010). Catalyst (2022) recently reported women held thirty-two (6.4%) CEO roles of S&P 500 companies. Thirty-five years on from Loden's (1987) recording of one female CEO in S&P500, there is an average growth rate of less than one female CEO per year leading S&P500 companies in the US. Hinchliffe (2021) exalts the record-breaking number of women CEOs running Fortune 500 companies, being forty-one, however this is a paltry 8% gender mix. International representation fares worse; Ibarra and Hansen (2009) studied two thousand global top performing companies and recorded only twenty-nine (1.5%) female CEOs leading.

A 2021 Irish Government Report Balance for Better Business acknowledged that despite clear (but optional) targets for all Irish listed companies to include at least a single woman on their Senior Executive Leadership team by the end of 2020, the target was missed. At the end of the target period 38% of Irish listed companies failed to include any women within their senior leadership teams (Balance for Better Business Report, Government of Ireland, 2021).

Within the technology sector, in 2013 US women held just 26% roles across all levels: this being a decline from 35% in 1990 (Peck, 2015). Within the Irish technology sector, 18.9% of total roles being filled by women in 2017, Ireland being slightly above the European average of 16.1% (Keniry, 2019).

These statistics prevail despite progressive CEO's and boards acknowledging benefits of women in senior leadership to attract top talent, retain star performers, drive sustainable profit growth, and satisfy growing shareholder demands. Actions are taken by setting aspirational gender targets, diversity in recruitment pools, developing internal mentorship programmes, dedicated employee resource groups for peer-to-peer support, to build out pipelines of talent (Madera, Ng, Sundermann and Hebl, 2019; Perrault, 2014; Ibarra, Ely and Kolb, 2013). Yet women's progress into visible leadership roles and to break the glass ceiling languishes.

1.2 Statement of the problem: Glass ceiling, cliffs or more

"Tech doesn't just have glass ceilings; there's glass doors, walls and floors [...] and then tripwire, lots of tripwires." Jackie, f, 3D Environment Artist, US. (Cited in Hardey, 2020).

From early on in their careers, women experience the double bind of choosing to be liked or be respected, both options bringing costs to career advancement (Ammerman and Groysberg, 2021); compounded by pay inequities, lack of role models and mentors, with an inability to break into the high-paying roles with the most power to affect change. Cortland and Kinias (2019) argue that the psychological experiences of women in the workplace are known to compound gender inequities in leadership, from battling gender stereotypes to lack of role-models to plain sexism, bias, and micro-aggressions, synthesizing to negatively impact women's confidence, engagement, performance, and ultimately top leadership participation.

Women in technology report having to modify their behaviours to operate within the industry's macho confines and dominant male norms, to become one of the boys for fear of backlash from male colleagues or additional threat to their careers (Hardey, 2019). Experiences of women in the workplace are layered with multiple complexities, restraining women from achieving their full potential as readily as male counterparts, under a shadow of repercussions and threat (Cortland and Kinias, 2019).

Research has evidenced that the presence of threat, risk of embarrassment or a hostile workplace environment reduces cognitive and behavioural performance significantly, moderating engagement, problem solving ability and inhibits learning; known as psychological safety (PS), when it is lacking, it is damaging for individuals, team and organisational efficacy (Edmondson, 1999).

If a correlation is found between perceived levels of workplace PS and women's career advancement, can an argument be made that women's ability to learn, develop, thrive, and grow into leadership roles benefits notably from the presence of workplace PS?

Attitudes towards female authority present another obstacle in women's advancement into visible leadership roles, with both men and women indicating a preference for having a man as a boss, notably women expressing this more than men (Rudman and Kilianski, 2000). This power disparity may stem from traditional perceptions of women as leaders. A 2016 UK Gender Media Monitoring Project (Mavin, Elliott and Williams, 2016) noted that the dominant male gaze, in society and business, glamourised, fetishised and sexualised women leaders; diminishing respect for their authority and selection for visible senior leadership roles.

In pursuance of improving women's potential to advance as visible leaders, it is crucial to determine if attitudes to workplace authority gaps determine the number of women in leadership, or vice-versa?

1.3 Research Gap: Women's invisible leadership

Criado Perez (2020) suggests that men's history and lived experience is accepted as being representative for all humanity; that women's voice, authority and leadership is historically rendered invisible.

Until the late 1990's women's leadership had routinely been ignored, compared to men's leadership which has been researched extensively over the centuries; this history of women's leadership evidences a slow and minor ascent (Schultheiss, 2021). Of the studies published, there are numerous erroneous arguments proposing how women may feel, act, think and behave is radically different to men and a shortcoming of women (Annis and Nesbitt, 2017). Conventional bias towards masculine authority typically dismisses any evidence of substantive business benefits being driven from women's presence in top decision-making, and that arguments in favour of women's leadership participation are fruitless in affecting change anyway, as existing leadership is predominantly male (Fine, Sojo and Lawford-Smith, 2019; Eagly, 2016).

Industrial-organisational (I-O) psychologists have disclosed that diversity, equality, and inclusion (DEI) is a leading 21st century workplace issue, yet since the turn of the century little has been researched on the topic. Hideg and Krstic (2021, p. 2) "identified 186 relevant articles, which translates to 2.41% of all articles in the reviewed journals"; that of the I-O articles researched, the authors only identified 2.4% to be DEI related.

Noting the importance of DEI for today's workplaces, it is surprising how little has emerged around the implications of PS and gender balance, how women and men can thrive with PS differently, to unlock organisational performance (Lim, 2022). In the Irish technology context, research into DEI, PS, and inclusive leadership for women is noted as being sparse and under researched (Karayel, 2021).

This provides an explicit rationale for this research focus on evaluating the significance of PS in the workplace and correlations to perceived bias towards women's authority, or the number of women in visible leadership roles. This research may appeal to DEI researchers, high-tech company boards and senior executives, that wish to delve deeper into DEI, to tackle bias to women's authority in the workplace and explicitly increase opportunities for females to compete equitably for visible leadership roles.

1.4 Aims and Objectives of the study: More women in visible leadership

The aims of this research are to investigate if perceived levels of PS correlate with bias towards women's authority and participation of women in visible leadership roles. Additionally exploring condition of women employed in Irish technology organisations, as female participation is typically very low within this male dominated industry, only 18.9% mix (Keniry, 2019).

Specific research objectives, underpinned with structure through explicit and distinct questions and hypotheses, backed-up with defined analysis, allow for investigative clarity into this study and potentially seminal contribution to further the existing

research (Saunders, Lewis and Thornhill, 2019). Concentrating the broader research aims into more targeted objectives, the principal aims are summarised below, and will be further expanded on in chapter three:

1. To explore the employee perceptions of psychological safety (PS) in the workplace and determine to what extent perceptions of PS may correlate with bias to women's authority

2. To investigate the nature of any workplace authority gap impacting on women's career advancement into visible leadership roles

3. To examine if the proportion of female participation in visible leadership roles within the organisation influences employee perceptions of PS and authority gap

4. To analyse if perceived presence of PS and/or bias towards women's authority relates to women's career advancement into visible leadership roles

1.5 Research questions and hypotheses

The overarching research question of this study to is examine if perceived levels of workplace psychological safety are related to bias towards women's authority and the number of women in visible leadership roles, in the context of the Irish Technology sector. The author explored the principal research of this study to identify pertinent, significant areas worthy of further research and deeper examination, employing the following main research questions:

1. Is there a relationship between perceived psychological safety and women's career advancement into visible leadership roles?

2. Is there a relationship between perceived levels of psychological safety and bias towards women's authority?

3. Is there bias towards women's authority in high-tech Irish companies?

4. How is bias towards women's authority related to women's career advancement, in terms of actual number of women in leadership roles and perceived opportunities for women's advancement?

The below hypotheses will serve as a guide for exploring these relationships:

Hypothesis 1: There is a significant relationship between levels of workplace PS and the number of women in visible leadership roles such that higher levels of PS will be related to higher numbers of women in leadership roles.

Hypothesis 2: Psychological safety levels are significantly related to perceived opportunities for women's advancement in high-tech Irish companies, in that increased perception of PS in workplace will be related to increased opportunity for women's career advancement.

Hypothesis 3: Levels of workplace psychological safety are significantly related to bias towards women's authority, such that there is a correlation to levels of bias and perceived levels of PS, higher PS will be related to lesser bias towards women's authority.

Hypothesis 4: Bias towards women in authority has a significant correlation with the number of women in visible leadership roles, such that higher participation rates of women in visible leadership roles will be related to lesser perceived bias to women's authority.

Hypothesis 5: The presence of bias towards women in authority is significantly related to perceived opportunities for women's advancement, in that increased perceptions of bias towards women's authority will correlate to lesser opportunities for women's career advancement.

1.6 Overview of Chapters

This dissertation is structured into six primary chapters, further honed into subsections. Chapter one provides an overview on aspects of the current state of women's leadership, noting aims this research will address and outline for remaining chapters. Chapter two comprehensively reviews relevant academic literature on the themes of psychological safety, the authority gap, and women in leadership; this chapter will critically analyse these themes and examine arguments for possible solutions to propel rates of women in leadership. Chapter three outlines the chosen methodology and instruments deployed to the primary data collection for this research study, along with philosophy taken in consideration of the overall aims and objectives of the study. Results from the analysis of the primary data will be discussed and critically assessed in chapter four, taking into review secondary data examined for each hypothesis; to identify and support core topics related to the research questions. In chapter five notable and significant findings are examined; critical evaluation of these findings is undertaken in the context of prior research whilst noting the limitations, practical implications, and suggestions for future research. Concluding with a broad summary of findings and research gaps, to inform and potentially expedite future research; whilst providing salient points for organisations with ambition to close the authority gap and elevate gender balance in visible leadership roles, meaningfully.

2.0 Chapter 2: Literature Review

2.1 Introduction

This chapter reviews the current state for women in leadership, examining women's education and skills, followed by an assessment of the research surrounding barriers to women's leadership progress and reviewing work to identify solutions; moving onto perceptions of the authority gap and how a bias towards female authority may impact female career advancement. Next, an examination for potential of PS to unleash high performance in individuals and teams, even unlocking greater rates of female participation in leadership. Taking an initial global exploration through the existing literature and research, any Irish-specific contribution to the review will then be weaved into the discussion.

2.2 Women in leadership today

More women today, than men, graduate from higher level education, women are over 50% of the workforce and yet "women currently hold just 5.2% of CEO roles and constitute only 11% of top earners on the S&P500" (Cortland and Kinias, 2019, p. 2). Women become a far rarer sight at higher positions of influential power such as senior executive, c-suite, CEOs and board level and top renumeration ranks (Eagly and Miller, 2016). As women around the world continue to be underrepresented in decision making and leadership, men are advancing at faster rates in career progression than women, despite women being majority of the workforce (Folke and Rickne, 2020; Bonet, Cappelli and Hamori, 2018); these unequal gender percentages apply both horizontally across sectors and industries as well as vertically in terms of leadership presence (Fine et al, 2019; Sojo, Wood, R., Wood, S., and Wheeler, 2016).

"The fact is that so far as leadership is concerned women in nearly every realm are nearly nowhere — hardly any better off than they were a generation ago" (Kellerman, 2010).

2.2.1 Nearly invisible progress

If women's leadership participation has to date been inequitable, are things improving? Globally the story varies strikingly, with only 2% of female CEO's leading India companies compared with the European Union, where women hold 7.9% of CEO roles scaling up to Australia where 17.1% of CEO positions are women (Schultheiss, 2021). A Catalyst (2022) report on female CEOs leading S&P 500 companies reveals that just two more women made the list year on year, a shift to 6.4% 2022 participation, up from 6.0% in 2021. An Irish Central Statistics Office (CSO) Gender balance in business survey (2021) notes that female CEOs increased from 11.5% mix in 2019 up to 13.4% in 2021; female representation on Irish boards increased to 21.8% in 2021

compared to 19.6% in 2019. Following the current trajectory it will take a century more before gender balance in the C-suite is achieved (Rhode, 2019), a century too long for a cohort that makes up approximately fifty percent of most populations.

Any progress women have made in breaking the glass ceiling, has been eroded by the Covid pandemic (Schultheiss, 2021); with women now leaving the workforce in significantly higher rates than men, rolling back the limited progress made. Within technology, women are leaving the sector at double the rate of men, with only 5% of leadership positions being held by women; in the UK only 15% women work across the whole of STEM (Economist, 2019), Irish women hold 18.9% of total technology roles, compared to the European average of 16.1% (Keniry, 2019).

2.2.2 What the research reveals

Five decades of empirical research on gender trends and themes evidence there is a sharp decline in the volume of gender articles being published since the 1980's (Joshi, Neely, Emrich, Griffiths and George, 2015); that gender weariness and fatigue is setting in, across business schools and academics. A study of 5.5 million science articles, observed that women are both published and cited significantly less than men (Eagly and Miller, 2016).

Emerging meta-analytical studies advocate for an evolved perspective on gender stereotypical biases, that leaders exercise early interventions to prevent high potential women being derailed, creating reformed feedback processes, fostering talent through diverse pipelines and critically create a new paradigm for gender-inclusive leadership (Valerio, 2022). Communal behaviours, typically found in inclusive leadership and traditionally attributed to women, are described as demonstrating a care for others, having empathy, being humble, fair, respectful, building trust and confidence with followers, and creating human connections. These behaviours are proving to be of greater organisational value during times of high pressure and crises, such as the Covid pandemic, (Valerio, 2022); necessitating forward-thinking leaders, regardless of gender, to adopt and practice. The inclusive leadership traits identified in these pioneering studies align with the characteristics underpinning psychological safety, as first outlined by Edmondson (1999); that high performance in teams thrives when followers feel valued, respected, and have trust within the workplace team.

2.3 Are women smart enough (and does it matter anyway?)

As women entered the workforce in recent decades, educational achievement was heralded as being a key lever to achieve career advancement, after family planning; women tackled this barrier presented to them as an opportunity and entered the halls of learning in droves to acquire higher education qualifications, degrees and cultivated experience needed to enhance their career aspirations and ambitions (Valerio, 2022).

2.3.1 Education of women

According to OECD figures more women are graduating from higher level education with at least a bachelor's degree, than men (Cortland and Kinias, 2019). For over two decades women have earned one third of US MBA's (Ely and Rhode 2010; Allen, French and Poteet, 2016) and majority of doctoral degrees (Eagly, Nater, Miller, Kaufmann and Sczesny, 2020). Recently US Women are exceeding males, earning '57.3% of bachelor's, 59.9% of master's, and 51.4% of doctorate degrees' (Hideg and Shen, 2019, pg. 287). World Economic Forum (WEF, 2022a) reports that averages for students graduating in fields commonly characterised as male domains, such as STEM and ICT, are still reporting the highest gender gaps across the OECD. Worldwide women have been enrolling and graduating in increasing numbers from higher education degrees however this same report notes that there has been no improvement in closing the student participation gender gap in ICT, Engineering and Manufacturing between 2013 and 2019.

2.3.2 Education, the key difference?

Ibarra and Hansen (2010) examined and ranked the overall performance of 2,000 global CEOs, their research found that CEOs with an MBA ranked higher, to a statistically significant effect, than CEOs who had no MBA. Further examination evidence CEOs with MBAs delivery better performance and increased shareholder value (Hansen, Ibarra and Peyer, 2010). Having an MBA can not only increase shareholder value, improve your prospects for senior leadership but also accelerate it. Unless you are a woman.

Highly educated women, typically holding more MBA's than their male counterparts, enter a gender balanced pipeline at the start of their careers. A US Women in the Workplace study (LeanIn.Org, 2019) notes entry-level role parity between women and men, across 590 companies employing more than 22 million people. However, almost immediately career advancement stalls for women post entry level, with only 73 women promoted or hired to manager level for every 100 men (LeanIn.Org, 2019), this filibuster named the 'broken rung'. Women never recover from this early career setback, this study further identifying that career advance continues to decline, culminating in women holding 22% of C-Suite positions versus 78% for men. A McKinsey (2021) global study corroborates that the pipeline of women into leadership stalls at that first step up to manager, women are left behind from the start. Women trail from the outset because of persistent barriers faced in progressing to their first manager role (Schultheiss, 2021).

2.4 Women in leadership: Many barriers to conquer

What drives the broken rung or impedes women's career advancement compared to mens? Does society burden women with a disproportionate cost for breaking gender norms? Brescoll, Okimoto and Vial (2018) argue the case that the backlash on women who stake a claim on senior leadership can be vitriolic, with arbitrary expectations on women to be both exceptional and exceed in talent compared to that of male counterparts, to overcome judgements of those in power - typically the same decision-makers seeking to preserve gender hierarchies and the status-quo.

Exploring the literature around barriers women face in ascending into visible leadership roles reveals obstacles ranging from plain old sexism, misogyny, resistance to change in traditional gender roles, bias to women's authority and ostensibly, the prejudice of "think manager – think male" (Schein, 1973).

2.4.1 Plain old sexism

As women seek to transform the status quo are men perceiving a threat to their status, a privilege they mistake for superior capability (Chamorro-Premuzic, 2013)? The Economist (2010) warns men sitting on European corporate boards that their position is under threat from female quotas, further speculating women do not bring as extensive a range of experience as their male counterparts, that many high-performing businesses succeed in the absence of any meaningful representation of women, the writer(s) cite unspecified academic research that women on boards add no determinable commercial value, they may even dimmish performance. Research cited by Hideg and Shen (2019) disputes this, noting greater representation of women in top leadership roles has been associated with better financial performance, across a decade long study; the authors further note sexism impacts women's psychological well-being and diminishes their human capital advantages earned through education and inherent traits.

A recent 2022 report issued by the UK Chartered Management Institute found that two-thirds of male managers believe gender balance is unnecessary to successfully navigate future business challenges, many even actively resisting it (Thomas and Smith, 2022). The findings raising concern about male backlash to women's ambition to earn greater equity in decision making and leadership, that entrenched sexist views endure across society, increasingly threatening to regress women's progress. Role benevolent sexism across multiple domains of work and family, undermines women's ability to advance in leadership positions (Hideg and Shen, 2019).

2.4.2 Stereotypes and traditional gender roles

Society handicaps women with an excessive and punitive burden for breaking with gender leadership norms, not only have women to over perform in talent but also overcome barriers placed by those seeking to preserve traditional gender hierarchies (Brescoll, Okimoto and Vial, 2018). A recent study into stereotypes, the work-family interface, sexual harassment, and bias to traditional gender roles as barriers to women's

career advancement, has observed the presence of subtle workplace prejudice against women perpetuated by men, but not men alone, also some women (Hideg and Krstic, 2021).

Communion traits (empathy, compassion, kindness, human connection with others, emotional intelligence) and agency traits (bias to action, assertiveness, independence, being ambitious and aggression) are characteristic generalisations and gender stereotypes (Valerio, 2022; Koenig, Eagly, Mitchell, & Ristikari, 2011; Schein 1973). Studies found that men were traditionally linked with agency and women linked with communion, agency being associated with traditional and powerful leadership, thereby a notable stereotype disadvantage for women's advancement into leadership (Koenig et al, 2011), as communion traits are deemed soft skills. However, the World Economic Forum (2022b) lists key skills that employers are looking for the agile 21st century transformational workplaces are transversal skills, being creativity, problem solving, critical thinking, emotional intelligence, and teamwork. Communion traits align more closely to transversal skills than agency traits, a potential advantage for women's inherent leadership skills to triumph.

US meta-analysis ranging across seven decades notes an encouraging, albeit slim, trend change in society's perceptions of stereotypes, that women's advantage in communion as a competitive advantage has grown (Eagly et al, 2020); with a small shift in participant perceptions that these stereotype and traditional gender traits are framed mainly by society (58%) rather than biology (42%). However, these trends are yet to translate into meaningful participation of women in visible leadership roles, particularly in traditionally male-dominated occupations, such as high-tech. Increased numbers of educated women are entering into these male-dominated industries only to find their roles are then resegregated into female-dominated subfields and specialisations, typically with less power to influence, engage in decision-making at a senior, executive leadership level and reduced potential for top-level executive renumeration (Levanon and Grusky, 2016).

2.4.3 Bias to women's authority

Gender equality issues and the lack of female participation in senior leadership has been profoundly spotlighted in public discourse, media debate and scholarly discussion within the last ten years, yet despite this scrutiny and awareness, inequality and bias towards women persists today, particularly in the workplace (Hideg and Krstic, 2021). Is there a negative bias towards female authority, limiting meaningful numbers of women earning visible leadership roles? Is that bias more deeply rooted in perceptions of male leaders? In her generative study on the Authority Gap, Sieghart (2021) reflects that bias towards female authority has been identified as young as five years old, even when children understand that girls are smarter at that age, when asked to select classmates to create a winning team, both girls and boys selected male classmates as a preference. A structure of gender bias embedded into human development from very early on, creating a lifetime of barriers for women's advancement and authority, that is often invisible, if not disregarded, by privileged males.

Chamorro-Premuzic (2013) argues that society misinterprets confidence as competence, a trait more typical in men, compounded by managers who may unconsciously hire for or promote characteristics that they regard highly and as male representation dominates current leadership, women's tendency to be less over-confident about their capabilities, can result in them being overlooked, a limiting bias to women's leadership authority. Reuben, Rey-Biel, Sapienzac and Zingales (2012) found that followers were far more likely to assign an over-confident man with lower ability to a leadership role than the alternative of a higher ability woman who presented as less confident. Talent cedes to hubris.

As women advance in their careers, earning positions of authority and greater leadership visibility, so raises the level of threat perceived by colleagues, leading to challenges to women's authority and their achievements (Allen et al, 2016); with evidence that managers, typically male, designating female employees with overly negative performance evaluations compared to men, undermining women's career aspirations. The authority gap is a bias, both conscious and unconscious, towards women's value not being perceived as equal, it is the manner that women are frequently not taken seriously in public and professional settings and are frequently undermined, questioned, mocked, and talked over (Sieghart, 2021); and the authority gap is alive, well and thriving.

"For women in professional jobs know that they can't afford to fail; unlike men, they are unlikely to be given a second chance." - (cited in Sieghart, 2021).

2.4.4 Women in tech: additional bias and barriers?

The problem of women's low engagement in technology has traditionally been seen as women's problem to resolve; global studies aggregated male technology leaders' sentiment into themes around women not being suitably educated, not having a maths or technical aptitude compared to male counterparts, or apathy to there being a problem at all, compounded by a gendered culture of bias to women's authority, capability and appetite to enter the tech industry (Hardey, 2020). In a study of fifteen-year-olds across seventy-two countries, girls match boys in mathematics, are significantly ahead in reading and only marginally behind in science (OECD, 2018); girls clearly have an equal aptitude for STEM. Evidence shows girls are not taking up STEM subjects in tertiary education due to fear of gender discrimination and they are not wrong, one study of science graduates found 76% of females experienced sexism and blatant authority gap (Barthelemy, McCormick and Henderson, 2016).

For those that graduate and choose a career in the male dominant technology and STEM industry, the authority gap continues; a 2014 study of STEM hiring managers found that men were doubly as likely to be successful in receiving a job offer, where gender was the only difference between candidates (Reuben, Sapienza and Zingales, 2014). Furthermore, high rates of gender discrimination and authority gap prevail, with women and men's work typically being segregated into digital labour (less authority) versus technical expertise (higher visibility) (Hardey, 2019; Duffy 2016). Barriers for women in high-tech organisations are clearly intensified.

2.5 Psychological safety: a solution?

Edmondson's (1999) seminal paper on PS examines the relationship between the degree of performance, in team or individual, being disadvantaged where embarrassment, humiliation or threat exist, real or perceived. Could workplace cultures with deeper levels of psychological safety create a more fertile ground for increasing women's leadership participation, building a robust pipeline, rather than a leaky one or worse, no meaningful pipeline at all as argued by Kellerman (2010).

2.5.1 What is it?

"Psychological safety – a shared belief held by members of a team that the team is safe for interpersonal risk taking." – (cited in Edmondson, 1999).

The presence of PS can create a safe space which stimulates increased contribution to ideas, more innovation, greater engagement, knowledge share, collaboration with shared purpose and humans to speak more freely with proposals and ideas for organisational improvement (Edmondson and Lei, 2014). A lack of PS or being psychologically threatened is a detrimental experience, causing thinking and emotions to be disrupted and derailed, relationships to suffer, productivity to suffer, and health to suffer; often occurring incrementally over time and at a subconscious level (Radecki, Hull, McCusker and Ancona, 2021; Frazier, Fainshmidt, Klinger, Pezeshkan and Vracheva, 2017).

PS was pioneered back in the 1960's but further research languished until renewed interest started again in the late 1990's and the topic has flourished since (Edmondson and Lei, 2014); which is timely noting the rise of teamwork, transformational leadership and the enhanced importance of innovation and agile learning within 21st century organisations. Earlier PS studies were typically observational, new frontiers into neuroscience research can evidence that affronts to our PS are as immediately impactful as a physical assault and often have longer lasting repercussions (Radecki et al, 2021). If strikes to workplace PS affect performance as would a physical attack, it is noteworthy that little research has delved into the moderating role of gender on key work stressors, such as counterproductive work behaviours (CWB); despite evidence that men engage in CWB with peers more readily than females thereby diminishing PS as CWB playing a role in PS (Kundi and Badar, 2021).

To unlock full potential in individuals and teams, Edmondson (1999) found that those teams which held a shared belief of PS, had higher performance levels, had greater rates of learning and development, improved skills, confidence, and resilience through respectful feedback, experimenting, asking for help, surfacing up errors for shared problem solving. Conversely an absence of PS or a culture of threat lead to team members being reluctant to admit mistakes or ask for help, cognitive and behavioural capacity was reduced, with ability to solve or tackle problems inhibited. If the presence of PS reduces threat in the workplace and opens cognitive engagement, can it also play a role in unlocking women's potential for greater advancement into visible leadership roles?

There are also practical implications for transformational, leading-edge organisations to better regulate for workplace PS, to enhance engagement amongst teams, increasing innovation, agile and shared learning, to drive high performance. Workhuman partnered with IBM Smarter Workforce Institute (IBM SWI) to analyse Workhuman's plus fifty million workplace datapoints from plus five million global employees, captured over 20 years, to evidence that businesses who fuse humanness, innovation, and interpersonal safety and respect into their culture with the intention to empower their teams, can outperform their peers – in sales by double and triple on assets (Mosley and Irvine, 2021).

If women demonstrate deeper instincts and traits in emotional intelligence (Kundi and Badar, 2021), which fuels PS, can women's leadership advancement benefit from increased organisational focus on PS, both as mentees and mentors? Conversely, women's leadership traits in PS, which unlocks high performance teams, may be an untapped competitive advantage for high-tech organisations.

2.5.2 Why it might matter more to women?

There is an indisputable problem with women's participation rates in leadership without an obvious solution, despite range of ideas, research, studies, solutions proposed which fall short or are unachievable (Kellerman, 2010), however the solution may be a mindset transformation in both women and men to take shared accountability and ambition to create a paradigm shift (Annis and Nesbitt, 2017). Could the presence of PS foster a mindset shift, through qualities of greater shared learning, cognitive openness, and behavioural flexibility (Edmondson, 1999), enhancing shared team intelligence and performance as identified in the Google Aristotle project (Duhigg, 2016).

Google's Aristotle project, the largest global study on tenets of high performance in teams, studied hundreds of teams to uncover that the highest performing teams could have varying levels of individual experience, skill, intelligence, and leadership but inclusivity and PS must exist in the team, that each team member had space to participate with equal value, then the team performance soared (Duhigg, 2016); in contrast to groups where one person or small cohort dominated, then the cumulative intelligence declined. However other studies note there has been minimal scientific knowledge on the significance of PS, as previous studies were based on observational studies (Radecki et al, 2021), with considerable questions outstanding on the extensive workplace impacts derived from PS despite research flourishing on the topic in recent years (Frazier et al, 2017).

In examining leadership aspirations, Sanchez and Lehnert (2019) found that the more work experience competent women had, the less likely they were to strive for career advancement into more senior leadership roles, this contrasted with women at earlier stages in their career and men at all stages of their career, who had much higher levels of ambition to advance into leadership. Why are experienced, seasoned, competent women eschewing from further career advancement?

Fine et al (2019) propose that whilst there is compelling evidence that workplace well-being and governance benefits from deploying strategies for greater gender diversity, there can unintended consequences as resentments arise that progress for women is not based on merit, that the traditionally privileged male group perceive themselves to be threatened, creating psychologically unsafe resentment towards female workers (Dover, Kaiser and Major, 2019).

Research shows women's aspirations are distorted by levels of bias towards women's authority, sexism, microaggressions stemming from gender role stereotypes and crucially, impacting how women themselves viewed their competence, confidence declining over time (Schultheiss, 2021; Sanchez and Lehnert, 2019). Studies into engagement and performance determined that making conspicuous stereotype threats result in lowered academic performances (Cortland and Kinias, 2019), demonstrating that women's leadership aspirations diminish where these stereotype threats prevail.

Women start out with career ambitions, but they decline overtime, in parallel with perceived barriers and dwindling levels of confidence, an increasing perception of being psychologically threatened?

"Apparently, since I became a female, I have become stupid. The more you're treated as if you don't know what you're talking about, the more you begin to question whether or not you do in fact know what you're talking about. I now understand a woman's tendency to doubt herself." – PS experiences of a trans-woman compared to when she was a cis-man (cited in Sieghart, 2021).

2.6 Literature gap

As critiqued meta-analytic studies across five decades reveals a disproportionate amount of research on the difficulties and obstacles women face in the workplace; this, coupled with the decline in articles on gender, may indicate that research into the drawbacks of women's participation in leadership has reached a saturation point (Joshi et al, 2015). This presents a gap in the literature for effective strategies that CEOs, boards and senior leadership can use to expedite the advancement of women in leadership roles without placing all the responsibility for finding solutions solely on women themselves.

2.6.1 21st century leadership

Contrary to accepted practices utilised by organisations today, achieving great leadership or stopping bad leadership is as understood now as it was generations ago (Kellerman, 2016; Chamorro-Premuzic, 2013), with the status quo holding fast to explanations that higher levels of power and status or increasing market share even if short-lived, is optimum leadership. At the turn of the century organisations were primed to prepare for highly competitive marketplaces, in a world increasingly accessible to global entrants, driven by rapidly evolving technology, that

transformational leadership would be essential to survive, human and social capital investment necessary to shore up a competitive advantage; to attract top talent and innovate ahead of competitors (Hitt, Takacs-Haynes and Serpa, 2010). In their report on 21st century leadership, McKinsey (2018) spotlights the need for agile and transformational leadership capabilities, that the traditional model that businesses historically operated, is gone; transformational leadership demonstrating key characteristics of PS and communion traits; most associated with women.

2.6.2 Who is at the helm of the ship?

To attract talented women, visible gender equity at executive and board level matters, as an influencing factor for women researching future employers (Madera et al, 2019). Women's rise to senior leadership ceases or slows down dramatically once a tipping point has been achieved, indicating optics not equality may be a driving force. Bonet, Cappelli and Hamori (2020) note women progress through ranks with intentional support however the pace of female progress slackens once there are one to two women at a visible senior level, indicating women's participation in senior leadership is an organisational choice.

A Deloitte (2021) global study found that "companies with women CEOs have, on average, significantly more gender-balanced boards than those led by men: 33.5% women vs. 19.4%. The finding is similar for companies with female chairs". If women's career progression into visible leadership roles is substantially accelerated under female CEO's and Chairpersons, are female senior leaders creating a different culture or a more equitable environment for high performance and opportunity for all?

Noting the collective inadequate volume of women CEOs and Chairs (Coleman, 2020), research awaits the critical tipping point of substantial female participation to be able to meaningfully critically evaluate if females in charge do in fact build out pipelines of female talent to advance other women's careers into visible leadership roles. Presenting a gap in the research into women's leadership.

2.6.3 Early career interventions

Much has been discussed about the 'broken rung', being women unable to break into their first managerial role (LeanIn.Org, 2019; McKinsey, 2021; Valerio, 2022), presenting an unrecoverable career set back. Investing in women's leadership potential earlier, through deliberate mentoring and coaching supported by organisational experiential learning, career mapping and calculated sponsorship by a senior leader with both authority and decision-making influence, can intersect outcomes for women's career advancement (Valerio, 2022; Schultheiss, 2021; Coleman, 2020). Little has been explored about women in STEM and sectors with high male province within an Irish context (Coleman, 2020), further explorations are warranted particularly as Ireland continues to strengthen its reputation for being a high-tech human capital resource.

2.6.4 PS as a gender shared solution

Gipson, Pfaff, Mendelsohn, Catenacci and Burke (2017) note that whilst leadership as a research topic is flourishing, over 165,000 articles, only 5% relate to leadership and gender related issues, observing that most workplace research into gender equality has focussed on stereotypes, prejudices and discriminations towards women leaders - further studies are needed to unearth solutions. Traditional research focusses on leadership as a masculine pursuit, being a more acceptable role in society for men than women (Brescoll et al ,2018; Cortland and Kinias, 2019). In fifty years of gender in management research, little has been directed to psychological well-being (Joshi et al, 2015), despite workplace conflict being alarmingly more common than previously recognised (Tremmel, Sonnentag and Casper, 2018). In studies 84% of employee's experienced conflict with co-workers, 50% experiencing it weekly (Kundi and Badar, 2021), impacting on workplace relationships, team effectiveness and potentially curtailing greater business outcomes; with men typically engaging in conflict with peers more readily than females.

If both team and individual high performance thrives with meaningful presence of PS (Edmondson, 1999; Radecki et al, 2021); considering the associative relationship between PS being present in organisational culture and leadership with women's career progression through to breakthrough senior leadership roles, minimal research was uncovered that is directed at women and PS, none identified which focused on high-tech organisations, presenting compelling further research opportunities.

3.0 Chapter 3: Research methodology

3.1 Introduction

In this chapter, the research methodology framework provides the reasoning behind the methodologies employed in the context of the research project, the layers within the chosen research model and evaluation of the model, instruments, data collection and sampling, giving thoughtful consideration in respect to the ethics, validity, reliability, and limitations of the research.

3.2 Research model

A research approach must be used to accomplish a dissertation's stated goals (Saunders et al, 2019). The validity and dependability of a researcher's findings can be confirmed by selecting the right approach (Crotty, 1998). Whilst also ensuring that reflexivity is embedded in the research model and approach, meaning the analysis of one's own opinions, behaviours, and beliefs during the study process to see how they might have affected the findings (Crotty, 1998; Finlay, 1998).

The research onion model is used in this study, consisting of six layers – philosophy, approach, methodological choice, strategy, time horizon, techniques, and procedures; in following the layers in sequence, the research has greater structure ingrained for enriched validity and reliability (Saunders et al, 2019).

3.2.1 Research philosophy

Research philosophy, the outermost layer of the research onion, refers to sets of presumptions and beliefs concerned with the knowledge growth, the body of ideas that address the nature of the chosen field of research (Saunders et al, 2019; Bryman, 2012). It is valuable to understand the chosen study philosophy, as it predicates consistency in the approach, the strategy, the methods, and choices taken with the research.

The aim of the research is to attempt to identify correlations between perceptions of workplace psychological safety and bias towards women's authority gap, understood numbers of women in visible leadership roles, with perceptions of women's career advancement opportunities, thereby inherent with a myriad of assumptions, conscious and unconscious. These assumptions unavoidably influence the interpretation of the research and evaluation of the findings (Crotty, 1998); however, a rational research philosophy selected will safeguard a more coherent research project.

Having critically assessed the five major research philosophies, being positivism, critical realism, interpretivism, pragmatism, and post modernism; it was found that the theoretical framework of positivism was the most compatible. The goal of positivism is to describe a quantifiable social reality, and positivistic investigations generally produce accurate, objective, and reliable quantitative data (Saunders et al, 2019; Tuli, 2010). Positivism takes a scientific and empirical approach to social issues and

phenomena, being driven by natural science principles which portend unambiguous facts uninfluenced by individual bias, it does a good job of illuminating the causal connections between several quantitative variables (Tuli, 2010).

A shortcoming of positivism is that it takes the lived human experience context out of the equation. This research and over-arching question has a very human element at its core, being women's equality in senior leadership and impacting key decision-making within high-tech organisations, in Ireland. Taking an interpretivist philosophy would allow for deeper investigation into a smaller cohort typically through qualitative method, capturing the subjective and personal perspective of participants and the nuances of their lived experiences (Saunders et al, 2019); however, the research ambition is to understand the data at an aggregate level to remove any individual bias or subjectivity. Employing a positivist philosophy maintains a higher degree of independence to investigating the variables and any correlations (Tuli, 2010).

3.2.2 Research approach

Taking a deductive research approach compliments the positivist philosophy and aligns with a quantitative method (Branka and Grant, 2014); it also enables the researcher to evaluate the over-arching question and hypotheses against two or more variables being tested. Taking a top-down approach, a deductive method allows a theory to be verified or falsified, through a sequence of steps, flowing from theory to data to results, at an aggregate level.

The deductive approach typically progresses through six consecutive steps (Blaikie, 2010); 1) a hypothesis which forms a theory, followed by 2) a review of the existing literature to inform conditions under which a testable proposition may be deduced, 3) if the argument formed advances existing understanding then research approach continues onto to 4) test the proposition through suitable data collection and analysis, then 5) if results are false, not consistent with the hypothesis, the research is rejected or modified; however if 6) the results are true, the theory is corroborated.

Examining the relevant literature for combinations of the variables of women's leadership, psychological safety, bias to women's authority, visible leadership and women's career advancement opportunities are sparse, taking a deductive approach will allow for multiple variables to be examined for correlations and corroborate, or not; noting the research question and hypotheses are conceptual at this stage. An inductive approach was dismissed due to the limitations of it not adopting an evolving theory and hypothesis as a framework (Branka and Grant, 2014); also, it takes a narrower, bottom-up approach exploring patterns from observations and interviews.

3.2.3 Research design and strategy

This research design is a strategic plan to demonstrate the researcher has carefully considered all the essential components, validated reasons for research design choices, based on the core research question and objectives, which is in keeping with research philosophy to deliver a reliable and effective research study (Saunders et al, 2019).

Determining a methodological choice, as part of the research design, presents the option to select either a quantitative or a qualitative method, known as a mono-method strategy; or to take a mixed-method strategy, combining elements of both quantitative and qualitative methods. The literature examined in the previous chapter, identified researchers employed quantitative, qualitative, and mixed methods designs and strategies, to cultivate their theories and hypothesis. A quantitative methodology is selected as it aligns suitably with positivist philosophy and a deductive research approach. Taking a quantitative approach allows the researcher to make use of the survey research design, which is an efficient method of eliciting relevant data from a larger sample size, to support more comprehensive breadth of base data to analysis and inform research question(s) (Tuli, 2010).

As previously declared, the research ambition is to understand the data at an aggregate level to minimise risk of individual bias or subjectivity. Taking a quantitative approach, which is typically grounded in numerical data sourced via a survey, evaluated through a data analysis procedure such as statistics and graphs, will deliver on this ambition.

3.2.4 Research time horizon

In determining research design, consideration needs to be given to the time constraints, is the research reflecting a point in time, a snapshot or is it evaluating data over a longer period? A snapshot time horizon is referred to as a cross-sectional study, typically using a survey; whereas the longer time horizon is referred to as longitudinal study and is most often used to study change as it evolves over a period (Lund, 2012).

For this study, a cross-sectional time horizon has been chosen since it works well for time-constrained projects and survey research. According to some reports, this method helps the researcher to efficiently use their time while still obtaining accurate and meaningful data, in a short amount of time (Robson, 2002).

3.2.5 Research techniques and procedures

Data collection and data analysis is at the core of the research onion model, this maps out the research techniques and procedures employed, aligned with the researchers chosen model and methods. In keeping with the positivist philosophy, taking a deductive approach, and employing a quantitative research method, the researcher will collect data via a self-completed online questionnaire for primary data source, supplementing research with secondary data sourced from existing literature and relevant studies (Saunders et al, 2019). These findings will inform if this research project and over-arching question reveals conducive results which support the existing research in this area, potential to recommend further study; or not, which will facilitate revisiting hypothesis, to pivot for further learnings. A questionnaire is also advantageous for increased probability of reaching higher numbers of suitable participants in a short period.

3.3 Research method

Deploying a thematic analysis grid to critically assess the literature, also provided a framework to identify commonly used research methods in the areas of this student's study. Quantitative methods using a deductive approach, collecting data via survey, to examine relationships between variables and develop theories, appear most commonly. This of course is not without its constraints, if an anonymous survey with open questions is utilised, additional complexity is layered into using the quantitative approach, however a wider of survey respondents could reduce risk of outlier anomalies (Lund, 2012).

Qualitative method of research is associated with interpretative philosophy, requiring the researcher to decipher subjective feelings and emotions (Tuli, 2010), typically requiring the researcher to engage one:one with participants. Taking a mixed methods approach to ask multiple questions across a variety of groups, Bowles, Thomason, and Bear (2019) identified limitations in their qualitative research, driven by the inherent bias embedded into the data sourced from interviews and through narrative accounts.

To assess team decision making Zhu, Wolfson, Dalal and Mathieu (2021) utilised both regular surveys and a simulation game across 320 participants streamed into random groups of 85 teams, competing over a 10-week period. To assess moderating roles of EI and gender, Kundi and Badar (2021) issued survey to 300 respondents across 15 organisations through their personal networks, with a 70.3% response rate, noting women in male dominated environments may prefer an anonymous survey. In her study on roles of PS, emotional intelligence and an organisation's support during Covid-19, Lee (2021) used a combined approach, issuing a survey to 187 participants however also utilised open ended questions, as Lee sought to get deeply into participants emotional responses.

Zikmund, Babin, Carr and Griffin (2009) argue that it is largely redundant disputing that qualitative is superior to quantitative and vice versa, as both can aptly succeed in delivering excellence to research objectives as much as they both have limitations too.

Reflecting that both approaches could demonstrate findings for student's hypothesis balanced with the student's limited resources, intention to use students own broad global network to target 100 respondents and the gender aspect of research, a quantitative approach through an anonymous survey is proposed. Using a survey allows questions such as what, who, where, how much, how frequently and how many to frame hypothesis in a controlled way, it will also enable the researcher to collect standardised data from a set of respondents, deciphering a combination of descriptive and inferential statistical trends, using sampling to generate results that are statistically representative of a larger cohort (Saunders et al, 2019).

Taking a mixed methods strategy has been disqualified, due primarily to time constraints however this presents an opportunity for further research to be undertaken, depending on the outcome of the results and findings from the quantitative strategy.

3.3.1 Instrument selection

There are several factors to consider, does the instrument adequately support investigation into the construct of the research, the question and hypothesis whilst clearly defining variables to measure and analyse (McClure, 2020); appreciating which variables are independent versus dependent can help determine the most appropriate instrument for use.

This study examines correlations between several constructs, being perceptions of psychological safety, bias towards women's authority, the understood number of women in visible leadership roles within the organisation and perceived potential for career advancement. There are widely used instruments and approaches for the parts individually, which apply the use of a survey / questionnaire; however, no instrument has been identified which incorporates all approaches into one. Therefore, to ensure effective sourcing of relevant data, the researcher appropriated multiple approaches as part of the instruments selected, further discussed below.

3.3.2 Questionnaire structure and format

3.3.2.1 Psychological safety measure

Edmondson's (1999) seminal PS study which empirically assesses the extent to which humans in the workplace perceive their environment to be safe for risk taking, is the overwhelmingly predominant scale used to measure PS (Frazier et al, 2017). As Edmondson's PS scale is widely recognised as an established questionnaire for this topic and extensively published, it has been adapted for use in this study. In Edmondson's (1999) research, a mixed-methods approach deploying both qualitative and quantitative strategies however for this study, the focus is on the five-section survey used. Edmondson's (1999) PS survey uses a mix of positively and negatively positioned words to temper for automatic response bias; examples of the PS survey questions are "Members of this organization are able to bring up problems and tough issues" and "No one in this organization would deliberately act in a way that undermines my efforts", these questions are rated on a seven-point scale ranging from 1 = strongly disagree to 7 = Strongly agree.

3.3.2.2 The Gender and Authority Measure

To discern if there are biases present in the workplace towards women's authority, the Gender and Authority Measure (GAM) has been adapted from Rudman and Kilianski's (2000) research, which examined the implicit and explicit gender attitudes to authority beliefs. Noting that bias towards women's authority is both conscious and unconscious, the research combined tests for explicit measures of gender beliefs, in which they used conventional rating scales (Rudman and Kilianski, 2000); as well as Implicit Association Test (IAT), to measure for implicit gender beliefs. The authors highlight the benefits of employing these techniques as not relying on respondents' competence, skill, or desire to report their attitudes, thereby more likely to disclose subconscious attitudes toward female authority (and implicit gender ideas as potential

determinants). Rudman and Kilianski's (2000) intentionally created a survey with dual response methods, one to measure for attitudes, the second for beliefs; examples of the survey questions are "If I were in serious legal trouble, I would prefer a male to a female lawyer" and "When it comes to politics, I would rather vote for women than for men", these questions are rated on a seven-point scale ranging from 1 = strongly disagree to 7 = Strongly agree.

3.3.2.3 Career advancement measure

For career advancement, the survey asks participants to note the number of promotions they have earned since starting full-time employment. A promotion was defined as more than one of the following: being eligible for bonuses, incentives, or employee equity / share plans; large increases in purview of role responsibilities and duties; significant increments in annual compensation; changes in level within the employing organisation (Whitely, Dougherty and Dreher, 1991). Measuring the number of promotions in a participant's career allowed for researcher to ascertain a benchmark for career advancement.

3.3.3 Sampling technique

In distributing the survey as an online option, the convenience sampling method was selected. A convenience sample collects data from relevant participants, it is non-probability sampling in which it is unclear or indeterminable which cases will take part in the study (Saunders et al, 2019). Researchers often choose convenience sampling as it is efficient to execute, inexpensive, straight-forward to administer and critically, it does not require specific restrictions to be applied to exclude or include participants, as the survey is open to the population in receipt of the link. The survey was created in Google Forms, a link to the anonymous online survey was issued across social media and email, also being shared to individuals in technology companies by contacts of the researcher; the intention was for it to be forwarded by individuals within researchers' network and thereby in an uncontrolled manner.

3.3.4 Sample size

Critical in determining a suitable sample size is to consider the degree of variability in the attributes being assessed, the level of accuracy (often called sampling error, being a +/-5% tolerance), the level of confidence or risk compared to the mean (in a normal distribution, two standard deviations capture 95% of the sample values eg mean) (Israel, 1992). The sample size being defined as a subgroup of a larger population (Saunders et al, 2019). Based on previous research a target sample size of 100 will be sought with a minimum of 84 preferred as G*Power (Faul, Erdfelder, Buchner and Lang, 2009) suggests a sample size of 84 is needed to be able to detect a medium

Pearson's correlation coefficient of r = .30 with 80% power (alpha=.05, two-tailed) and a 50/50 gender split.

The survey was open for three weeks through June 2022, receiving 194 completed responses. Filtering sample size to only include participants meeting the criteria of being full-time adult employees over the age of eighteen years, working within Irish high-tech organisations, the eligible sample size reduced to 83 participants, just one short of the preferred G*Power, gender split being 48 (58%) female / 35 (42%) male.

3.3.5 Measurement of variables

To source the primary data the instruments selected consisted of two self-completed questionnaires, targeting measures of perceived PS and bias to Gender and Authority, further complemented with closed-ended questions to determine a rate of career advancement for women and the perceived number of women in visible leadership within the workplace. The questionnaire on PS was adapted from Edmondson's (1999) research, employing five questions to assess perceptions of PS. The questionnaire on bias to gender and authority was adapted from Rudman and Kilianski's (2000) research, consisting of fifteen questions to gauge implicit and explicit bias to women's authority. Consistency with original questions reduces risk of unstandardised responses (Kerlinger & Lee 2000).

Each questionnaire's response options used a Likert scale, ranging from 1 = strongly disagree to 7 = Strongly agree, with 4 being interpreted as uncertainty. Scores above 4 indicated the participant agreed, below 4 indicated the participant disagreed with a score of 4 indicating uncertainty.

3.4 Ethical considerations

An extensive and thorough review of the research topic and management of any prospective data obtained was conducted in full compliance with the ethics and GDPR protocols of the National College of Ireland. All information gathered via the online questionnaire was anonymous and analysed at an aggregate level, with no personal identifying information being published in the findings or stored. Every endeavour was taken to ensure the data collected was securely hosted, stored on password protected systems to prohibit any unauthorised access. Period for information being securely and anonymously stored is in keeping with data retention policy of the college, with information being securely destroyed once exceeds storing requirement.

Participants were briefed via an information page, that their participation in the anonymous questionnaire was voluntary and detailed the premise of the study. Participants were advised they could disregard the questionnaire any time by closing their browser window, choosing to no longer participate nor submit their responses. Consent to participate was secured through participants voluntarily submitting their

completed questionnaire. Before doing so, it was highlighted again to participants the nature of the survey, respect to anonymity and participating was fully voluntary.

3.5 Methodology summary and reflection

Without a rigorous framework and model to structure the research methodology, reliability and validity of the data collected, the resulting analysis may be compromised, and lack credibility (Saunders et al, 2019); thereby using the Research Onion Model has provided the necessary framework and structure for this research methodology to follow a logical process and flow. The research approach being quantitative in nature, employs a survey to source data from participants. Using descriptive statistics will help order the data into a straightforward and understandable way, and inferential statistics will enable potential learnings from sample to inform for a larger sample size or population (Zikmund et al, 2019). This completes the discussion of the methodology used in this investigation and its justification.

4.0 Chapter 4: Research findings and analysis

4.1 Introduction

This chapter reviews the findings of the survey, examining correlations between workplace perceptions of PS, attitudes toward women's authority, the proportion of women in visible leadership, and perceived opportunities for women's career advancement. A target sample size of 100 was sought, with a minimum of 84 eligible responses preferable based on prior research and Faul, Erdfelder, Buchner and Lang (2009) suggestion of a G*Power sample size of 84 is needed to be able to detect a medium Pearson's correlation coefficient of r = .30 with 80% power (alpha=.05, two-tailed) and a 50/50 gender split. The survey was open for just over three weeks through June 2022, receiving 194 fully completed responses. When the sample size was filtered to only include participants meeting the criteria of being full-time adult employees over the age of eighteen years old, working within Irish high-tech organisations, eligible sample size reduced to 83 participants, just one short of the preferred G*Power, the gender split being 48 (58%) female / 35 (42%) male; thereby a sample size limitation.

4.2 Demographic analysis

The demographics from the initial part of the survey, ask for participant profile details being their gender identity, location, education level, current workplace position, working full-time in high-tech organisation, size of organisation working in, number of times they identified a promotion within their career. Responses were filtered to only include eligible participants, being full-time adult employees over the age of eighteen years old, working within Irish high-tech organisations, resulting in 83 eligible participants. See table 1 for demographic summary.

The secondary data noted that women are graduating with majority of tertiary education, across degrees, masters, and doctorates (Ely and Rhode 2010; Eagly, Nater, Miller, Kaufmann and Sczesny, 2020). This phenomenon holds true in this research, with females evidencing higher mean average of education level and a lower standard deviation dispersion for females, indicating the data is clustered closely around the mean and more reliable (Salcedo and McCormick, 2020). Females (n=48, M=3.42 and SD=.679) compared to males (n=35, M=3.17 and SD 1.071), see table 2. For tertiary education percentages, the survey results show 93.8% of females graduated with a degree or higher qualification, compared to 85.7% for males.

The secondary data also reflected that significantly larger cohorts of males achieving career advancement into visible senior roles than women (Bonet et al, 2018; Cortland and Kinias, 2019; Fine et al, 2019; Folke and Rickne, 2020). This finding held true in this research, with 40% of male participants holding senior leadership roles (defined as Director and above, being no more than 3 reporting levels down from CEO) with females holding 35% of senior leadership roles. Notably no female CEOs were recorded in this survey, compared to 2 male CEOs.

Descriptive Statistics (n = 83)		
Variable	Frequency	Percentage
Gender		
Female	48	58%
Male	35	42%
Age		
18-25	31	37%
26-40	32	39%
Over 40	20	24%
Education		
Leaving Cert / A Level / GED or equivalent	2	2%
Certificate	1	1%
Diploma	5	6%
Degree / Higher Diploma	38	46%
Masters / Post Grad Diploma	35	42%
PhD	2	2%
Position / Role		
CEO	2	2%
Snr Vice President / Snr Exec (1*)	3	4%
Vice President / Snr Direct (2*)	7	8%
Director / Head of Function (3*)	19	23%
Snr Manager (4*)	13	16%
Manager (5*)	15	18%
Individual contributor	24	29%
*1 = direct rpt to cEO, *2 = no more than 2 reporting levels from CEO etc..		
Number of career promotions		
0	3	4%
1	9	11%
2	14	17%
3	14	17%
4	10	12%
5	15	18%
6	7	8%
7	1	1%
8	1	1%
9	1	1%
10	5	6%
11	1	1%
15	1	1%
40	1	1%

Table1. *Descriptive statistics (n=83)*

education

gender	Mean	N	Std. Deviation	Median
Female	3.42	48	.679	3.00
Male	3.17	35	1.071	3.00
Total	3.31	83	.869	3.00

Table2. *Breakdown of education by participants' gender*

role * gender Crosstabulation

			gender		
			Female	Male	Total
role	CEO	Count	0	2	2
		% within gender	0.0%	5.7%	2.4%
	Senior Vice President / Senior Exec (reporting directly to CEO ie 1 reporting level from CEO)	Count	1	2	3
		% within gender	2.1%	5.7%	3.6%
	Vice President / Senior Director (no more than 2 reporting levels down from CEO)	Count	4	3	7
		% within gender	8.3%	8.6%	8.4%
	Director / Head of Function (no more than 3 reporting levels down from CEO)	Count	12	7	19
		% within gender	25.0%	20.0%	22.9%
	Senior Manager (no more than 4 reporting levels down from CEO)	Count	8	5	13
		% within gender	16.7%	14.3%	15.7%
	Manager (no more than 5 reporting levels down from CEO)	Count	8	7	15
		% within gender	16.7%	20.0%	18.1%
	Individual Contributor	Count	15	9	24
		% within gender	31.3%	25.7%	28.9%
Total		Count	48	35	83
		% within gender	100.0%	100.0%	100.0%

Table3. *Breakdown of role / position by participants' gender*

4.3 Data preparation

Prior to commencing the main analysis, data was prepared for review by confirming internal reliability for all scales used, this requires correlating the answers provided within each scale with each other (Saunders et al, 2019); the researcher selected the Cronbach's Alpha, which is a convenient test for judging reliability and internal consistency across an average score within a scale and one which is most frequently used. Cronbach's Alpha is an alpha coefficient holding values ranging between 0 and 1, for this study a value of 0.7 or above would be acceptable, as indicates the scale questions combined measure to be internally consistent (Tavakol and Dennick, 2011).

This research has adapted the PS measure from Edmondson (1999), and the GAM has been adapted from Rudman and Kilianski's (2000). Each questionnaire's response

options used a Likert scale, ranging from 1 = strongly disagree to 7 = Strongly agree, with 4 being interpreted as uncertainty. Scores above 4 indicated the participant agreed, below 4 indicated the participant disagreed with a score of 4 indicating uncertainty. The results of the analysis indicated that both the PS Scale and the GAM scale were highly consistent, with a Cronbach's Alpha value of .799 on the 5-item inventory PS Scale and .804 on the 15-item inventory GAM Scale, see table 4 below.

Reliability Statistics

Cronbach's Alpha	N of Items
.799	5

Reliability Statistics

Cronbach's Alpha	N of Items
.804	15

Table4. *Cronbach's Alpha for PS Scale (.799) and the GAM scale (.804)*

Evaluating the selected scales through the reliability analysis in SPSS allows the queries to be further validated, essentially the Cronbach's Alpha reliability analysis re-computes the outcome with each question being eliminated from the overall calculation, to identify if any individual scale question is an outlier and potentially distorting the internal reliability consistency (Salcedo and McCormick, 2020). Running the reliability analysis for both the PS and GAM scale did not change outcomes with any statistically significance to original results taken at full scale level.

Furthermore, once acceptable reliability was established, composite scores were created for each of the scales used in the survey, to facilitate deeper analysis and investigation for correlations. Applying a one sample t-test on each of the compositive scores for each of the scales was run. Males had a higher perception of PS in the workplace with narrower standard deviation (SD) range (n=35, M=29.14, SD=3.90), compared to females (n=48, M=25.44, SD=5.92), see table 5. In the GAM scale females perceived a higher gender authority gap (n=48, M=79.33, SD=11.55), compared to males with (n=35, M=71.74, SD=10.91), see table 6. This was also run for perceived opportunities for women's advancement in the organisation, with females perceiving a lower mean (n=48, M=4.77, SD=1.65), compared to males with (n=35, M=5.74, SD=1.5), see table7.

Female participants lower mean of PS was expected; however, a higher GAM mean was not expected. It was also expected that females have a lower perception of career advancement opportunities. Critical to note, statistically significant results do not necessarily support the validity of a study hypothesis, just that the findings offer evidence towards the research question(s) and hypotheses (McLeod, 2018).

gender		N	Mean	Std. Deviation	Std. Error Mean
Female	PS_Composite	48	25.4375	5.91754	.85412
Male	PS_Composite	35	29.1429	3.90432	.65995

Table5. *One sample t-test on PS scale composite score*

gender		N	Mean	Std. Deviation	Std. Error Mean
Female	GAM_Composite	48	79.3333	11.54516	1.66640
Male	GAM_Composite	35	71.7429	10.90964	1.84407

Table6. *One sample t-test on GAM scale composite score*

One-Sample Statistics

gender		N	Mean	Std. Deviation	Std. Error Mean
Female	women_opportunities	48	4.77	1.653	.239
Male	women_opportunities	35	5.74	1.502	.254

Table7. *One sample t-test on perceived career advancement for women*

4.4 Descriptive analysis

Here the research circles back to the five hypotheses detailed earlier in this study, to identify possible solutions and initiatives for high-tech organisations to implement, with the intention of increasing numbers of women advancing through the pipeline into visible leadership roles. The hypotheses will explore the role of PS, if perceptions of workplace PS are related to bias towards women's authority, if there are further correlations to the number of women already in visible leadership roles; and do these factors contribute to the perception of women's career advancement?

4.4.1 Hypothesis 1

H1: There is a significant relationship between levels of workplace PS and the number of women in visible leadership roles such that higher levels of PS will be related to higher numbers of women in leadership roles.

Statistics on the participation of women in senior leadership evidence that women, despite being fifty percent of most populations and typically more educated, are still significantly under-represented in top executive level roles (Kellerman, 2010; Eagly and Miller, 2016; Sojo et al, 2016). If most employees resign from roles or declare job dissatisfaction due to poor quality leaders and nearly all leaders are male, Chamorro-Premuzic (2019) proposes that increasing women's leadership participation would create an environment for greater productivity, well-being, and performance. The aim of this hypothesis is to explore if greater participation of women in visible leadership roles correlates with perceptions of PS in the workplace and vice versa.

To assess if evidence was found in the survey results, to suggest that higher levels of perceived PS are related to higher numbers of women in leadership (percent_SP) roles, a bivariate correlation was conducted. The results of the bivariate correlation indicated there is no statistically significant correlation between percent_SP & PS (r= 0.119, p= 0.34). The hypothesis is null for total cases, additionally when split for females and males, there is no statistically significant correlation between PS and percent_SP. Notably only 66 out of 83 cases were able to provide a response to the percentage of women in visible leadership roles, both genders unable to provide responses comprehensively on women's visible leadership participation, see table 8.

H1: Correlations		PS	percent_sp
PS	Pearson Correlation Coefficient	1	.119
	Sig. (2-tailed)		.340
	N	83	66
percent_sp	Pearson Correlation Coefficient	.119	1
	Sig. (2-tailed)	.340	
	N	66	66

percent_sp = What percentage% of senior leadership positions are held by women, in the company you currently work?

Table8. *Hypothesis 1: Correlation between PS and percent_SP*

4.4.2 Hypothesis 2

H2: Psychological safety levels are significantly related to perceived opportunities for women's advancement in high-tech Irish companies, in that increased perception of PS in the workplace will be related to increased opportunity for women's career advancement.

Google's Project Aristotle identified that PS was the crucial element in unlocking high performance in teams and perception of inter-personal safety (Duhigg, 2016); in contrast to groups where one person or small cohort dominated, then the cumulative intelligence declined. Research has demonstrated that women's career advancement is curtailed, in comparison to male colleagues, as a shadow of repercussions and threat persists (Rudman and Kilianski, 2000; Cortland and Kinias, 2019). This hypothesis aims to explore if greater levels of PS perceived in workplace is correlated to greater perceived opportunities for women's career advancement (women_opportunities), to assess if evidence was found in the results of the population surveyed, a bivariate correlation was conducted. The results of the bivariate correlation indicated there is statistical significance in the correlation between women_opportunities & PS (r= 0.403**, p= 0.001), see table 9. The hypothesis is true for total cases, additionally

when split for females and males, there is greater statistically significant correlation in results for females (r= 0.376**, p= 0.008), compared to males (r= 0.262**, p= 0.128), demonstrating that females may perceive they can progress their careers more significantly when perception of PS is higher.

H2: Correlations		PS	women_opportunities
PS	Pearson Correlation Coefficient	1	.403**
	Sig. (2-tailed)		<.001
	N	83	83
women_opportunities	Pearson Correlation Coefficient	.403**	1
	Sig. (2-tailed)	<.001	
	N	83	83
** Correlation is significant at the 0.01 level (2-tailed).			

Table9. *Hypothesis 2: Correlation between PS and women_opportunities*

4.4.3 Hypothesis 3

H3: Levels of workplace psychological safety are significantly related to bias towards women's authority, such that there is a correlation to levels of bias and perceived levels of PS, higher PS will be related to lesser bias towards women's authority.

As women advance in their careers, earning positions of authority and greater leadership visibility, so raises the level of threat perceived by colleagues, leading to challenges to women's authority and questioning of their achievements (Allen et al, 2016); with evidence that managers, typically male, disproportionately penalise female employees with negative performance evaluations, undermining women's career aspirations. To assess if evidence was found in the results of the population surveyed, to suggest that lower perceptions of women's authority gap (GAM) be related to higher levels of PS, and vice versa, a bivariate correlation was conducted. The results of the bivariate correlation indicated there is no statistically significant correlation between GAM & PS (r= -0.128, p= 0.25). The hypothesis is null for total cases, when split for females and males, there is no statistically significant correlation between GAM and PS, see table 10. This result was not expected and requires further investigation.

H3: Correlations		GAM	PS
GAM	Pearson Correlation Coefficient	1	-.128
	Sig. (2-tailed)		.250
	N	83	83
PS	Pearson Correlation Coefficient	-.128	1
	Sig. (2-tailed)	.250	
	N	83	83

Table10. *Hypothesis 3: Correlation between GAM and PS*

4.4.4 Hypothesis 4

H4: Bias towards women in authority has a significant correlation with the number of women in visible leadership roles, such that higher participation rates of women in visible leadership roles will be related to lesser perceived bias to women's authority.

A Deloitte (2021) global study found that "companies with women CEOs have, on average, significantly more gender-balanced boards than those led by men: 33.5% women vs. 19.4%. The finding is similar for companies with female chairs". If women's career progression into visible leadership roles is substantially accelerated under female CEO's and Chairpersons (Deloitte, 2021), are female senior leaders creating a different culture, leading to lesser perceived bias to women's authority? To assess if evidence was found in the results of the population surveyed, to suggest that lower perceptions of women's authority gap (GAM) be related to higher participation levels of women in visible leadership roles, and vice versa, a bivariate correlation was conducted. The results of the bivariate correlation indicated there is no statistically significant correlation between GAM & percent_sp (r= -0.204, p= 0.101). The hypothesis is null for total cases, additionally when split for females and males, there is no statistically significant correlation between GAM and percent_sp, see table 11.

As previously noted only 66 out of 83 cases were able to provide a response to the percentage of women in visible leadership roles, both genders unable to provide responses comprehensively on women's visible leadership participation, however more males did respond with a percentage than women did.

H4: Correlations		GAM	percent_sp
GAM	Pearson Correlation Coefficient	1	-.204
	Sig. (2-tailed)		.101
	N	83	66
percent_sp	Pearson Correlation Coefficient	-.204	1
	Sig. (2-tailed)	.101	
	N	66	66

Table11. *Hypothesis 4a: Correlation between GAM and percent_sp*

When Pearson's correlation is re-run to compare GAM and number count of women in visible leadership roles (number_ldrship), the result is marginally significant for p, (r= -0.049, p= 0.705), see table 12. When split by gender, the correlation between numbers of women counted and a lower bias to gender authority is stronger for males, males (r= 0.082, p= 0.677), compared to females (r= -0.135, p= 0.439), see table 13.

Additionally, 80% of male respondents were able to respond with number of visible women in leadership, compared to 72.9% of female respondents.

H4b: Correlations		GAM	number_ldrship
GAM	Pearson Correlation Coefficient	1	-.049
	Sig. (2-tailed)		.705
	N	83	63
number_ldrship	Pearson Correlation Coefficient	-.049	1
	Sig. (2-tailed)	.705	
	N	63	63

Table12. *Hypothesis 4b: Correlation between GAM and number_ldrship*

Correlations

Gender			GAM	number_ldrship
Female	GAM	Pearson Correlation Coefficient	1	-.135
		Sig. (2-tailed)		.439
		N	48	35
	number_ldrship	Pearson Correlation Coefficient	-.135	1
		Sig. (2-tailed)	.439	
		N	35	35
Male	GAM	Pearson Correlation Coefficient	1.000	.082
		Sig. (2-tailed)		.677
		N	35	28
	number_ldrship	Pearson Correlation Coefficient	.082	1.000
		Sig. (2-tailed)	.677	
		N	28	28

Table13. *Hypothesis 4b: Correlation between GAM and number_ldrship, split by gender*

4.4.5 Hypothesis 5

H5: The presence of bias towards women in authority is significantly related to perceived opportunities for women's advancement, in that increased perceptions of bias towards women's authority will correlate to lesser opportunities for women's career advancement.

As discussed earlier in this study, highly educated women, typically holding more MBA's than their male counterparts, enter a gender balanced pipeline at the start of their careers but the impact of the 'broken rung' almost immediately stalls career advancement (LeanIn.Org, 2019), women never recover from this early career setback. A US study identified that women's career advancement continues to decline, culminating in C-Suite positions held by women making up only 22% versus 78% men (McKinsey, 2021; Schultheiss, 2021). Noting that the longer the career tenure competent women had, there was a remarkable decline in ambition for career

advancement into more senior leadership roles (Sanchez and Lehnert, 2019). Research notes women's aspirations are distorted by the workplace and organisational climate experienced over time; being levels of bias towards women's authority, sexism, microaggressions stemming from gender role stereotypes wear women down and crucially, distort how women themselves view their competence (Schultheiss, 2021; Sanchez and Lehnert, 2019).

To assess if evidence was found in the results of the population surveyed, to suggest that increased perceptions of bias towards women's authority (GAM) can be related to lesser opportunities for women's career advancement, and vice versa, a bivariate correlation was conducted. The results of the bivariate correlation indicated there is a statistical significance in the correlation between perceived GAM and women_opportunities (r=-.237*, p= 0.031), see table 14. The hypothesis is true for total cases.

H5: Correlations		GAM	women_opportunities
GAM	Pearson Correlation Coefficient	1	-.237*
	Sig. (2-tailed)		.031
	N	83	83
women_opportunities	Pearson Correlation Coefficient	-.237*	1
	Sig. (2-tailed)	.031	
	N	83	83
* Correlation is significant at the 0.05 level (2-tailed).			

Table14. *Hypothesis 5: Correlation between GAM and women_opportunities*

Where there is a noticeable disparity is in the mean averages between gender, where females perceive higher rates of GAM bias correlates with lower rates of opportunities for career advancement than the male sample group; females (n=48, GAM M=79.33, SD=11.55; women_opportunities M=4.77, SD 1.65); whereas males in this sample, observe lower levels of GAM being present and significantly higher correlating opportunities for women's career advancement (n=35, GAM M=71.74, SD=10.91; women_opportunities M=5.74, SD=1.50).

Splitting out further for females and males, there is greater statistical significance in correlation of results for females (r=-.025, p=.867), where the p value demonstrates a probability of obtaining a more extreme sample than the ones observed in this study sample size. Compared to males (r=-.374*, p= 0.027). Females may perceive their careers do not advance with the same opportunities, as their male counterparts believe, particularly where females observe there to be higher levels of GAM and male counterparts not perceiving it as noticeable, see table 15.

Correlations

Gender			GAM	women_opportunities
Female	GAM	Pearson Correlation Coefficient	1	-.025
		Sig. (2-tailed)		.867
		N	48	48
	women_opportunities	Pearson Correlation Coefficient	-.025	1
		Sig. (2-tailed)	.867	
		N	48	48
Male	GAM	Pearson Correlation Coefficient	1.000	-.374*
		Sig. (2-tailed)		.027
		N	35	35
	women_opportunities	Pearson Correlation Coefficient	-.374*	1.000
		Sig. (2-tailed)	.027	
		N	35	35

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

Table15. *Hypothesis 5: Correlation between GAM and women_opportunities, split by gender*

4.5 Conclusion

Reflecting on the diverse range of results and correlations between the data sets, particularly when reviewed at gender level, there are multiple findings which are in keeping with the existing literature, even in this small sample size study of participants in Irish high-tech organisations. Women are more educated than their male counterparts in this study, yet they are still not climbing the career ladder to secure c-suite positions at the same rate as male colleagues. The sample group indicates most individual contributors are female, however only 35% of women have earned senior leadership roles, being Director or above, compared to men (see table 3), evidencing there are broken rungs (LeanIn.Org, 2010), notably the only CEOs in the survey were male. Also women are reporting many more average career promotions, indicating women may have to work harder for promotions; they having to take more steps to

achieve career advancement into senior leadership positions, further study could be taken to explore this, see table 16 below.

n_promotion * gender Crosstabulation

Count

		gender		
		Female	Male	Total
n_promotion	0	2	1	3
	1	5	4	9
	2	8	6	14
	3	7	7	14
	4	7	3	10
	5	8	7	15
	6	5	2	7
	7	0	1	1
	8	0	1	1
	9	0	1	1
	10	4	1	5
	11	0	1	1
	15	1	0	1
	40	1	0	1
Total		48	35	83

Table16. *career promotions, split by gender*

In summary, men perceive higher levels of PS in the workplace, less GAM than females and males also see greater career advancement opportunities for women, notably more males can count the exact numbers of women in visible leadership in their workplaces. Different experiences across the genders with less perceived challenges by men for women. This will be further discussed in the next chapter.

5.0 Chapter 5: Discussion and recommendations

5.1 Introduction

This chapter revisits the overarching question which has grounded this study and led to the formation of the hypotheses - to evaluate potential solutions to the problem of women being clearly underrepresented in visible leadership roles. A reflective discussion of the study findings, aligning primary and secondary data, is followed by a discourse around the prevalent themes from the research analysis, divided into the core pillars of PS, the authority gap, career advancement and noting specific implications with the technology context; rounding out with limitations identified and proposed recommendations for further research.

5.2 Discussion on findings

Women are clearly more educated as repeatedly evidenced in the secondary data (Ely et al, 2010; Allen et al, 2016) and identified in the primary dataset. Does being more educated matter?

Women in this study are 62.5% mix of the individual contributor entry level compared to males 37.5%, next career level up 16.7% of women note their position to be manager, compared to 20% males. This is a noticeable shift in mix from the gender split for entry level positions and again, in keeping with the existing research in this area around the 'broken rung' phenomenon (LeanIn.Org, 2010; Schultheiss, 2021).

Women have earned 35% of senior leadership roles in this survey, compared to 40% of males; senior leadership roles being defined as Director up (no more than 3 reporting levels down from CEO); two CEOs are recorded in the study, both male. Additional c-suite positions in this study were 5 in total, 1 female and 4 males, 80% males in c-suite compared to 20% c-suite positions being held by women; a McKinsey (2021) global study corroborates with similar findings of c-suite positions being 78% male compared to only 22% women. Women are trailing from the outset because of persistent barriers faced in progressing to their first management role (Catalyst, 2022) as is demonstrated in this study too. See table 3 for details.

Women take more steps for career advancement, see table 16, men in this study only having to make 72.9% of the number of promotion steps women need to take, to achieve their current role. The increased number of steps for women's career advancement could require more study, to understand more deeply why women must earn more incremental advancement to progress up the career ladder? It could be argued that men are getting promoted quicker to higher positions and ultimately into uppermost influential and visible leadership roles as they are more capable than women? Studies evidence that women are selected for leadership 33% less often than their abilities warrant, their gender being the persuading factor compared with men's overconfidence being perceived by managers as capability (Reuben et al, 2012).

Notably both males and females in this study struggled to pin down the percentage of women in visible leadership roles, only 66 participants able to answer this question, similarly when it came to providing a definite count of women leaders, 80% of male respondents were able to respond with number of visible women in leadership, compared to 72.9% of female respondents. Male respondents significantly more able to count the actual women in leadership or perceive there to be more women, whilst women see less representation of other women? A US study identified both gender and racial blindness in comparison to high levels of biased of perceptions to imagine more women and black people taking traditionally male roles (Stainback and Tomaskovic-Devey, 2009). This gender 'blindness' could warrant a more thorough study in an Irish technology context.

Next core themes will be discussed, followed by a reflection on the limitations and recommendations for further study.

5.3 Discussion themes

When reviewing the secondary data, it was identified that a disproportionate weighting of the research examines the challenges and barriers women face in the workplace, this paralleled with the decline in articles on gender, may signify a saturation on research into the negatives for women's participation in leadership (Joshi et al, 2015). Finding solutions for women's career advancement into decision-making roles matters, as occupying visible leadership roles particularly in technology will be incisive for all women more broadly across society and for generations to come (Criado Perez, 2020); maintaining research into more possible solutions is critical, noting female participation is typically very low within this male dominated industry, only 18.9% female mix in Irish technology (Keniry, 2019).

Based on the themes identified in the research to date, the summary of findings will be addressed under the sub-headings of PS, the authority gap, and the implications that are specific to women's representation and participation in technology.

5.3.1 Psychological safety

In surveys of MBA students, research finds that men are far more likely to have career ambitions which take them to C-suite and CEO positions than women (Eagly, 2021). Women's ambition being more measured from early on. Within STEM, women tend to have lower rates of representation where the specific STEM field is more associated with higher levels of intelligence or participant brilliance is widely recognised (Eagly, 2021); compounding a belief that the respective STEM fields are more befitting males or that women are not intellectually capable for such roles.

Edmondson (1999) identified that for adaptable and agile learning capabilities in teams, leadership must incubate PS, as this unlocks full potential of individuals, who when bound by shared purpose create high-performance teams (HPT). HPTs that are

adaptable, agile, and able to be resilient change agents are critical requirements in successful organisational transformation (Kotter, 1995). Transformational leadership has been critical during workplace changes brought on by the Covid-19 pandemic, escalating the premise that PS and transformative organisational support have determined the scale of success in employee engagement, retention (Lee, 2021) and ultimately business survival in this highly volatile period. During volatile business cycles, counterproductive work behaviours (CWB) increase, however where there are increased levels of emotional intelligence (EI), the negative impacts of CWB are reduced, leading to better team decision making; Zhou, Zhu and Vredenburgh (2020); women generally display higher levels of EI, being key to creating PS, compared to men who typically engage in CWB with peers more readily than females, reducing PS.

In the primary data analysis, more males identified a stronger perception of PS, based on the one sample t-test. This finding did not appear to significantly influence the outcomes for hypothesis 1; those higher levels of PS would correlate to higher numbers of women in leadership roles. It is noteworthy that male cases in this study did identify with higher levels of PS and held higher percentage of senior leadership roles. Men feel safer in the workplace than women, thereby advancing their careers into leadership more readily? In hypothesis 2 there are compelling findings to indicate that increased perceptions of PS created greater observations of opportunities for women and their career advancement, particularly affirmed in the female cases. As discussed previously, women's career ambitions diminish the longer their career span (Sanchez and Lehnert, 2019), if perceived levels of PS could be sustained throughout a woman's career, would that increase representation of women into visible leadership roles?

Greater levels of PS in the workplace, allows authenticity for individuals without the fear or threat of negative consequences, for teams it is the belief that they are safe for interpersonal exchanges that include risk taking, owning mistakes, respectfully challenging ideas, whilst being accepted and respected; Mosley and Irvine (2021) further note that teams achieving PS typically outperform competitors three-fold on assets and twice on sales. Without PS both individuals, teams and organisations lose out.

5.3.2 The Authority Gap

Eagly (2021) acknowledges that the lack of women in technology is a combination of discriminatory factors excluding women from equal representation but also, women's own agency in the degree of their pursuing both participation in the sector and an ambition for leadership. As noted, both genders display levels of bias towards women's authority and perceived leadership competence. Nonetheless most social scientists attribute the dominant significance for occupational gender segregation, including gender authority gap, within STEM particularly in technology, onto plain old sexism, stereotype gender bias, prejudice, and discrimination (Heck, Santhanagopalan, Cimpian and Kinzler, 2021).

Whilst hypothesis 3 did not evidence any correlation between women's authority and PS, to help understand what may constitute an influencing factor on the workplace authority gap; there was a marginal correlation between GAM and numbers of women identified in visible leadership evidenced in hypothesis 4b findings. This corroborates with other research findings, that the number of women represented in the field influences how culturally recognised the field is with being masculine or feminine; those disciplines of STEM which are stereotypically considered more masculine, have less women represented (Carli, Alawa, Lee and Zhao, 2016) and vice versa, the more women represented typically decreases the bias to women's authority.

This result could be further explored within the context of the Irish technology sector compared to other areas within STEM, to validate if more women represented in science results in lower perceptions of bias to women's authority compared to technology which has notably lower female participation and heightened bias.

Where the bias to women's authority has demonstrated a significant finding, is the correlation to levels of GAM and perceptions of women's career advancement, in hypothesis 5, split out by gender. Women observe higher levels of GAM with a corresponding lower perception of opportunities for their career advancement; in that woman in this study perceive reduced prospects for their career development into leadership roles when observed with higher perceived gender bias. Bias to women's authority matters, when note that for women to achieve a promotion, studies evidence women must meet substantially higher performance standards than their male counterparts (Kroska and Cason, 2019). Noticeably the male participants in the study had lower levels of perceived GAM and perceived women had greater career opportunities, so the male participants are less aware of obstacles to women's career advancement.

As GAM is typically lower when there are more women in visible leadership roles, a lower GAM should then increase women's perceived opportunities to advance their careers. Compounded by the evidence that having a female CEO and/or Chair results in greater rates of female representation, so it is an organisational choice to propel women into visible leadership roles; is there a case for organisations to be compelled to publicly release the stats on numbers of females in senior leadership roles, being Director upwards by their customers, investors, government and/or women's advocacy groups – to accelerate action for greater gender balance in leadership, particularly c-suite and board?

5.3.3 Implications for tech: the future of bias

Numerous studies reveal sexual harassment, gender stereotype bias, discrimination, workplace aggression and sexism are preventing meaningful cohorts of women to thrive and advance their careers in STEM, particularly technology (Carli et al, 2016). In one study, students were presented with evidence that women achieved superior results in maths tasks, the males in the group were still more likely to hire men over women for the same tasks (Reuben et al, 2012). Studies testify to overwhelming evidence of bias towards women in the fields of science and technology, with women

having to demonstrate 2.5 times more productivity compared to male counterparts, to receive the same peer review scores (Carli et al, 2016). It is clear why women are not excelling into leadership roles within technology, plain old sexism. Yet, creating an intentional strategy to drive participation and engagement of female employees in technology can bring greater diversity of thought with new perspectives and breadth of innovation, as well as increasing attractiveness to top talent (González Ramos, Vergés Bosch and Martínez García, 2017).

Critically, machine learning and technology advances in artificial intelligence (A.I.) are rapidly evolving, changing our everyday lives not just today but into the future. Machine intelligence learns primarily from the data it is presented with, with men significantly over-represented in the design and development of these technologies (Leavy, 2018). Varying evidence has already been presented on the heightened presence of gender bias, even aggression towards women in the technology sector, compared to other STEM sectors (where women are also under-represented, just not as poorly). With the technology industry revealing significantly higher levels of bias and lack of PS for women, whilst also shaping the future for us globally, these biases are being embedded into the algorithms defining AI and machine learning (Crawford, 2016).

Time is of the essence to meaningfully represent women in technology and stem the current decline of women's participation in the sector, as AI and machine learning advance, women risk being further left behind, indefinitely.

5.4 Limitations and recommendations for future research

5.4.1 Limitations

A clear limitation of this dissertation was time, the broad scope of the topic and the experience levels of the researcher, even with a narrowing down of the study to examine the core research question within the Irish technology context. The researcher intentionally wanted to be able to search broadly for solutions, noting the prevalence in studies which identify the many and numerous barriers to women's advancement into visible leadership roles and key participation in senior positions.

From multiple meta-analyses examining decades of women's inability to advance in leadership (Eagly et al, 2020), burdened under the weight of prejudice and bias; other meta-analyse reveals that despite women performing equally with male counterparts, they are paid significantly less, this is particularly prevalent in more senior leadership roles (Joshi, Son and Roh, 2015); through to emerging studies which proffer possible actions that human resource departments, organisational psychologists and executive coaches can explore to support women in their career advancement (Valerio, 2022); with a growing number of studies on the positive impacts of PS launching with dual implications for increasing women's participation (Frazier et al, 2017). Yet still nothing is changing (Kellerman, 2010), and women appear to be getting nowhere fast.

Deep levels of resilience and determination have been required, and may have presented a limitation, to counter the fatigue from researching copious studies which reference extensive evidence of negative outcomes for women's leadership and the intensity of sexism, gender bias, hostility to female leaders and flagrant inequality, however it has given the researcher an authentic sense of the experiences reflected in the journal articles and studies reviewed.

Qualitative and quantitative research methodologies both have strengths and shortcomings, as both can aptly succeed in delivering excellence to research objectives as much as they both have limitations (Zikmund et al, 2009). Reflecting on the unexpected results in the gender split, being that males observed lower mean scores than women on the GAM questions, opens the question on the limitations of the contemporary appropriateness of the GAM survey questions, adapted from Rudman and Kilianski's (2000) Gender and Authority Measure. A UN 2020 gender study found that 90% of people are biased against women (BBC, 2020). The lower mean scores from the composite GAM results in this study are significantly in conflict to these UN trends. Is it that the GAM scale is too obvious for today's workplace where employees are all trained in DEI and workplace appropriateness? Anecdotally, upon receipt of the online survey several male colleagues commented that they would have to be careful to answer politically correct. Did males answer how they should not how they subconsciously think and act? A limitation may be the quantitative nature of the survey omitting opportunity to establish intimacy and trust, to reveal more candid truths and biases from participants (Ivey, 2012).

5.4.2 Recommendations

Following are recommendation themes for further research, to continue to identify meaningful solutions but also to demand greater measures of accountability, as this researcher sees it, change will not happen organically otherwise.

5.4.2.1 Aim high and hold them accountable

"Aim at a high mark and you'll hit it. No, not the first time, nor the second time. Maybe not the third. But keep on aiming and keep on shooting for only practice will make you perfect." – Annie Oakley, Sharpshooter, and inspiration for 'Annie get your gun' (Anderson, 2021).

The research has demonstrated convincingly that women are highly educated, they are resilient and have much practice in striving to better themselves against the odds. Is the time for courteous engagement and polite incremental push for workplace equality gone? In a society where women and men are compensated and promoted differently, that disparity favouring men, the ratio is fourteen times bigger than the difference in their performance ratings; because 70% of males think men are better than women at achieving similar objectives and reward men higher (Livni, 2017).

As transformation is clearly not happening organically for women's leadership; it is recommended that research is undertaken to explore what impacts could be expected from greater levels of public accountability, if greater accountability is placed by government to legislate for change through mandatory quotas and publication of statistics including the gender pay gap as well as participation percentages of women in senior leadership, from executive to boards. For organisations that do not instil gender equality into their cultures to be publicly questioned on their DEI strategies, what help do they need to embed fairness into their workplace? What role do advocacy groups such as the National Women's Council (NWCI) and Women in Tech and Science Ireland (WITS) play to spotlight organisations with zero female representation in visible leadership, lobbying for a minimum 40% gender balanced representation in visible leadership.

5.4.2.2 Unnatural interventions: disrupting the disruptors

Bonet, Cappelli and Hamori (2020) note women progress through the ranks with intentional support however the pace of female progress slackens once there are 1-2 women at a visible senior level, indicating women's participation in senior leadership is an organisational choice, driven by optics. Existing leaders do not typically acquiesce their power to those below, history repeatedly shows that followers, the masses, must compel the change (Kellerman, 2016). Unless the CEO is a woman.

As discussed, organisations with a female CEO or Chair typically have a 50% better gender mix on their boards (Deloitte, 2021). Could deeper research studying PS in female CEOs, Chairs, and influential senior executives, uncover greater understanding of intrinsic characteristics that women leaders possess to propel more women into visible leadership roles?

If male leaders progress further and faster in their careers, acquire higher representation in senior leadership roles, despite being less educated, not having as many 21st century transformational leadership characteristics, displaying lower levels of PS and advancing their careers with significantly less obstacles (Chamorro-Premuzic, 2019); then women and their allies may need to disrupt the status quo.

What would disruption look like to achieve greater gender parity in the workplace? A US study found that 42% of female and male employees would need to change roles and employment to remove sex segregation in the labour force and arrive at a fully integrated one, this labour force gender segregation commonly favouring men with higher paying and more authoritative positions (Eagly, 2021). It is recommended that further research, taking a similar approach, for Ireland/EU, would inform Governments and women's lobby groups on the disparate variances more strikingly, to compel change to move to an integrated workforce, free of sex segregation in roles.

Noting that in contrast to males, who are predicted to gain approximately one new STEM job for every four traditional jobs lost due to technological disruption, women are predicted to lose 20 jobs and only gain one new STEM job as recompense (Amerasinghe, 2016). This study has identified that AI and machine learning are inheriting gender bias into their algorithms, driven my majority of male participation

in technology. A double negative impact for women, labour opportunities lost to technology disruption and inherent sexism in the disrupting technology. Technology is widely recognised as having a leaky pipeline of women, previously believed to start at tertiary level education however more recent studies observe that girl's interest in STEM is already leaky in secondary school if not earlier (Heck et al, 2021), driven by gender bias, not academic capability.

There is much published on women's leadership generally, however there is a dearth of research on women within technology which consider the implications of rapid advances in AI and machine learning (Leavy, 2018), particularly in an Irish context. It is recommended that both government, women's advocacy groups and higher education institutes support further academic research on solutions to stem this tide of bias in STEM, at a much earlier intervention and more boldy; time is of the essence.

6.0 Chapter 6: Conclusion

This chapter recaps the findings, evidence, and compelling arguments from both the primary and secondary data to support the case that more women in visible leadership positions matter, that gender bias and prejudices against women are real (Brescoll, Okimoto and Vial, 2018), that incompetent men rise to the top more readily than competent women (Reuben et al, 2012; Chamorro-Premuzic, 2019), that DEI is the right thing to do in a modern, 21st century society and can be the competitive advantage for fast-paced organisations operating in rapidly evolving tech marketplaces (Hideg and Krstic, 2021; McKinsey, 2021). However, to make this a reality for women in leadership, many actors have a role to play, and transparent accountability is key. As we have seen, without transparent accountability, only external optics are met by male CEOs, c-suite and boards; Bonet, Cappelli and Hamori (2020) note the pace and momentum of women progressing through an organisation to the most senior positions ceases once there are one to two women at a visible senior level, indicating women's participation in senior leadership is a choice, the CEOs choice, the boards choice.

Five plus decades of research evidence that women are notably more educated than their male counterparts (Kellerman, 2010; Eagly and Miller, 2016; Sojo et al, 2016; Bonet et al, 2018; Cortland and Kinias, 2019; Fine et al, 2019; Folke and Rickne, 2020). McKinsey (2018) upholds for organizations to move beyond surviving in the 21st century but to thrive, it is integral that senior leadership embed a transformational mindset into their cultures, to secure a competitive advantage, drive client satisfaction, and critically engage employees. Women exhibit key skills which are relevant to 21st century transformational leadership. Chamorro-Premuzic, (2013) cites Alice Eagly's studies which report women typically elicit greater respect and loyalty, communicate vision, mentor and empower followers more deeply, take innovative approaches to problem solving and creative, strategic thinking – all of which are core characteristics of transformational leadership; in contrast the study results indicated male leaders are statistically less likely to relate meaningfully with followers, leading the author to ponder if women's lower participation in visible leadership is more of a reflection of the lack of career obstacles placed in from of men, even incompetent ones. Women do not typically enjoy the same advantages presented by authentic workplace PS, in organisational culture or from leadership yet it appears women's style of leadership maybe a key to unlocking high performance in followers and teams for transformational 21st century organisations. In today's competitive recruitment market, to attract talented women, visible gender equity at executive and board level matters, as an influencing factor for women researching future employers (Madera, 2019).

And still, despite the evidence of the competitive advantage of gender balance, women are unable to break through into senior leadership roles, CEO positions or onto boards in meaningful volume (Eagly and Miller, 2016). Having greater diversity in organisational leadership has also been demonstrated to increase commercial performance and profitability, attract talent, and enhance neurodiversity (Government of Ireland, 2022); to curtail risk of group think. A Peterson Institute for International Economics paper, which surveyed nearly 22,000 firms globally, surmised that female participation in senior corporate leadership (CEO, the board or other c-suite level

roles) mattered to the bottom line; that a shift from zero women up to 30% female representation evidenced a one-percentage increase in net margin, which their studies revealed could translate into a 15% increase in profitability (Noland and Moran, 2016).

Humble CEOs matter in organisational outcomes, with a narrower pay disparity between CEO, executive team and across the wider team, higher team performance and integrated purpose, less ethical scandals and questionable corporate decision making, all driving better organisational performance (Ou, Waldman and Peterson, 2018; Collins, 2001). In a Korn Ferry (2017) study of some fifty-seven women CEO's, forty-one from Fortune 1000 companies and sixteen from large privately held companies, they found that women were humbler than men, that these female CEOs were more likely to empower their teams and leverage others for shared success and engagement to achieve results and much less likely to be a self-promoter; on average these women took 30% longer to earn CEO position through many more promotions than males. Perhaps humility and key characteristics for creating psychological safety were earned on the longer, tougher road to senior leadership for these female CEOs.

Over decades of stalled progress (Joshi et al, 2015), women continue to be marginalised from key leadership participation, which is both a business and an ethical issue (Hideg and Shen, 2019). There appear to be immeasurable obstacles for women compared to noticeably few for men (Chamorro-Premuzic, 2013). Bias to women's diversity in approach to leadership and their displaying traits uncharacteristic to the outdated view of "think manager – think male" (Schein, 1973), prevents women's ambition to succeed and capability be recognised; such that male managers evaluate woman's performance harder and as inferior compared to a male counterpart, despite the women having the skills and abilities necessary as leadership criteria (Szymanska and Rubin, 2018). Critically men, particularly progressive CEOs and board members, must partner on delivering an equal playing field of opportunity and as a principle of a just society, evaluating women fairly. This subject warrants much more research.

Most of the gender and leadership research to date focusses on the obstacles and barriers (Gipson et al, 2017), a limited and diminishing academic research range to date, on exploring solutions, is showing signs of fatigue for resolutely unpacking a way to course correct. Further research is imperative. As a small but contributory body of work to try to uncover answers to this egregious question, this study has sought to explore what elements big or small can contribute to unlocking women's potential to enter key leadership roles, what role PS may play as a solution; if the presence of PS in organisational culture and manager attitudes, can support women's career development and success in becoming senior leaders. It cannot be disputed; women's leadership is in dire straits. Significantly more research is warranted to unearth meaningful and measurable solutions.

"And the authority gap is the mother of all gender gaps. If women aren't taken as seriously as men, they are going to be paid less, promoted less and held back in their careers. They are going to feel less confident and less entitled to success. If we don't do anything about it, the gap between women and men in the public sphere will never disappear."

– Mary Ann Sieghart ((cited in Sieghart, 2021, p.9).

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Appendix A

Information and consent sheet

Dear Participant,

I am inviting you to take part in important research on levels of workplace psychological safety and how they may relate to authority gaps, by completing the following brief survey. This survey is part of the requirement for the completion of my Master of Business Administration at the National College of Ireland. You are eligible to participate if you are 18 years and over, and currently working full-time in an Irish high-tech company.

The focus of the research is to examine how different levels of psychological safety in the workplace may be related to authority gaps in visible leadership roles, using brief self-report questionnaires. This research will help inform the implementation of proactive initiatives to review workplace authority gaps in high-tech organisations and so your input is highly valuable.
The information you provide will be treated with strict confidentiality. The survey does not require any personal, identifiable information (i.e., your name, email address) or any information which can be traced to you and so your participation is anonymous. The data from this study will be held on a password-protected computer, to which only the lead researcher will have access. A report of the study will be produced to meet course requirements and may be submitted for publication, but the data will be analysed on an aggregate level, and no individual participants will be identifiable. Your data may be shared with other researchers if requested after publication. However, there is no identifying information in the data and your responses will be completely anonymous.

Participation in this research is voluntary. You can discontinue the study simply by closing your internet browser window. However, you will be unable to withdraw after completing the study, as the data analysis process may have begun and as all responses are anonymous, we will not be able to identify your data.
The survey will take approximately 12mins to complete. At the conclusion of this study, you will receive further information to inform you about the nature of this research. Should you have any concerns or need clarification at any point, you may reach out to the lead researcher through the following emails: x20146281@student.ncirl.ie (Rebecca Molloy, Lead Researcher); Lynn.Farrell@ncirl.ie (Dr Lynn Farrell, Project Supervisor).

By completing this survey, you are consenting to participate in this study. If you do not wish to participate you can close this internet browser window.

Thank you.
Rebecca Molloy
Lead Researcher.

Appendix B

Questionnaire on Women in leadership: the authority gap and psychological safety in the workplace

1.0 Respondent demographic profile

1. What gender do you identify as? *Mark only one *

- ○ Female
- ○ Male
- ○ Prefer not to say
- ○ Non-binary
- ○ Other...

2. Where is your current home base located? *Mark only one *

- ○ Ireland (Island of Ireland)
- ○ Europe
- ○ Mainland UK
- ○ North America
- ○ Other

3. What is the highest level of education that you have completed? *Mark only one *

- ○ Less than secondary school / high school
- ○ Leaving Cert / A Level / GED or equivalent
- ○ Certificate
- ○ Diploma
- ○ Degree / Higher Diploma
- ○ Masters / Postgraduate Diploma
- ○ PhD

4. Age bracket when graduated, for highest qualification *Mark only one *

- ○ Under 18 years old
- ○ 18-25 years old
- ○ 26-40 years old
- ○ Over 40 years old

5. Are you currently in full time employment? *Mark only one *

- ○ YES
- ○ NO

6. What size is your company *Mark only one *

- ( ) Micro-enterprise: 1 to 9 employees
- ( ) Small enterprise: 10 to 49 employees
- ( ) Medium-sized enterprise: 50 to 249 employees
- ( ) Large enterprise: 250 employees or more

7. Which title best describes your role level? *Mark only one *

- ( ) CEO
- ( ) Senior Vice President / Senior Exec (reporting directly to CEO ie 1 reporting level from CEO)
- ( ) Vice President / Senior Director (no more than 2 reporting levels down from CEO)
- ( ) Director / Head of Function (no more than 3 reporting levels down from CEO)
- ( ) Senior Manager (no more than 4 reporting levels down from CEO)
- ( ) Manager (no more than 5 reporting levels down from CEO)
- ( ) Individual Contributor

8. How many times have you been promoted throughout your career? *

A promotion was defined as a change in more than one of the following: (a) change in offices and/or type of furniture/decor in office(b) significant increases in annual salary(c) qualifying for a company bonus, incentive, or stock plan(d) significant changes in job scope or responsibilities(e) changes in company level

Short answer text

9. Do you work for a technology or high-tech company? *Mark only one *

A high-tech company is defined as an organisation that operates as a SaaS company, is involved in technological innovation, research, and development, may have close scientific and technical partnership relations and high creativity, entrepreneurship, innovativeness, science demand and agility.

- ( ) YES
- ( ) NO

2.0 Psychological safety questionnaire

Psychological Safety (adapted from Edmonston, 1999)

Kindly indicate your agreement or disagreement with the following statements reflecting on your experience working in your current role. Notes: Response range on a seven-point scale ranging from 1 = strongly disagree to 7 = Strongly agree.

Members of this organization are able to bring up problems and tough issues *

	1	2	3	4	5	6	7	
Strongly disagree	○	○	○	○	○	○	○	Strongly agree

People in this organization sometimes reject others for being different *

	1	2	3	4	5	6	7	
Strongly disagree	○	○	○	○	○	○	○	Strongly agree

It is difficult to ask other members of this organization for help *

	1	2	3	4	5	6	7	
Strongly disagree	○	○	○	○	○	○	○	Strongly agree

No one in this organization would deliberately act in a way that undermines my efforts *

	1	2	3	4	5	6	7	
Strongly disagree	○	○	○	○	○	○	○	Strongly agree

Working with members of this organization, my unique skills and talents are valued and utilized *

	1	2	3	4	5	6	7	
Strongly disagree	○	○	○	○	○	○	○	Strongly agree

3.0 The Gender and Authority Measure

In general, I would rather work for a man than for a woman *

	1	2	3	4	5	6	7	
Strongly disagree	○	○	○	○	○	○	○	Strongly agree

If I were having a serious operation, I would have more confidence in a male surgeon *

	1	2	3	4	5	6	7	
Strongly disagree	○	○	○	○	○	○	○	Strongly agree

When it comes to politics, I would rather vote for women than for men *

	1	2	3	4	5	6	7	
Strongly disagree	○	○	○	○	○	○	○	Strongly agree

For most college courses, I prefer a male professor to a female professor *

	1	2	3	4	5	6	7	
Strongly disagree	○	○	○	○	○	○	○	Strongly agree

Personally, I would rather go to a male doctor than a female doctor *

	1	2	3	4	5	6	7	
Strongly disagree	○	○	○	○	○	○	○	Strongly agree

	1	2	3	4	5	6	7	
Strongly disagree	○	○	○	○	○	○	○	Strongly agree

In general, women make better leaders than men do *

	1	2	3	4	5	6	7	
Strongly disagree	○	○	○	○	○	○	○	Strongly agree

In most areas, I would rather take advice from a man than from a woman *

	1	2	3	4	5	6	7	
Strongly disagree	○	○	○	○	○	○	○	Strongly agree

In general, I would rather take orders from a man than from a woman *

	1	2	3	4	5	6	7	
Strongly disagree	○	○	○	○	○	○	○	Strongly agree

If I were being sentenced in court, I would prefer that the judge be a woman *

	1	2	3	4	5	6	7	
Strongly disagree	○	○	○	○	○	○	○	Strongly agree

In general, I feel more comfortable when a man (vs. a woman) is in charge *

	1	2	3	4	5	6	7	
Strongly disagree	○	○	○	○	○	○	○	Strongly agree

4.0 Women in Leadership in the Organisation

How many women in senior leadership positions are there in the company you currently work for? *

A senior leadership role is defined for the purposes of this survey as being one of the following titles / role levels: CEO, Senior Vice President / Senior Exec (reporting directly to CEO ie 1 reporting level from CEO), Vice President / Senior Director (no more than 2 reporting levels down from CEO), Director / Head of Function (no more than 3 reporting levels down from CEO)

Short answer text

What percentage% of senior leadership positions are held by women, in the company you currently work? *

A senior leadership role is defined for the purposes of this survey as being one of the following titles / role levels: CEO, Senior Vice President / Senior Exec (reporting directly to CEO ie 1 reporting level from CEO), Vice President / Senior Director (no more than 2 reporting levels down from CEO), Director / Head of Function (no more than 3 reporting levels down from CEO)

Short answer text

5.0 Perceived opportunities for women's advancement in the Organisation

"Women have sufficient opportunities for promotion in my current workplace?" *

	1	2	3	4	5	6	7	
Strongly disagree	○	○	○	○	○	○	○	Strongly agree

Appendix C

Further information

This study was conducted to examine how different levels of workplace psychological safety may relate to authority gaps. Additionally, we are interested in the relationship between any authority gap bias, the visibility of women in senior leadership positions, career advancement potential and levels of psychological safety in the workplace.

Please click the 'Submit' button at the end of this page to submit your data for inclusion in this study. Again, we wish to reassure you that the information you provided is anonymous and will be treated with strict confidentiality. No individual will be identifiable, all data will be analysed at an aggregate or group-level. If you do not want wish to participate you can close out of this internet browser window. You will be unable to withdraw after completing the study and submitting your responses as the data analysis process may have begun and, as all responses are anonymous, we will not be able to identify your data.

We would like to thank you for your participation. Should you require a follow up or have any further questions, you may reach out to the lead researcher Rebecca Molloy at the following e- mail address: x20146281@student.ncirl.ie

Thank you.

Rebecca Molloy

Lead Researcher.