Maneuvering an IT career: a study of female IT professionals/practitioners from a millennial generation

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Abstract

This thesis responds to prior work that calls for further research with emphasis on non-traditional and non-linear careers, exploring how female IT professionals/practitioners from a millennial generation navigate their working life and their negotiating strategies to counter challenges amplified by other forms of *difference* in a gendered construct; and individual behavior change and (re)construction in line with their work-life changes. This qualitative study is based on in-depth interviews with twenty-five female IT professionals/practitioners from several developed countries and regions, primarily the United Kingdom, European Union members, the United States, and Australia, who work in web design, digital and software development, user interface development, and codes that connect these business units and services in IT organizations. Rather than simplifying women's gender, race/ethnicity, age, place of residence and education levels as mutually exclusive categories of experience and analysis, this study brings women's multifaceted work-life experiences and multiplicity of living into the dialogue, demonstrating millennial women's work-life experience in IT in a more nuanced manner. The analysis reveals millennial women's evolving attitudes toward technology and how it affects their career navigation, which are embedded in their daily work-life experiences as well as their ongoing mixed feelings, emotions, motives, and reflections in pursuit of work independence, belonging, and meaningfulness at/in work. Hence, this thesis contributes to offering new perspectives and fostering alternative discussions behind women's underrepresentation in technology fields.

Individual differences theory of gender and IT has been used as an analytical lens, and the thematic analysis is presented in a way that crosses traditional gendered boundaries in the IT

work field while also translating social constructivist philosophy and inequality regimes through empirical work. Given the inherent gendered nature of IT firms and their essentialist-like rhetoric, I argue that millennial women's agency to mitigate, perceive, compromise, and resist the meanings and connections concerning their subjection is not diminished by power relations in IT and/or knowledge effects on subjectivity. It adds to the existing debates on the gender-technology relationship and the in-between connotations of gender, work-life navigation, and attitudes to technologies, which are no longer static. One of the study's main findings is that women's participation in and growth in the IT culture can perform as a mediator in addressing structural/organizational disparity, which is exacerbated in various types of discriminatory actions against *difference*; while strengthening individuals' capacity to act against, in which it provides a plausible imaginary to promote women's future work in IT. It means that, empirically, this will provide IT practitioners with important mechanisms for fostering gender equity and initiatives to enable more young girls from the millennial generation to engage and thrive in historically male-dominated IT fields.

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Declaration

This work has not been submitted for any other awards, and it is entirely original. I also confirm that this work fully acknowledges opinions, ideas and contributions from the work of others. An ethical clearance for the research presented in this thesis has been approved by the institutional ethics committee on 21/02/2018.

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Table of Contents

List of tables and figures

Chapter One Introduction

1.1 An overview of the research area

Information technology (IT) workplaces are often categorized as knowledge-intensive fields and have historically excluded women and minorities from accessing equal job opportunities in computing and IT, and from participating in the design, development, implementation, installation, and management of cutting-edge technologies (e.g., Armstrong, Riemenschnerder, and Giddens, 2018; Von Hellens, Trauth, and Fisher, 2012; Williams, 2015). Despite the fact that at first glance, women fulfill a variety of skills and qualities in the IT workplace, where men and women appear to play equal and impartial roles, studies have found that women are still outnumbered and outranked in this field (e.g., Kenny and Donnelly, 2020; Tassabehji *et al.*, 2020). According to Kenny and Donnelly (2020), it is evidenced that "only one in six IT specialists in the UK is female" (p. 326). Women hold approximately 26% of IT jobs in the United States and other developed countries (Armstrong, Riemenschnerder, and Giddens, 2018). Such women's underrepresented ratio has been declining over the past two decades (Deloitte, 2020; PwC, 2020a). To align with such a male dominance and gendered structure in the IT workplace, women frequently employ discourses and practices of exerting masculinity in order to fit into the IT structure and be perceived as competent by male peers (e.g., Buse, Bilimoria, and Perelli, 2013; Orser, Riding, and Stanley, 2012). It is also evidenced that women in technology firms have been adapting themselves, even compromising their identity work to some extent to live up to the associated gendered role expectations (e.g., Reid *et al.*, 2010; Rhoton, 2011; Wijayawardena, Wijayawardena, and Samaratunge, 2017). The existing optimism derived from the fact that

information technology creates computing sites and new forms of gender-neutral work (e.g., gig workers) (Kost, Fieseler, and Wong, 2020), makes women's entering non-traditional work domains visible (e.g., Woodfield, 2000). Such optimism is also raised in alignment with new legislative and regulatory frameworks supporting diversity and inclusion policies in the workplace (CIPD, 2020a). Yet varied pressing challenges still exist to achieve gender equality, since there is ample evidence demonstrating women's progress in workplace interactions shows definite signs of radical change to address women's oppression in the IT field.

There is a growing interest in researching the underrepresentation of women in IT, which spans across a variety of disciplines and streams of scholarly work, including careers, gender and technology, management and organization studies, and information system research (e.g., Armstrong, Riemenschneider, and Giddens, 2018; Hari, 2017; Kenny and Donnelly, 2020; Petrucci, 2020; Tassabehji *et al*., 2020; Trauth, 2013; Wajcman, 2010, 2014). Among these studies, there are varied barriers and other social and structural factors that have been documented that may affect women's career entry into IT careers, and the subsequent persistence and advancement in this field (e.g., Armstrong, Riemenschneider, and Giddens, 2018; Hari, 2017; Kenny and Donnelly, 2020; Tassabehji *et al*., 2020). For example, it is recognized that women usually face challenges in those fields of work where male dominance is prevailing and formal in-company mentoring support is limited (e.g., Durbin, Lopes, and Warren, 2020; Germain, Herzog, and Hamilton, 2012, Martin and Barnard, 2013). Existing literature in the field sheds lights on how to explain the underrepresentation of women in IT and women's working life experiences, through mapping gender differences between men and women in IT, and how gendered role expectations and associated social interactions are constructed and performed between different genders (e.g., Trauth, 2013).

Gender differences and competition manifest in such things as individual preferences, career choices, and attributes (e.g., Ahuja *et al.*, 2006; Trauth, 2002, 2011; Trauth, Nielsen, and Von Hellens, 2003; Trauth, Quesenberry, and Yeo, 2008), which are also perceived as fluid, processual, and performative practices (e.g., Mavin and Yusupova, 2021; Raz and Tzruya, 2018). Building upon the theory of structuration, Risman, Froyum, and Scarbrough (2018) provoke an understanding of the iterative relationship between an individual and the respective gender structures of the person involved, which could be used to explain whether women are constrained or liberated in an IT construct. In other words, to focus on the power play between an individual's human agency and organizational structure and adopt this to argue that gender as a social structure constructs social interactions and gender identities and also contributes to the shaping and reshaping of occupations and organizations in a broader context.

It is also worth noting that recent feminist organizational scholarship has expressed an interest in the role of reflexivity in challenging conventional gender ideologies and the discursive construction of 'unproblematic' women in the workplace, including male-dominated fields (e.g., Ahonen *et al.*, 2020; Bell *et al.*, 2020; Gao and Sai, 2020; Gill, Kelan, and Scharff, 2016; Lewis and Simpson, 2017; Ozkazanc-Pan, 2018). It is also acknowledged that women who work in male-dominated occupations face difficulties that are distinct from those who work in more gender-balanced and female-dominated occupations (e.g., Adamson, 2014, 2017; Adamson and Kelan, 2018). These barriers and challenges often influence women's retention and career success. In this study, the researcher explores the challenges these women face as well as how they cope, and initiatives employed despite them. This study adds to the existing debates on the literature of gender relations in contemporary organizations that highlight the dominance of 'masculinity' and 'individualism' (e.g.,

Adamson, 2014, 2017; Lewis, Benschop, and Simpson, 2017; Lewis and Simpson, 2017) – frequently presented as explanations for the systemic gender disparities and inequalities women experience in the workplace.

Following the above discussion, I deeply recognize the social construction of gender. Further, the gender disparity which is pronounced in the IT field is imperative to be considered in investigating the monolithic categorization of men and women in IT (e.g., Kenny and Donnelly, 2020). It is noted that some scholars in sociology and management have been viewing gender as a social structure (e.g., Acker, 1990, 2006, 2012; Martin, 2004; Risman, 2004). Such an approach of integration has been adopted to further investigate and theorize human agency and dominance in organizational settings (e.g., Mader, 2016), where women and men are attached to different social positionality to power dynamics and capital-based resources. In the meantime, the embodied gender and social identities of female IT professionals and identity work are also influenced by these influential factors involved in different constructs; and vice versa, male dominance and hegemonic masculinity also reshape women's changing behavior and performance during their work-life experiences and the nature of work (e.g., Belgorodskiy *et al*., 2012; Berdahl *et al*., 2018). Gendered structure in IT organizations has been used as a theoretical lens in current scholarly work, examining issues such as gender inequality and women's coping and/or compromising behaviors to stay in or opt-out of the IT workplace, and gendering the work-life experiences between men and women in IT firms (e.g., Griffiths and Moore, 2010; Hari, 2017; Kalev, 2018; Kossek, Su, and Wu, 2017). It is also acknowledged that in recent years, women have benefited from the fast-changing technology innovations, manifested in the increased job opportunities such as working with/around digital platforms, boundaryless career choices, and flexibility they are presented within the broader labor market (e.g., Kost, Fieseler, and Wong, 2020), compared

to those occupations where male predominance and obstacles women have encountered are long-standing, such as in science and engineering work settings (e.g., Haas, Koeszegi, and Zedlacher, 2016; Fernando, Cohen, and Duberley, 2018; Smith, Costello, and Wilkinson, 2018). Yet those emerging IT sites and environments where a higher proportion of women's participation are found have not been 'officially' counted under the narrowed categorization of computing and IT in general (e.g., Vitores and Gil-Juárez, 2016). These overlooked IT work settings and professionals include those who work at the intersection of computers and fields like art and design, cognitive sciences, biomedical research, digital media, and so forth. For example, according to Vergés, Cruells, and Hache (2009), more than half of the 302 women they surveyed with technology expertise do not have a degree in a STEM-related area. Similarly, other computer education sites in the social sciences, humanities, art and design, and business studies (where, again, a higher proportion of women participate) are not typically classified as computer education in most published statistics, nor are they the subject of gender and technology studies (Corneliussen, 2012). Thus, the present study responds to prior work that calls for further research with emphasis on these overlooked IT sites where a higher proportion of the female millennials involved, in particular, looking into those interdisciplinary aspects of computing and IT settings where young women learn, work and practice could be located. In doing so, this research provides new perspectives and landscapes behind the underrepresentation of women in the IT profession in general, unveiling the dynamic aspects of millennial women's living and livelihoods in IT visible. It is, on the other hand, neither to undermine nor stop problematizing women's underrepresentation in certain areas of education and employment, such as STEM-related subjects and ICT sectors. However, it is worth noting that among those highly skilled and well-educated women in the IT workforce, they may be aware of the barriers and challenges to gender discrimination and practices of exclusion of women, and thus, they increase their

resilient voices and human agency to seek to break patterns of the existing stereotypical assumptions and norms that marginalize women and minorities in the neoliberal capitalist IT workforce (e.g., McGee, 2018; Petrucci, 2020; Tassabehji e*t al.*, 2020).

Here, I reiterate the research gap which lies upon the problematic nature of the mantra that *there are no women in computing.* There is a need to gain an in-depth understanding of the multiple, sometimes paradoxical reality of what constitutes a female IT professional identity work interlocked with overall work-life experiences and wellbeing, in the context of today's changing nature of the IT market. This also includes playing with the possibility of new subjectivities and analyzing gendered discursive practices that have the power to hold the normative order in technology workplaces. Further, to open up the 'not-yet-known stories' concerning women's exertion of power and agency to challenge the grand narrative in this masculine domain. In doing so, this study broadens and de-massifies perspectives on the essentialist categorization of women in the IT profession.

1.2 Research questions

Gao and Sai (2020) recently reminded us that "the new generation of scholars [needs] to be bold. Don't get stuck in familiar models of gender...In other words, feminist frontiers mark a shift away from a focus on equality to a focus on fostering alternative dialogues that celebrate differences and collective resistance, and address the demands of marginalized, diasporic cultures across national and other borders" (p. 755). Thus, in this research project, in alignment with the above overview of the field of study, I seek to make the realities of the millennial generation of women in IT visible, including those women and minorities who enjoy IT work as well as the struggles, challenges, and subsequent changes in behaviors to

address these various difficulties rupturing in/at everyday working life. In doing so, to explore the changing behaviors of millennial women who work as IT professionals/practitioners by addressing three principal research questions:

First, what attracts millennial women into IT work?

Second, what are the barriers and challenges that women in IT face in their profession (and/or in balancing their professional and personal life?) and what are the underlying reasons?

Third, how do these women in the IT profession navigate and negotiate with these challenges encountered and why?

In addressing these research questions, this research project seeks to contribute to the understanding of how women negotiate and (re)construct the male-dominated working environments in the tech profession genre, and how the postfeminist and neoliberal context shapes this construction. Drawing on in-depth interviews with female IT professionals, who work as software developers, programmers, web and application designers, system operators, and other production IT staff to oversee code releases, I explore issues including masculine norms attached to the computer-related workplace and its impact on women's access to IT careers and further career development, and women's identity work in the IT profession. This research adopts a lens of individual differences of gender and IT to interpret women's living experiences and livelihoods in IT, through which I offer to explain how and why these professional women from a new generation construct (contradictory) discursive accounts to navigate cracking barriers encountered and empower themselves in respective IT constructs. More importantly, to map how these female IT professionals use their agency to challenge the prevailing narrative, which portrays women as less competent than their male counterparts and thus seen as not fit for the IT work environment.

1.3 Overview of this thesis

Chapter Two contextualizes the debate in the field of study, followed by explanations of why research on millennial women in IT matters. I begin with an overview of the research area and women's place in it, based on a preliminary review of the literature around traditional divisions of labor and gendered organizations (e.g., Acker, 1990, 2006, 2012). Millennial women are projected to occupy around 75% of the workforce in 2025 (Noel and Arscott, 2015). In the meantime, there is a growing demand for skilled labor in the IT workforce, and female millennials born between 1980 and 1995 represent a significant and growing portion of this new era of global talent (PwC, 2020a, 2020b). Women in the IT profession need their ranks to closely resemble the work that they do because they make up a significant portion of the workforce and hold a significant role in the digital economy. Yet most statistics indicate that there is a 'leaky pipeline' (e.g., Scott *et al*., 2018), manifested in women's underrepresentation in the IT profession and a slower rising trajectory in the IT employment proportion compared to their male counterparts (e.g., WISE, 2018, 2019). Thus, there is a rising concern for the new generation of women and their future in IT, due to the low proportion of women entering the IT field, and the seemingly high dropout rate during their IT career paths. On the other hand, there are some emerging IT sites and environments where a higher proportion of women's participation is found. However, these sites and professionals involved have not been 'officially' accounted for under the narrowed categorization of computing and IT in general (e.g., Vitores and Gil-Juárez, 2016). These alternative IT opportunities for the new generation of women are emerging at the intersection of information technologies and areas such as art and design, cognitive sciences, biomedical science, new media, etc. Thus, the present study, alternatively, focuses on a few overlooked

IT sites, e.g., those interdisciplinary aspects of computing and IT work settings where a higher proportion of young women learn, work, and practice could be located.

Chapter Three provides an overview of literature around gender, technology and women in IT. Feminist theory has been used to conceptualize women-machinery relationships and contribute to reforming the static relationships between women and technology (e.g., Trauth, 2011, 2013; Wajcman, 2004, 2010, 2014). I summarize three main theoretical perspectives adopted in the existing gender and IT research, followed by relevant studies investigating the underrepresentation of women in the IT profession. Next, various barriers and other influential factors have been documented that may affect women's career entry into IT careers and their subsequent persistence and advancement in this field (e.g., Armstrong, Riemenschneider, and Giddens, 2018; Hari, 2017; Kenny and Donnelly, 2020; Tassabehji *et al*., 2020). For individual IT professionals, it seems inevitable to consider what approaches they can take and in what kind of way in which their human agency could be increased, to make a change and improve their status at work. In this respect, it is worth noting that there are a burgeoning number of varied forms of self-organized, community-based associations that enable female IT professionals to seek a site of training, collaboration, advice, mentorship, and support outside of their workplace. Over time, the postmodern feminist approach has emerged to challenge the entrenched system of patriarchy and hierarchy, that women should not be viewed as a unitary group sharing the same identity. Instead, they could be released from norms and cultural expectations to constantly construct and reconstruct new (and multiple) identities. The shaping and reshaping process may also involve intersectional differences and could be viewed as fluid and performative with the potential and possibility to transform power dynamics, gender relations, and women's empowerment in today's digital society.

Chapter Four details the research methodology and methods adopted to address the research questions, which is the basis for conducting the present study. I start the chapter by outlining and justifying the philosophical position that underpins the study. An inductive, qualitative research design as an approach to explore the living work-life experience of the millennial generation of women in IT is outlined. The epistemological stance that underpins this study is primarily interpretive, and critical epistemology is used as a complement, to unveil how these millennial women challenge the prevailing narrative and seek change against women's oppression in the IT profession. Next, I supply explanations of the sampling approach and interview process, along with reflections on issues encountered during the data collection process. I then move on to discussing the data analysis part, which describes the application of thematic analysis in this study. This is followed by research validity, reliability and ethics.

Chapter Five presents the empirical findings of this research, documenting how these millennial women navigate their working life in the IT profession and their coping strategies to counter challenges amplified by a gendered construct, and individual behavior change and (re)construction in line with their work-life changes. The individual differences theory of gender and IT has been employed as an analytical lens. It encompasses the complexities of the tensions between challenging norms and changing work-life experiences in IT that have yet to be voiced and are considered taboo in neoliberal society. The findings are presented in such a way that they cross traditional organizational and gendered boundaries, as well as translate social constructivist philosophy and inequality regimes through empirical work. The empirical findings also prove the reasons for, and coping strategies associated with their embodied working experience, which further indicates that the millennial women often focus on seeking values of work, meaningfulness, purposes, and inspiration of a combination of working, living and being. I argue that a simplified category of what brings women to enter

the field and what has been compromised for them to stay in the IT profession, either positive or negative, cannot fully explain women's various responses and changing behaviors. By unraveling the multiple realities of those millennial women in IT work and how they navigate across different situations, I can develop a greater appreciation of the ambivalent nature of their ways to cope with and resist male dominance and patriarchal practices during their non-traditional and non-linear working life experience in the IT profession, where contradicted identity work and resilience are fused in a co-existent and co-dependent fashion.

In Chapter Six, I start by summarizing the main findings extracted from the empirical work and discussing how they relate to and extend the current literature in the field of gender and IT research. I bring these findings into an overarching discussion in which I can unveil the multifaceted careers of women in the IT profession from a younger generation and make a multiplicity of their work, living, and being open for discussion. I highlight that subjective work-life experience remains the reality for these women in the IT profession to cope with. In doing so, I explain the ambivalent nature of their ways of constructing paradoxical discourses and practices in technology workplace interactions and their impact on their work-life navigations mediated by social and technological changes. I then move on to discussing the theoretical and empirical contributions of the present research, which arise from the individual differences theory of gender and IT construct, a timely response to the prior work that calls for further research with an emphasis on non-traditional and non-linear careers. In doing so, I contribute to offering new perspectives and fostering alternative discussions behind women's underrepresentation in technology fields. It adds to the current debates on the women-machinery relationship and the in-between connotations of gender, work-life navigation, and attitudes to technologies. I argue that the relationship between gender and technology is no longer static among millennial women. Instead, it alters with the changing

nature of technological capabilities in the context of rapid socio-cultural and economic growth, which further propels an upsurge of women enrolled in computer-related courses and professions. It also alters the way individuals work and live in everyday practices, which aligns with changes in rules and norms about technology enacted and performed. As a result, the shift to non-linear and multiple careers observed among these female IT professionals reflects a change in the meaning and experience of work, which has also manifested in the expansion of gendering work/life balance to seek meaningful work and meaningfulness in/at work.

Moving beyond, I extend the discussion by revisiting the meaning of work and meaningfulness which arise from a person's expectations and perceptions, including self-efficacy and self-esteem, authenticity, belongingness, cultural and interpersonal sensemaking, and purposes. Underlying such drifts is an image of realization that a woman, an IT professional, finds meaning when she is inspired, personally passionate, agentic, and living up to discover one's true desire and talents with care and ethics originated yet beyond self. I conclude the findings and discussion by proposing an alternative future of returning to an ethics of care approach, aligning with the rapid growth of the technology workplace. Constructs that a woman, an IT professional, is likely to encounter, such as intrinsic motivation, work involvement, and community involvement, are strongly linked to her discovering meaningful work and determining the density of meaningfulness. This is also a move to transcend the traditional masculine view of what accounts for meaningful work. Such behavioral and emotional changes manifest among those female millennials who work as IT professionals, further contributing to creating a new ideology and a caring community. However, this is not a sign of a revolutionary uprising of change in terms of power relations in the world of technology and the broader labor market. Rather, a more significant reflexive

criticism is required to rethink epistemological assumptions and problematize the discursive accounts of the role of technology in (re)producing gender (in)equality since it reflects paradoxical continuity and change (e.g., McDowell, 2014). Chapter Seven concludes the thesis by summarizing the present study, reiterating the theoretical and empirical contribution to knowledge. This is followed by the practical implications and limitations of this study.

1.4 Research contribution

This timely inquiry will investigate the experiences of millennial women who work as technology professionals in order to gain a better understanding of the various challenges they encounter and the strategies they employ to stay motivated and persevere; as well as initiatives implemented in these environments to encourage women's education in technology, especially in computer-related fields. In doing so, it makes theoretical and empirical contributions to the field of study. First, my research extends the work of a small number of management and organizational scholars who have documented the trouble women encounter in the gender structure in IT and how this affects behaviors of women in computing and IT sectors (e.g., Hari, 2017; Kenny and Donnelly, 2020; McGee, 2018; Petrucci, 2020; Tassabehji *et al.*, 2020; Vitores and Gil-Juárez, 2016), the application of gendered theory on the persistence and advancement of women in IT careers (e.g., Armstrong, Riemenschneider, and Giddens, 2018; Orser, Riding, and Stanley, 2012; Reid *et al*., 2010; Riemenschneider *et al.*, 2006), and what helps to promote women's career equality and equity for gender diversity and inclusion (e.g., Dennissen, Benschop, and van den Brink, 2019, 2020; Kossek, Su, and Wu, 2017; Panteli, 2012; Panteli and Pen, 2009; Petrucci, 2020; Reid *et al.*, 2008). My research provides new landscapes behind women's underrepresentation in IT fields, making those emerging IT working sites visible where a

higher proportion of women could be found. Added to the above, to make the younger generation of professional women's living experiences and livelihoods visible in the IT workplace. This includes those women and minorities who enjoy IT work and those who encounter various struggles and challenges along the IT career journey. It maps various responses and behaviors of women in the IT professions, in relation to different social, environmental and structural factors that have helped and/or hindered women's entry into and further development in the IT profession. In doing so, this research goes beyond the ingrained epistemological structural inequalities in the existing literature which portray women as less competent in computing and IT work, along with women having limited career prospects in the broader information technology, electronics, and communication sectors. Unveiling the living experiences and changing behaviors of professional women in IT from a younger generation also adds to the the work of a small number of technofeminist and cyberfeminism scholars who have documented the changing women-machinery and gender-technology relationships (e.g., Faludi, 2013; Wajcman, 2004, 2010, 2014). The pursuit of non-linear and non-traditional IT careers by women contributes to contemporary feminist understandings of gendering technology in the workplace, as well as the changing nature of IT work and the gender-technology relationship. The outcomes speak out of those untold stories in this field, revealing women's changing attitudes, ulterior motives, struggles, and coping strategies in their work-life experiences, which are embedded with their on-going mixed feelings, emotions, reflections, and sense making in seeking new meanings of IT work as a group of promising younger IT workers. Thus, this research addresses what is typically left 'unspoken' behind their modern working lives and livelihoods in a more nuanced manner, and adds to the current debates on the monolithic, static gender-technology relationship and the in-between connotations of gender, work-life navigation, and attitudes to technologies. However, this is not an indication of the radical change of power dynamics in the world of IT

work and the broader labor market. Rather, it calls for a more significant reflexive criticism to rethink the epistemological assumptions; to problematize the discursive accounts on the role of technology in reproducing gender inequity and inequality as it reflects continuity and change.

Second, building upon Trauth's (2011, 2013) influential work, this research further incorporates feminist thinking of doing/undoing gender and how gendered interactions are (re)constructed by women in the IT profession genre under contemporary postfeminist and neoliberal cultural norms and organizations (e.g., Gill, Kelan, and Scharff, 2016; Gill and Orgad, 2017; Lewis, 2014; Lewis *et al*., 2019) to understand the site of multiplicity and behaviors of female professionals within different IT constructs while recognizing individual (intersectional) differences. Rather than simplifying women's gender, race, ethnicity, age, place of residence, and educational backgrounds as mutually exclusive categories of experience and analysis, my research brings multifaceted careers and multiplicity of living into the dialogue. In doing so, this study moves beyond the traditional essentialist categorization of gender and technology, which are perceived as fixed variables (Adam, Howcroft, and Richardson, 2004; Trauth, 2014; Venkatesh, Thong, and Xu, 2012). Instead of complying with the exclusion paradigm underpinned by the field of study and the prevailing narrative, my research project explores what makes IT work attractive for millennial women, and women's potential for improving agency while countering against the male dominance in IT work. For example, those self-organized meetups among these professional women in the IT field and community-based IT collectives, whether established in collaboration with local IT companies and/or outside of the workplace, have fused the increased individual agency and collective resistance against women's underrepresentation in IT. Thus, my research

further contributes to promoting more young girls to enter and succeed in such historically male-dominated IT work settings.

Third, this research contributes to providing practitioners in the IT field with important mechanisms which could be incorporated into developing workable strategies to promote gender equality, diversity, and inclusion to ensure the progress and long-term sustainability of various genders and other minorities coexisting in this field without dominance or discrimination. Broadly, the proliferation of information technology and the increased opportunities generated from the emerging digital sites and environments have been marked by an enormous growth in women's participation. Such a change towards accessing more opportunities and work flexibility contributes to women's increased autonomy, mobility, and control in the IT profession. The change is, however, intermeshed with the continuity of gender inequity and inequality. It is manifested in such things as women making up the majority of part-time and temporary workers in this field. Reasons include the deeply ingrained gender norms in IT firms and the promotion of almost exclusive individualism and technical competencies, which align with corporate goals. This also applies to women's employment protocols and role expectations in IT, as manifested in how IT companies organize their human and capital resources and when professional women in the IT workplace act in a way that advances their agency in addressing gendered power relations. On the other hand, it reveals the essential patriarchal and hegemonic male power perpetuated in the IT workplace. Thus, it becomes clear that new technologies may be epistemologically open, but many of their current forms may be gendered in their material relations to existing techniques.

Fourth, there is a widespread emphasis on promoting women to take personal responsibilities, that women can 'have it all' in the IT workplace (e.g., Grinberg, 2012; Sandberg, 2013). However, such emphasis on individualism and autonomy appears contradictory and ultimately undermines feminist strategies of community-based organizing, in which mutual support for social solidarity is prioritized over competition (Hodgson-Wright, 2001). Despite a spike in the volume of women enrolling in computing-related courses and expanded work opportunities in the IT field, women still face occupational gender discrimination in the labor market. Here, I resonate with Irigaray's (1985, 1993, cited in Pullen and Vachhani, 2020) ethics of sexual difference and feminist philosophy, which provokes the view that individuals reshape symbolic positioning through modes of action, to undermine the structure of women's subordination and incorporation and thus resisting repressive and patriarchal gender roles and stereotypes. Taking into account the intrinsic masculine nature and essentialist-like rhetoric of IT firms, I argue that to effectively address women's underrepresentation in IT, it needs to rely on feminist thinking and incorporate its philosophical approach that interrogates the gendered symbolic of an 'ideal worker' image into the traditional career and HR development in this field. In other words, to counter the prevalent, conventional, and normalized gender assumptions that underpin the mainstream theory that explains male dominance in IT.

Fifth, despite qualitative methods being acknowledged for their research values in the broader field of management and organization studies, certain disciplines and fields such as mainstream international business and global human resources management/development are traditionally quantitatively oriented, which are guided by the positivist paradigm and exert a clear preference towards quantitative methodologies and methods (Bell, Kothiyal, and Willmott, 2017). The combination of an interpretive approach and a critical lens could be

employed in future research exploring the complexity of employees' feelings and mixed emotions and their perceptions towards daily interactions in a longitudinal period in the IT field. In this regard, future research can also fill the research gap located in intra-gender leadership interactions among male employees (e.g., resistance or prejudice) and in comparison, to women's perspectives. Any comparable or (in)compatible themes which emerge from future studies could be employed here to logically flow to this area, pinning the importance of understanding women's oppressed situations during career entry and further success in IT, along with the changing actions required from examining those different perspectives.

Chapter Two Understanding the research context and women's place in the context

2.1 Introduction

This chapter contextualizes the debate in the field of study and explains why research on millennial women in IT is needed. I begin with an overview of the research area and women's place in it. This is based on a preliminary review of the literature around traditional divisions of labor and gendered organizations (e.g., Acker, 1990, 2006, 2012). It is evident that there is a growing demand for skilled labor in the IT workforce, and female millennials born between 1980 and 1995 represent a significant and growing portion of this new era of global talent (PwC, 2020b). Millennial women are projected to occupy around 75% of the workforce in 2025 (e.g., Noel and Arscott, 2015). Women in the IT profession need their ranks to closely resemble the work that they do because they make up a significant portion of the workforce and hold a significant role in the digital economy. Most statistics indicate a 'leaky pipeline' (e.g., Scott *et al*., 2018), manifested in women's underrepresentation in the IT profession and a slower rising trajectory in the IT employment proportion compared to their male counterparts (e.g., WISE, 2018, 2019). In the US and many European countries, only around one-third of IT jobs are occupied by women and this proportion has declined during the last decade (Tandon, 2012; Tassabehji *et al.*, 2020). Reasons for causing this disparity include but are not limited to the negative influences of prevailing male norms and gender discrimination in the IT workforce (e.g., Crump, Logan and McIlroy, 2007), and a lack of adequate explanations and sufficient mechanisms or strategies to address the negative consequences of gender inequalities at work (e.g., Adam, Howcroft, and Richardson, 2004; Ridley and Young, 2012). Regarding corporate employment equity, advancement, and diversity strategies, existing studies explain that the relatively low engagement of women in

engineering and advanced technology is, to some extent, due to these initiatives being mostly introduced and undertaken for symbolic reasons (e.g., Haas, Koeszegi and Zedlacher, 2016; Orser, Riding and Stanley, 2012; Powell, Bagilhole and Dainty, 2009). Similarly, it is argued that initiatives to recruit more women into IT careers are not deemed as successful, as women do not stay long after employment (e.g., Kossek, Su, and Wu, 2017; Scott *et al*., 2018). Accordingly, concern is raised about the new generation of women and their future in IT due to the low proportion of women entering the IT field and the seemingly high dropout rate during their IT career paths. Yet there are some emerging IT sites and environments where a higher proportion of women's participation is found. However, these sites and the professionals involved have not been 'officially' accounted for under the narrowed categorization of computing and IT in general (Vitores and Gil-Juárez, 2016). These alternative IT opportunities for the new generation of women are emerging at the intersection of information technologies and areas such as art and design, cognitive sciences, biomedical science, new media, etc. Thus, the present study, alternatively, focuses on a few overlooked IT sites, and in particular, those interdisciplinary aspects of computing and IT work settings where a higher proportion of young women learn, work, and practice could be located.

2.2 Gendered division of labor and women's place in gendered organizations

Feminist organizational scholars mostly understand gender as a social construction process of both masculine and feminine categories, which is based on what attributes and behaviors are culturally appropriate for men and women. In other words, gender is a social construct that relates to the position and/or role that comes with being a man or a woman. It implies two distinct approaches to understanding gender differences within organizational behavior research - gender as biological sex and as a socially constructed stereotype (Trauth, 2002). It

is also worth mentioning that people do not necessarily fall into either of two categories: performing masculinity or performing femininity. An intersex person, for example, is a person who shares physical characteristics with both men and women (Powell, 2018). Transgender people who identify with a sex other than their biological sex group may undergo physical transformations to become members of the sex with which they identify (ibid). In this Ph.D. research, I explore a cognitive explanation for understanding behaviors of female professionals and practitioners in an IT career context. This includes mapping various responses to barriers, challenges encountered and subsequent changing actions to navigate IT careers. Furthermore, to investigate the underlying causes and approaches to overcoming the difficulties encountered, and to investigate women's potential for improving agency while countering against the male dominance in IT work.

Traditional gender roles indicate that men and women have been required to play their roles in society, with women's roles typically aligned with domestic duties, saddling working women with contradictory demands towards the role-set, while working men do not face the same conflict (e.g., Emslie and Hunt, 2009; Eraranta and Kantola, 2016). Occupations are thought to be gender-typed and are usually characterized to men and women based on either a commonly agreed-upon and accepted societal convention of feminine or masculine occupations, or the division of labor which is assumed to be gender-related (e.g., Wilson, 2003). Such bias in cognitive processing of relevant information would drive undesirable workplace outcomes while it could be extremely difficult to control. Gender schemas, on the other hand, are formed at a young age and vary greatly across cultures.

Culture and socialization assign men and women emotional and behavioral roles (Wilson, 2003), which means that men and women are learning to be a man or a woman through

conforming to existing norms. Individuals explore gender appropriateness of conduct as adolescents, either becoming gender conformists by adhering to gender-stereotyped norms that correspond to their sex or becoming gender nonconformists by refusing to be trapped by gender-stereotyped standards (Acker, 2009; Orser, Riding, and Stanley, 2012). A person's job decisions will be affected by these sex stereotypes (Lemons and Parzinger, 2007) because the sex-role socialization process in childhood constantly affects the development of personality for both men and women. Although gender differences are small in childhood, manifested in the phenomenon of that, for example, teenage girls are found to be more concerned with being liked and seem more self-conscious. On the contrary, boys are more concerned with achievement and competence (Wilson, 2003). The emergence of psychological sex differences can be explained by childhood social contexts; for example, women are more rooted in social contexts, while men are more individualistic, and mastery directed. These early developments provide a valuable context for considering the personality variables explored in the relationship between women's achievement and career advancement. For example, research on career aspirations and subject choices has shown that men are more likely to choose subjects that are perceived as masculine (e.g., science) and aspire to do "tough" manual jobs instead of entering the service sector (e.g., Trauth, 2002; Crump, Logan, and McIlroy, 2007). In addition, those men who are more biased and exclusively choose masculine subjects are much more likely to adopt traditional gender-stereotyped standards, subscribing to traditional sex-role norms of performing masculinity; while women do not follow the same pattern (e.g., Wilson, 2003).

Gender inequality is integrated into job design, wage measurement, decision-making and supervisory authority distribution, workplace physical design, and explicit and implicit workplace rules (Acker, 2012). Gender neutrality in organizations is thought to be

contentious, according to Acker's (1990, 2006, 2012) pioneering theory of gendered organizations. Organizations, as per common belief, continue to perpetuate gendered expectations, norms, and working environments. Even though the number of women managers is rising, and companies are implementing more equal opportunity policies, women remain underrepresented in many historically male-dominated occupations (e.g., Germain, Herzog, and Hamilton, 2012). Added to that, in comparison to men who hold technology executive positions, women appear to hold lower-paying jobs and have less formal control and power (e.g., Feyerherm and Vick, 2005). Such manifestations of gender disparity in terms of accessing opportunities between men and women, on the other hand, have remained largely unchanged (Emslie and Hunt, 2009). Working women expect challenging employment and career advancement opportunities, but they are also seen as disadvantaged in the work market, with different skills than men and primary responsibility for family duties. Despite the fact that women already have equal access to higher education in most Western countries, there are still barriers to their advancement into senior management positions, as shown by the fact that women's early career options are markedly underachieved based on their academic records (Germain, Herzog and Hamilton, 2012). Furthermore, women face greater challenges than men in breaking through the glass ceiling and achieving a higher degree of flexibility, autonomy, and agency in order to advance their careers (e.g., Lyness and Heilman, 2006). Why are these stereotypical obstacles still in place? Women are less likely than men to enter male-dominated fields, and they are often more likely than men to leave these fields due to maternity leave or job breaks for caring responsibilities outside of work, such as looking after young children or elderly family members. Yet stereotyping is frequently unrecognized but universally expressed in the workplace, and both women and men are unaware of the extent to which gender role expectations influence their developmental experiences as they advance in their careers.

Thus, gender issues need a fundamental change in values, attitudes, and development, as well as making equity and equality visible in the workplace and shifting people's awareness and perceptions of these issues.

In gender and organization studies, liberal and progressive feminist approaches have been proposed to solve the problem of gender discrimination in the workplace. The *different* approach has been promoted by radical feminism theorists to counter gender discrimination in the workplace. They represent an attempt to interpret materiality and the social environment in order to demonstrate how women's living conditions and livelihoods vary from men's. Panteli and Pen (2009) describe masculinity as a cause of women's facing barriers in IT, as this controls access to resources and power relations between employees of different genders. Accordingly, in the IT workforce, women are pursuing justice and equality by replacing and redefining certain cultural masculinities with more values and attributes associated with femininity. Liberal feminism, on the other hand, advocates for a *sameness* approach to promoting gender equality in the workplace, emphasizing increased women's participation and equal treatment of men and women. However, this theory lacks substantial analysis of why some male-dominated professions and industries are unappealing to women in the first place. Feminist organizational academics have criticized both liberal and radical feminism for treating gender as a static, individual attribute (e.g., Lewis, 2014; Lewis, Benschop, and Simpson, 2017; Mavin and Grandy, 2012). They argue that conceptualizing gender as an individual attribute makes it impossible to illustrate and understand the many manifestations of gender that are socially constructed and processual. Gender, in other words, is performative (Butler, 1990, 2004) and fluid, and an individual's sensibility for performing masculinity and femininity varies across social contexts, organizational settings, and different individual circumstances (e.g., Adamson, 2014; Lewis, 2014; Mavin and Grandy, 2016).

There is ongoing discussion about gender disparities in self-perceptions of capacity, success goals, job engagement, and values in these fields (Bobrowska and Conrad, 2017; Castaño and Webster, 2011; Wilson, 2003). Previous research in attempting to address gender barriers for women to thrive in the technology workplace has focused on identifying either women's choices and career orientations or their differences from men (e.g., Doorewaard, Hendrickx, and Verschuren, 2004; Emslie and Hunt, 2009). There are also some studies looking at what kind of workplace atmosphere will respect women's individual interests and allow them to stay employed for a long time while dealing with traditional masculine traits and financial constraints (e.g., Feyerherm and Vick, 2005; Panteli and Pen, 2009). This discrepancy may be explained by Gottfredson's (2002) theory of circumscription, compromise, and self-creation during career growth stages. Her theory attempts to explain how workplace stereotypes influence young people's career choices. Women, for example, are not permitted to attend or participate in men's clubs. As a result, women have fewer formal and informal opportunities to establish mentoring relationships with men than men (see, for example, Mavin *et al*., 2015). In addition to the above, rumors suggesting sexual relations between a male mentor and a female protégé may theoretically undermine the relationship's subversive existence (e.g., Wilson, 2003). Another factor contributing to women's underrepresentation in male-dominated professions is the importance for women of balancing work and family life (e.g., Eraranta and Kantola, 2016; Hari, 2017; Herman, Lewis, and Humbert, 2013). Female-oriented and neutral occupations, in contrast to male-oriented occupations, may tend to be more versatile. As a result, the gender lens has been incorporated into understanding work and family by focusing on contrasting different styles of how women and men manage work and family across different countries (e.g., Clark, 2000; Gerson, 2004); exploring their experiences and how they view work-family conflict (e.g., Emslie and Hunt, 2009). Previous

research in the field of information technology, for example, has focused on work-family conflict, with findings indicating that women's frustration with domestic demands has a negative effect on job satisfaction and engagement (e.g., Ahuja, 2002). In addition, women consciously adapt their working lives to the various stages of their lives. Work-family tension and balance have different effects on male and female workers, resulting in different career choices about whether to enter and/or maintain employment.

These views, which highlight the stereotypical assumptions about job patterns between men and women, have been criticized by feminist researchers for reproducing gender inequality in the labor market (e.g., Gorbacheva *et al*., 2019; Kelen, 2008; Kenny and Donnelly, 2020; Khilji and Pumroy, 2019). Scholars like Catherine Hakim, who describes women as being forced to choose between two life goals, family or work, are chastised for being trapped in primary care jobs and being treated as homogeneous (Hakim, 2000). In this regard, when examining women's perceptions of living and livelihoods, their complexities, such as their adaptive preferences in reaction to structural gender imbalance and inequality, should be taken into account (Leahy and Doughney, 2014). In this present study, gender is perceived as a social mechanism, in which gender is continuously evolving, fluid, changing, and reconstructed in various ways depending on the ongoing social construction process. Furthermore, feminist organizational scholarship suggests that women have choices, but those choices are constrained and reshaped in their respective constructs, as well as influenced by a variety of social and structural factors.

2.3 Growing demand for skilled labor in the IT field

PwC's (2020b) report on the female millennials born between 1980 and 1995 puts millennial women, a group of younger employees, at the front of the stage, representing a significant and growing portion of the global talent pool. It is projected that in 2025, millennial women will make up around 75% of the workforce (Noel and Arscott, 2015). Despite the fact that women appear to fulfill a variety of skills and qualities in the workforce, where men and women tend to play equal and impartial roles, women are still outnumbered and outranked in a few traditional male-dominated fields, such as science, technology, engineering, and mathematics (STEM). For example, in the UK, women made up approximately seventeen percent of the total STEM workforce (WISE, 2018), with the proportion of women employed in ICT sectors declining over the past decade (WISE, 2019). Women also show a slower rising trajectory in the employment proportion within the STEM workforce compared to their male counterparts. Stansell (2018) defines tech roles as positions requiring knowledge and/or expertise in coding, software, or data. Women hold only twenty-six percent of IT jobs in the United States, and other developed countries (Armstrong, Riemenschnerder, and Giddens, 2018). According to Kenny and Donnelly (2020), in the UK, almost one in every six IT specialists is female. Thus, it is suggested that there is a leaky pipeline (e.g., Scott *et al.*, 2018), in which efforts to recruit more women into IT careers are not deemed successful. Similarly, Tassabehji et al. (2020) also acknowledge that the IT professions recruit a small number of women, but for whatever reason, few of these women, IT professionals and practitioners, stay in IT for long.

Chamberlain (2017) publishes a report that looks the number of job listings for technology employees on Glassdoor, the second most visited job site in the United States, and finds that the proportion of IT jobs has been steadily increasing in non-tech sectors such as retail, finance, and financial services, and manufacturing since 2012. The proportion of IT jobs is

also spreading out from the technology capital, Silicon Valley in the US. It is also interesting to see that the proportion of women in technology has been falling in some sectors, such as computer hardware and aerospace. Another huge shift in hiring IT professionals has also been reported. IT job postings on recruitment websites with 'software' in the job title are rising sharply, such as software developer and software engineering manager. Skilled labor demand appears to be high in certain disciplines, such as STEM, and companies in related fields are looking for top-level IT employees with more experience and soft skills, such as communication and leadership skills, to meet their human resource demand. Vergés, Cruells, and Hache (2009), for example, show that more than half of the 302 women they surveyed with technology expertise do not have a degree in a STEM-related area. Similarly, other computer education sites in the social sciences, humanities, art and design, and business studies (where, again, a higher proportion of women actively engage) are not typically classified as computer education in most official statistics, nor are they the subjects of gender and technology studies (Corneliussen, 2012). Yet those emerging IT sites and environments where a higher proportion of women's participation could be identified are overlooked in existing research that focuses on the narrowed categorization of computing and IT in general. These underestimated IT work environments and practitioners include those who work at the intersection of computers and fields like art and design, cognitive sciences, biomedical research, digital media, and so forth (Vitores and Gil-Juárez, 2016). Further, attracting and retaining skilled female millennials in the IT profession has been recognized as one of the top concerns in the new era of talent (PwC, 2020a, 2020b). It is also reported by Glassdoor (2020) that most efforts at attracting highly skilled workers in today's workforce have been focused on the increased demand for hiring tech-savvy millennial workers rather than experienced seniors. Three primary reasons why millennial women, especially those in their 30s and holding organizational leadership roles, leave organizations have been found (e.g.,

Noel and Arscott, 2015), including the demand for a higher-paying job, the inability to advance in a shortened time period due to a lack of learning and development of skills, and a shortage of meaningful work that would inspire them with a purpose. Added to the above, such a growing demand for skilled and educated labor is aligning with baby boomers (older than 65 years old) retiring (Johns, 2018) and the falling rate of science and technology graduates, which indicates a shrinking corporate pipeline (McKinsey and Company, 2020). This report also documents the slow progress in women's underrepresentation in the past five years (between 2015 and 2020), and such a gap is even larger for women of color and other minorities. Overall, there is a shortage of competitive jobs in the workforce because the global labor market hasn't kept up with the new economy's rapid changes, and their inefficiencies have taken a toll. Thus, it is highlighted that companies need to address the heightened challenges and pressure women encounter in the workplace, and, to better support and promote those women of color and other minority groups of employees in the workplace.

Added to the ageing problem that resulted in the massive retirement of the baby-boomer generation, the majority of the contingent workforce (e.g., gigs, temporary, low-skilled, and part-time based) is filled by women, further complicating women's persistence and career advancement. Although an estimated 30% of the US workforce of 49 million people are freelance, these contingents and/or independent workers have not been well counted and measured in official statistics (Manyika e*t al*., 2016). Jones (2018) reports that a burgeoning number of millennials (74% in the US), intend to have freelance careers rather than work full-time. They intend to become their own bosses, taking charge of their own work schedules, working flexible hours with full-time stability, and nearly half of them plan to leave their job for contractual and/or freelance-based work in the next five years. Another

exploratory study conducted in Canada, which focuses on the retention of highly skilled workers in science and technology from the perspective of distant regional employers, has found that those employers generally think they have merit retention capacity, and they attribute turnover issues to personal reasons or working conditions (Beaudry *et al*., 2014). However, it is suggested that employers generally have no formal or structured strategies or practices for retention. Professional, scientific, and technical services experience the highest growth in both advanced and developing economies. Workers in the field of information technology will, therefore, pose lots of recruitment and professional development problems in the IT workforce. According to Wingard (2019), millennials have been leading the charge in this contingent workforce, which is also known as a group of younger workers pursuing autonomy, flexibility, and fulfillment. Similarly, in Australia, more than half of those gigs and temporary workers are women (Weploy, 2020), and among these workers surveyed, 56.5% are millennials (25-39 years old). It is also worth noting that not all contingent workers are entry or junior level workers, rather, about seventy percent of those gigs and temporary workers surveyed have experience of managing a team, and most of them (55%) have had at least five years of professional experience (ibid). On the other hand, IT firms require highly skilled professionals to fill in technical positions, and they cannot afford to lose critical skilled employees hired on good wages and those individuals trained and developed in-house, implying that companies have invested heavily in their training and human resource development.

2.4 Gender Diversity and Performance

Gender diversity management addresses issues and concerns around inequality and discrimination that women face in the workplace (Georgiadou and Syed, 2021; Kamenou,

2020), and has been closely intertwined and analyzed by the norms and rules of the social construct in which it arises (Damianidou and Georgiadou, 2021). Leading IT firms require a diverse workforce to maintain their competitive technical labor resources across the globe. And instead of suffering from 'groupthink' within homogeneous teams, research shows that employee diversity can improve an organization's bottom line by offering a creative range of thought styles, and therefore, new business solutions could be formed (e.g., Simard *et al.*, 2008). This further suggests that organizational approaches to gender diversity and inclusion, such as employee diversity and inclusive leadership, could be influenced by institutional and social factors, which include but are not limited to policies and regulations on work-life balance, staff education background, and employment circumstances across different countries (Georgiadou, Gonzalez-Perez, and Olivas-Lujan, 2019a, 2019b). Diversity management in organizations encourages scholars and practitioners to challenge the oppressive dimensions of the hierarchical structure and culture that discriminate against otherness, as well as to promote active approaches to addressing discriminatory practices in organizations by embracing and celebrating embodied differentiations (Fotaki and Pullen, 2019). According to Powell's (2018) *Women and Men in Management,* individuals vary in a variety of ways, some of which are changeable, while others may not. Primary aspects of diversity refer to those personal traits which are difficult to amend, with associated long-term implications, and gender is commonly identified as a primary aspect of diversity. Other than gender, race/ethnicity, sexual orientation, age, and physical abilities/disabilities are also referred to as primary aspects of diversity (ibid). Thus, managing diversity in work settings involves challenging hidden norms and patterns of discrimination in organizations through recognizing intersectional differences between gendered, sexed, aged, and racialized bodies. Diversity is beneficial since it leads to enhanced performance within teams and groups, which is evidenced by an improved understanding of tasks, enhanced creativity, and better

use of a variety of skilled workers (e.g., Rigoglioso, 2006). Considering the dynamic aspects of differentiation between individuals in organizational decision-making and problem-solving approaches would contribute to better outcomes for corporates. Margaret A. Neale, a Stanford Graduate School of Business (GSB) Professor of Organizations and Dispute Resolution, once said, and I rephrase the core meaning as: in reality, the worst kind of community for an organization that wants to be innovative and creative is one in which everybody is alike and gets along too well. As such, diversity management in organizing and organizations is regarded as an effective and useful approach to contributing to organizational and tacit knowledge, adding value to the existing stock of ideas, which will further lead to better organizational performance and innovation (e.g., Garib, 2013). What is more, one of the important dimensions of diversity is gender. Thus, it is posited that the explanatory variables linked to gender diversity in high-level managerial and executive positions and enterprise financial performance are derived from cognitive diversity and task conflict benefits that stem from gender diversity.

One important approach to implementing gender equity and equality in organizations is to have a diverse workforce (e.g., Pullen *et al*., 2019), where intersectionality is the site of multiplicity and differentiations between gendered, racialized, aged, and sexed bodies can be recognized and celebrated (Fotaki and Pullen, 2019). Many IT jobs need creativity and problem-solving skills, and the high-tech industry thrives on innovation. Diversity management in organizations could benefit from leadership problem-solving abilities and innovation, in which the subject remains one of the top corporate self-interests. This is, to some extent, because having a diverse skilled workforce would be helpful to meet an organization's goals and demands for top personnel by achieving a better person-organization fit (e.g., Kristof-Brown and Billsberry, 2013), in which neurodiverse individuals further fuel

the driving force of IT organizations. However, when it comes to providing equal opportunities for women in the IT workforce, most statistics indicate that male-dominated IT organizations lag significantly behind those in other sectors (e.g., Kenny and Donnelly, 2020). Simard et al. (2008) report that men are 2.7 times more likely than women to hold high-level management or executive roles in the technology field. In comparison to their male counterparts, women seem to have a stronger preference for working with others and helping others (e.g., Diekman *et al.*, 2010; McCarty, Monteith, and Kaiser, 2014), and having a diverse workforce could be of help for these women to thrive and achieve their full potential in their IT careers. Such a gap of gender disparity becomes even larger among those women of color and other minorities. For instance, according to the Chartered Institute for IT (BCS, 2020a), the proportion of black women's participation in the field across the UK is only about one percent (0.7%) as of 2020. Only 11% of IT directors are from ethnic minority backgrounds (BCS, 2020b). In 2020, there will be more women than ever filling IT roles in the UK. They still make up only 20% of the whole IT workforce (BCS, 2020c). Across North America, it is also identified that there is a lack of diversity and inclusion in the technology ecosystem, with women making up less than 15% of executive-level positions in technology fields (e.g., Lemons and Parzinger, 2007; Scott *et al*., 2018). Thus, diversity management in the IT field has become an urgent issue to be addressed at a national level (Scott *et al*., 2018).

The behavior of an organization in terms of gender diversity management demonstrates its socialized predispositions and, as a result, the social attitudes directed at various groups or individuals (Syed and Özbilgin, 2009). As so many IT jobs entail creativity and problem-solving, the high-tech industry can stay competitive by driving innovation. Given that diversity is more important and advantageous for problem-solving and innovation tasks than for more routine tasks (Orser, Riding, and Stanley, 2012), gender diversity in IT teams can

benefit from distinguishing between the different types of tasks performed. Members of IT teams may initially experience low group integration, long-term group cohesiveness, and group identification due to perceived intersectional differences between gendered, racialized, aged, and sexualized bodies. This may further lead to lower group performance and satisfaction. More importantly, those women who are in the middle stages of their careers in IT work are extremely valuable to tech businesses. As such, gender diversity remains an important driving force of technology enterprise performance, and thus, IT organizations must manage it effectively to reap the benefits. Yet issues of concern have been acknowledged concerning structural barriers women encounter in their progression stages to advance up the career ladder in IT firms (e.g., Simard *et al*., 2008). Accordingly, there is a potential loss of creativity, knowledge, and skills, and this would ultimately affect an IT firm's organizational performance.

In 2008, Stanford University's Anita Borg Institute for Women and Technology and the Clayman Institute for Gender Research conducted a pioneering study of female scientists and engineers at publicly traded Silicon Valley high-tech companies ranging in scale from mid-to-large. This attempt is to further implement radical changes to promote gender equality and break the "glass ceiling" for those skilled women in technology looking to progress further on their technical ladders. According to the report, the standard gender ratio in a technical company is 79 percent men and 21 percent women, with the gender gap widening with rank. Senior and executive positions are three times more likely for men than for women. The study also proposes systemic strategies for the retention and development of technical women based on empirical evidence (Simard *et al.*, 2008). Nevertheless, women in the IT profession remain significantly under-represented in both advanced and developing economies. Specifically, while their presence in managerial positions is increasing, there are overtly

under-represented women working in information technology and information systems, which manifest gender segregation and gender inequalities such as pay gaps, remain distressingly evident (Crump, Logan, and McIlroy, 2007; McDowell, 2014).

Chapter Three Identifying the various factors that influence women's career choices and advancement in the IT field

3.1 Introduction

The main aim of this chapter is to provide a detailed review of the theoretical and empirical literature on gender and technology, with a focus on identifying the various factors that may influence women's career choices and advancement in the IT field. The primary purpose of this study is to gain a deeper understanding of the working life experiences of female millennials in the IT profession. Instead of adhering to the entrenched 'ideal worker' philosophies and practices of IT firms, this research project explores women's potential for improving agency while countering male dominance in IT work. Opening up millennial women's career experiences in the IT profession is an approach to speak out about those overlooked aspects and stories in this field, and in doing so, this study further addresses what is typically left 'unsaid' behind their 'modern' working lives and livelihoods. More specifically, the following research questions would be answered in this research (which are also outlined in Chapter One Introduction):

RQ1: What attracts millennial women into IT work?
RQ2: What are the barriers and challenges that women in IT face in their profession (and/or in balancing their professional and personal life?) and what are the underlying reasons?
RQ3: How do these women in the IT profession navigate and negotiate with these challenges encountered and why?

There is a growing number of studies investigating women's underrepresentation in broader STEM fields in recent years (e.g., Armstrong, Riemenschneider, and Giddens, 2018; Hari, 2017; Fernando, Cohen, and Duberley, 2018; Kenny and Donnelly, 2020; Makarem and Wang, 2019; Tassabehji *et al*., 2020). Among these studies, there are various barriers and other influential factors that have been documented that may affect women's career entry into IT careers and their subsequent persistence and advancement in this field (e.g., Armstrong, Riemenschneider and Giddens, 2018; Hari, 2017; Kenny and Donnelly, 2020; Tassabehji *et al*., 2020). A review of existing literature in the field of gender and technology research helps to lay out a theoretical foundation for this present study. It includes a review of different theoretical perspectives introduced in researching gender and technology, and in doing so, I developed an understanding of the issue of women's underrepresentation in technology-related fields. To extend, I explored possible reasons that have been contributing to this underrepresentation, along with key findings and practical suggestions to advance women's careers in the IT field proposed by other scholars. This review process also helps to reiterate the research gap in the field of study, as well as to further justify the use of research methods to approach and address the above research questions. This chapter contains two main sections: First, a review of the different feminist movements and the associated theoretical underpinnings adopted in the field of gender and IT research. This is followed by critical discussions on the use of different theoretical perspectives in existing gender and IT studies. Second, a review of the literature on women in the IT workforce is provided, with a focus on studies concerning women's underrepresentation in the IT field and their livelihoods in a career context. This chapter is organized as follows:

To present a theoretical foundation upon which this research would be based, I start this chapter by outlining three dominant theoretical perspectives that are adopted in the field of

study, namely, the essentialist perspective, the social construction perspective, and the individual differences perspective on gender and IT. This part is followed by a rationale that is supplied to justify the theoretical perspective and relevant theory adopted for this research. Next, I move on to summarizing different factors that influence women's career choices, development, and advancement in the IT field, followed by critical discussions on varied factors based on existing literature in the field of study. This chapter ends with a justification of why this present research is needed.

3.2 Three waves of feminist movements and associated effect on women and technology debate

Starting from the definition of feminism, which is raised by Kvasny and Chong (2006) as "a set of social theories and political practices that are critical of past and current social relations that privilege men as a group. Feminism involves the promotion of women's rights, and the belief that men and women should be politically, economically, and socially equal" (p. 1171). Feminist literature has been offering a variety of methods, viewpoints, and theories to approach matters of equality, diversity, and inclusion and has not been developed in complete chronological order. There are also overlapping forms manifested in these streams of feminism, such as liberal, socialist, Marxist, essentialist, and postmodern feminism, etc. Yet together, these feminist theories offer conceptual frameworks that could be used to investigate the underlying reasons for women's oppressed status in the workforce and the broader society, as well as seek radical changes against the oppression and, thus, towards gender equality.

It is acknowledged that there are three trending feminism waves that occurred in the past (Enns and Sinacore, 2002). The first wave has occurred from 1830 to 1920, which focuses on equal legal rights for women by challenging and changing the entrenched legal system in society. From the mid-1960s through the mid-1980s, the second wave mainly concentrated on advancing liberal feminism, socialist/Marxist, and radical feminism to confront gendered oppression. The third wave has occurred since the 1990s, which promotes more forms of gendered liberation by bringing a variety of contemporary perspectives (Enns and Sinacore, 2002), including women of color, homosexuals, global citizens, and members of generation X (born between the mid-1960s and the early-1980s). Scholarly debate on women's underrepresentation (and exclusion) in the technology field started in the 1970s. This has occurred in tandem with the world's rapidly evolving technological change and the feminism waves mentioned above (Wajcman, 2004). Together, such a new space promotes feminist scholars to start exploring the gender-technology relationship and start understanding why women are being excluded from the technology field. Next, an overview of the trending feminism approaches applied in gender and technology research is outlined, namely, liberal feminism, socialist feminism, and postmodern feminism. These theoretical foundations form the basis of the theory of individual difference of gender and IT, which is employed as the principal theoretical guide for this present study.

Over a decade ago, Wajcman (2004, 2007, 2010) built a strong case for bringing feminist perspectives into social science debates about technology. In the past, different streams of feminism have been introduced to conceptualize the relationship between gender and technology. For example, liberal feminism, socialist feminism, and feminist standpoint theory are all attempts to conceptualize the relationship between gender and technology. Since entering the 21st century, this field of study tends to be blooming with postmodern feminist

theory, which focuses on the reciprocal shaping of gender and technology, in which technology is conceptualized as both a source and a consequence of gender relations (Wajcman, 2010). Beddoes and Borrego (2011) argue that feminist theory is critical in exposing these deep-seated gender issues. Sprague (2005) also urges potential research to ask questions focused on women's perspectives rather than questions that favor dominant social roles and institutions. The following provides an overview of feminist approaches to gender and technology studies.

3.2.1 Liberal feminism

Liberal feminism emerged out of the oppressed status of women in society, which manifested in women's receiving unjust discrimination (Jaggar, 1983). Thus, liberal feminism promotes gendered equality by stating that men and women should be entitled to receive the same rights. Liberal feminism holds the view that women's oppression in society is primarily due to gendered socialization, a process that defines what is a man's role and what is a woman's role. To elaborate, a man's social role is more closely linked to social status and power, which is based on masculine attributes such as competitiveness and efficiency, whereas a woman's social role is more closely linked to domestic and family traits such as caring and nurturing. Accordingly, liberal feminist scholars seek to make changes to women's oppression by demanding equal rights for everyone without discrimination based on sex (e.g., Rosser, 2006). Women, it is argued, should have the same natural rights as men to make productive individual decisions, engage in the same resources and social contracts, and be treated equally (Enns and Sinacore, 2002). This approach emerges during the second feminism wave, which focuses on removing barriers for women to address the issue of gender imbalance, which is evidenced in the unequal division of the labor market (e.g.,

Lorber, 2010). Analysis of such an equal division of labor markets (e.g., Britain and the States) illustrates both gender-related vertical and horizontal segregation. Women are concentrated in the lower echelons of higher-status occupations from a vertical perspective, while from a horizontal perspective, women are concentrated in the lower echelons of skills affiliation and less work effort-required occupations (Branaman, 2011; Gorman and Kmec, 2007). It is also clear that occupational segregation arose from comparisons between important gender-based characteristics, such as caring, which is a stereotypically feminine trait, or domestic associations, such as housekeeping, which are seen as normal extensions of womanhood (e.g., Fine, 2010), rather than involving skilled labor or competencies. Accordingly, since part-time work does not reflect the masculinized pattern of full-time employment, the prevalence of women as primary caregivers in the home encourages more part-time work, which is devalued (e.g., Hersch, 2006). In return, it does devalue the content and the status of such work, with limited prospects to advance women's careers to top positions (Branaman, 2011). As a result, occupational concentration and discrimination fuel the social devaluation of feminine characteristics, which has become inextricably connected to women's socioeconomic activities.

When applying liberal feminism thinking to the technology field, liberal feminists focus on addressing the gender imbalance by removing the barrier of women's not being given equal access to employment opportunities and issues of discrimination. Hence, liberal feminists made a case for getting more women into the science and technology fields from the 1970s to the 1980s (Wajcman, 2007). For instance, they highlight the need to encourage more women to enter the science and technology field through such as getting more women enrolled in computing courses, and in doing so, to promote equal access for women to enter the IT field and have a career after their relevant studies (Griffiths and Moore, 2006). Further, they

recognize the barriers women encounter in the field that have caused a relatively high drop-out rate of women in IT jobs (e.g., Rosser, 2006). Thus, it is worth noting that liberal feminists have been making a great effort to promote equal access for women to enter the IT field while contributing to the persistence of women in the IT profession. Yet, despite the effort to address the underrepresentation of women in IT, liberal feminism has been questioned for seeing technology as neutral, and thus, the approach does not address the underlying reasons that caused such inequality between men and women in the IT workforce. In other words, liberal feminism does not question the shaping and reshaping process of the technology field as a male domain. Rather, they attribute the underrepresentation of women in IT to the lack of their participation and engagement in the field of study, and thus, women are not able to recognize and reach their potential in IT jobs like their male counterparts. According to Wajcman (2007), "liberal feminist tradition located the problem in women (their socialization, their aspirations, and values) and did not ask the broader questions of whether and in what way technoscience and its institutions could be reshaped to accommodate women" (p. 289). In this sense, it is not surprising that women are being asked to change and, to some extent, compromise their gender identities to fit a masculine image in the IT field. On the other hand, women are perceived as unfit or unsuitable to work in the IT field, and in a nutshell, the IT workplace is not the right place for women. Such stereotypical assumptions are strongly embedded in the male IT culture, which requires long hours of work, high levels of competitiveness, and other expectations at work. These assumptions shed light on how many forms of masculinity contribute to a patriarchal, even sexist culture, that has left women in an ambivalent position in the IT profession (e.g., Armstrong, Riemenschneider and Giddens, 2018; Tassabehji *et al.*, 2020). Next, during the 1980s, the socialist feminism stream complements the drawbacks of liberal feminism and moves the scholarly debate forward by analyzing the gendered nature of technology (Wajcman, 2007).

3.2.2 Socialist feminism

During the 1970s, the term "socialist feminism" was coined to describe a combination of progressive and Marxist viewpoints that claimed women's inequality was caused by gender, class, and race differences in a larger social, political, and economic context. To elaborate, radical feminism posits that the fundamental reason behind women's oppression is deeply embedded in patriarchy, a term which has been used to describe the "masculine projects of the domination and control of women and nature" (Wajcman, 1991, p. 17). It means that social interactions and relations are constantly constructed by male power and privileged values in society. Furthermore, Wajcman (2010) claims that this genre distinguishes gender differences by power difference between men and women which manifests in patriarchal institutions such as science and military units, seeing women's culture and pleasure being controlled and dominated by men. On the other hand, men, according to Marxist feminism, are the ruling class, and the dominant ideology is male (Ratliff, 2006a). It takes a capitalist approach to women's oppression, which means that capitalism privileges men's ruling class and position in society, while women are situated as subordinate to them. Thus, Marxist feminists have been promoting a balanced resource-based distribution because they perceive such an approach could be of help for more women to utilize these resources (Rosser, 2005, 2006).

Harding (2004) develops the feminist standpoint theory, which has been used to investigate the connections between information creation and power practices, building on the insights of the Marxist and radical feminism. The use of this theory involves the varied experiences of women by taking factors such as gender, race, and class into consideration over the process

of creating knowledge (Harding, 2004). It marks a pursuit of interpreting materiality and the social world in a unique way, as this theory points out that women's experiences of living and livelihoods are different from men's. Taking these experiences into analysis means bringing the sexual division of labor into the scholarly debate, such as women's unbalanced domestic, unpaid, and emotional labor, as well as other social work compared to men (e.g., Ratliff, 2006a).

In the field of gender and technology research, the feminist standpoint theory has been applied to analyze the relationships between women and technology (Wajcman, 2004). Transcending the liberal feminism approach, which focuses on promoting equal access to technology for women, socialist feminists emphasize the gendered nature of technology, and thus, they focus on analyzing the underlying reasons for this gendered nature. In other words, socialist feminism sees masculinity as inherent in the machinery itself, stressing technology's role as the main source of male power. Feminist analysis in the field of gender and technology involves male designs on technology and moves beyond technological determinism by incorporating the process from gender-blind to gender-aware in technology (e.g., Wajcman, 2004, 2007). In Wajcman's (1991) *Feminism Confronts Technology*, she argues that technology is more than a set of artefacts; instead, technology itself is a "cultural product which is historically constituted by certain sorts of knowledge and social practices as well as other forms of representation" (p. 159). She brings technology into the analysis as social artefacts, recognizing the technology itself has been shaped and reshaped by gendered relations and meanings. These artefacts are neither neutral nor worthless and these gendered relations and meanings are materialized in technologies, manifested in technology design and use, which are constituted by male power and thus, excluding women. Thus, Wajcman (2004) argues against technology determinism, claiming that it is the feminist politics, rather than

technology, that make a difference to the women-machine relationship. Her argument is based upon her perception that the gender-technology relationship and gender identities are constructed and reconstructed during the process of social interactions, and other changing contextual factors that may have an impact during the construction process. For instance, back in the early days, "girls often have more responsibilities at home, and girls' extracurricular activities are generally much more restricted than boys" (Wajcman, 1991, p. 154). These stereotypical values attached to gender roles also play a part in contributing to the masculine image of technology, which requires women "to forsake their femininity" (ibid, p. 19) to enter the field. It is also believed that the gendered division of labor under capitalism and patriarchy further propels the establishment of societal norms, with men specializing in paid work with technological skills while women, on the contrary, specialize in unpaid domestic work with a lower need for technological skills (Brayton, 2006). The public and private spheres have been divided, with the public sphere including patriarchal institutions historically dominated by men, and the private sphere including patriarchal institutions traditionally dominated by women. Yet women's livelihoods seem to be constrained by domestic work and are perceived as technologically incompetent and lacking productivity. In other words, under capitalism, organizational behaviors and practices are often seen as more compatible with traditional masculine value orientations (e.g., aggressiveness, competition, high ranks, and control) than taking stereotypical feminine value orientations (e.g., care, sensitivity) into account fairly. It is not surprising, then, that men from a dominant group of authority and hierarchy wield more social power than women, particularly women from marginalized and/or minority groups (e.g., Acker, 2006, 2012), and thus perpetuate the status inequality between men and women (Acker, 1990, 2006, 2009).

Both liberal feminism and socialist feminism have laid out the theoretical foundations in the field of gender and technology research. These scholarly discussions contribute to the understanding of women's oppression and underrepresentation in the technology field. Further, these discussions contribute to the ongoing debates about the nature of the women-technology relationship and attitudes toward technologies. These discussions provide an examination of the gendered nature of technology, which is infused with epistemological structural inequalities based on power dynamics and privileged values. Furthermore, the in-between connotations of masculinity, femininity, and technology have been brought into analysis of the gendered nature of technology, which portrays women as less competent in computing technology. Along with the third feminism wave, there is a growing trend of feminist scholars criticizing the feminist standpoint theory's essentialist, dualistic and deterministic thinking (e.g., Ratliff, 2006b). Rather, it is proposed that future studies avoid focusing exclusively on women "as victims of patriarchy" (e.g., Greenhill and Wilson, 2005, p. 158-159), while treating them as historical artefacts. Added to that, Ratliff (2006b) problematizes the feminist standpoint theory for its tendency to distinguish between men's and women's behavior, seeing women as a universal group without taking into consideration differences among women's experiences. Such a view implies that not all men are competent with technology, nor do women find technology incompatible with their lives. Postmodern feminism and post-structuralism have emerged during the third wave, offering a new approach to analyzing gender as a performative, fluid, changing process (e.g., Butler, 1990; Lorber, 2001). According to Lorber (2001), postmodern feminism challenges the categorization of gender, which is "dual, oppositional, and fixed...instead [of] that sexuality and gender are shifting, fluid, multiple categories" (p. 32). Similarly, Wajcman (2009) also contends that rather than thinking of feminism as a single entity, we need to perceive and understand feminism as multiple, complex, and in a constant state of change. Thus, there is a

growing number of studies researching the intersectional differences among women for the purposes of promoting diversity and inclusion in the workplace. For instance, to explore the possibilities of women's empowerment along with third-wave feminism and the development of the digital era, particularly within those traditional male-dominated realms. Next, an overview of the postmodern feminism and post-structuralism that contribute to the empowerment of women in the technology field and the changing gender relations is provided.

3.2.3 Postmodern feminism

Postfeminist, described here as a sensibility characterized by a collection of entangled and conflicting discourses about feminism and femininity (Gill, 2007), is a critical context that influences the (re)configuration of contemporary feminine subjectivities significantly (Gill, 2007; Gill and Scharff, 2011; McRobbie, 2009; Negra, 2009). It places women as active and motivated agents while also replacing the feminist ideal of a collective struggle with a "regime of personal responsibility" (McRobbie, 2009, p. 19), putting individual responsibility for success or failure on the table and ignoring systemic concerns. It is acknowledged that postmodern, post-structural, and critical theories are used to refer to the same thing, yet sometimes these terms are used in different ways (e.g., Gannon and Davis, 2012). Generally, the use of this approach would argue against a universal truth, emphasizing that knowledge and reality are situated in varied discourses. Butler (1992) once wrote about how the vantage point embracing those characterizations could affect feminist research and writing:

> *"A number of positions are ascribed to postmodernism, as if it were the kind of thing that could be the bearer of a set of positions: discourse is all there is, as if discourse*

> *were some kind of monistic stuff out of which all things are composed; the subject is dead, I can never say "I" again; there is no reality, only representations. These characterizations are variously imputed to postmodernism or poststructuralism, which are conflated with each other and sometimes understood as an indiscriminate assemblage of French feminism, deconstruction…and cultural studies"* (p. 4).

The common reality manifested in these labels is constituted by language, which is perceived as "the place where our sense of ourselves, our subjectivity, is constructed" (Weedon, 1997, p. 21). Such understanding of the postmodern feminism approach contributes to the view that women are not perceived as a universal fixed group sharing one unitary truth. In other words, not all women in society share the same oppression in their lives and livelihoods (e.g., Ratliff, 2006b). Resonated with the above Butler's (1992) statement, Lorber (2005) also points out that when postmodern feminism applies, the research "examines the ways societies create beliefs about gender at any time with discourses embedded in cultural representations or texts" (p. 269). Thus, postmodern feminism provokes the view that gender is discursively (re)shaped in a process in which the process is performative and fluid. Yet in mainstream thinking, the logic of how people know the truth and reality through language and discourse is centered on binary thoughts, such as men and women, the rational and emotions/feelings, hard and soft, cool and hot, etc. These manifestations of binary thoughts are deeply ingrained in the entrenched patriarchy and hierarchy in society, constraining and limiting ways of thinking as oppositional. Similarly, the categorization of gender, which has been understood in binary terms, has positioned masculinity as a privileged trait, while femininity has been positioned as an inferior trait (Wajcman, 2010). Thus, the binaries that are embedded in relations of power play contribute to maintaining the status quo of women's oppression in society.

The neoliberal context, which is characterized as a mode of governmentality exercised through discourses that expand and disseminate market values into social spheres and behaviors (Brown, 2003), is also important to investigate because it works to re-establish worker subjectivities - our sense of self as good workers (e.g., Adamson, 2017). Following Gill's (2007) argument that the postfeminist subject is at least partially constituted by neoliberalism, it is proposed that examining both contexts is directly relevant to our theorization of how and, more importantly, why particular ways of femininity in organizational settings come to be seen as more or less desirable in contemporary developed western economies. Nonetheless, mainstream gender and IT research appears to be too entwined with essentialist ideologies, which, through its male-dominated environment and masculine interaction culture, discourage women's participation and success in it.

Butler's (1990) pioneering work on gender and sexuality argues that gender, which houses identity, is performative, processual, and shaped by language. Gender is defined by her as:

> *"Gender is the repeated stylization of the body, a set of repeated acts within a highly rigid regulatory frame that congeal over time to produce the appearance of substance, of a natural sort of being. A political genealogy of gender ontologies, if it is successful, will deconstruct the substantive appearance of gender into its constitutive acts and locate and account for those acts within the compulsory frames set by the various forces that police the social appearance of gender"* (Butler, 1990, p. 33).

Butler's conceptualization of gender further promotes the postmodern feminism approach to moving beyond these binary and fixed categories of perceptions such as gender, heteronormativity, and biological determinism (Hesse-Biber, 2012), instead emphasizing the site of the multiplicity of the body embedded in social norms and a variety of discourses. Accordingly, postmodern feminists provoke and further strengthen the view that women are not unified as a unitary group sharing a universal gender identity. Rather, women are sites of creating, often multiple, identities and subjectivities, and they are released from fixed labels, social norms, and cultural expectations (e.g., Butler, 1997a, 1997b, 2004).

In the field of gender and technology research, Haraway's (1985) influential work, *A Manifesto for Cyborgs: Science, Technology, and Socialist Feminism,* introduces the metaphor 'cyborg' to challenge the static and monolithic culture of science and technology. Instead, it is believed that the entrenched categorization's boundaries between women and machines are no longer stable in science and technology culture. As a result, the cyborg figure provides a new perspective on the gender-technology relationship, allowing both men and women to be liberated from those binaries and subsequent expectations. Further, the cyborg figure also rejects the thought of viewing and analyzing women as a singular category and its attached unitary identity (e.g., Brayton, 2006). When the postmodern feminism approach applies in the field of gender and IT research, scholars would usually criticize the thought of gender essentialism as well as machinery determinism that situates women as 'unfit' in IT (e.g., Wajcman, 2010). Rather, they see the relationship between gender and technology as fluid, processual, and contextual. Thus, women are suggested to be viewed as having different and unique identities influenced by varied factors, and there is no unitary action or behavior attached to seemingly universal femininity. According to Brayton (2006), this allows for the reinterpretation of social inequalities and the formation of new identities

from multiplicities where women can be fused with technology. Such a claim also indicates that there is no universal research application or agenda for studying gender, technology, and women-technology relationships for the purposes of rectifying women's oppression and achieving equality for symbolic reasons. Rather, it is encouraged that future research in the field of gender and technology could engage with the site of the multiplicity of women's bodies and further insights on strategies that women could utilize to break down barriers encountered in IT (e.g., Rosser, 2005; Wajcman, 2010). Thus, this present research brings intersectional differences among a group of millennial women in the IT workforce, including various reactions towards issues of gender, age, ethnicity, sexuality, place of residence, and other influential factors into the analysis of gender, technology, and gender-technology relationships, instead of viewing women as a whole.

In contrast to the liberal and socialist feminism approaches, which see women as victims in a patriarchal and capitalist society, postmodern feminism offers a vision of possibilities of what technologies could offer in terms of empowering women. Thus, the postmodern feminism approach seeks to explore how frontier technologies could possibly lead to radical changes in the monolithic and static gender relations in technology (e.g., Wajcman, 2010, 2014). This contemporary approach sees gender, technology, and gender-technology relationships as subjects that could be changed, redeveloped, and transformed over time. According to Wajcman (2010), gender power relations will be affected by technological change, which will then shape gender relations. One of the strands of postmodern feminism in technology studies is known as cyberfeminism - an optimistic, almost utopian vision in which web/Internet-based technology creates a new space with unlimited freedom (e.g., Wajcman, 2004). To explain, a cyber feminist's belief lies in the potential of cyberspace, along with the increased discussion of Internet connectivity and virtual community, where people can

rebuild the missing parts of connectivity and community in modern society. This approach opens new opportunities for women who could benefit from the new forms of technology, that make their social and interpersonal ties in cyberspace possible. These new opportunities further contribute to changing how women interact and intertwine with technology and other aspects of their daily life, as well as cultural change in the field of technology. As such, moving beyond the social construction of technology as masculine, postmodern feminists emphasize the potential of IT, e.g., computing capabilities, in alleviating the effects of gender bias and discrimination (Wajcman, 2009), resulting from gender essentialism and biological determinism. In doing so, they are seeking radical changes to liberate and empower women in the digital era. Yet, techno feminism has also been questioned as to whether it is a feminist utopia or a dystopia. According to Brayton (2006), they are criticized for being abstract and unrelated to the socio-cultural differences that result in women's varying levels of access to and participation in technology and cyberspace. It is not surprising that such a critique against the postmodern feminism approach would have arisen, considering the reality that not every woman in the world has the same and/or equal access to cyberspace, infrastructure, education in technology, economic and social power, etc.

In the field of gender and IT research, the use of the socialist feminist approach enables researchers to map out the barriers that women encounter in this field of study, and the adoption of liberal and postmodern feminist approaches enables researchers to further contribute to addressing the underrepresentation of women in IT and narrow the gender gap between men and women within this workforce. Next, I move onto discussing the impact of these threads of feminism in the use of analyzing and conceptualizing the connotations of gender and IT relations.

3.3 Theoretical perspectives in gender and technology research

The choice and application of gender and technology theories is a major concern when attempting to explain the underrepresentation of women in the male-dominated technological workforce and to address the gender gap. Gender is typically an overlooked area of study and lacks theorizations within the body of gender and IT analysis in the wider field of management and organization studies (e.g., Armstrong, Riemenschneider, and Giddens, 2018; Gupta, 2015; Hari, 2017; McGee, 2018; Tassabehji *et al.*, 2020; Trauth, 2002, 2011, 2013; Trauth and Howcroft, 2006; Trauth, Nielsen, and Von Hellens, 2003). According to Tauth's (2006) classification of such under theorization of gender theory development in the field of gender and IT studies, there are three main categories, which are pre-theoretical, implicit-theoretical, and insufficient-theoretical studies. The term 'pre-theoretical' generally refers to gender and IT studies that lack a theory to direct the research project's conceptualization or inform data collection and analysis. Rather, the emphasis is usually on collecting and providing statistical data about the gaps in technology adoption, use, and participation in the IT profession between men and women (Trauth, 2006). In the field of gender and information technology research, an implicit-theoretical study refers to a type of research that, while not specifically articulating a theory, is influenced by a theory-in-use, such as the theory of inherent differences (ibid). The lack of clear discussion of theory makes it impossible for others to analyze, challenge, or expand the analysis. This approach is considered a form of under theorization. The insufficient-theoretical study in the field of gender and IT research, on the other hand, does complement the former types discussed by introducing an explicit theory-in-use, yet it usually lacks a comprehensive exploration of the gender-technology relationships which vary between different genders in the career context (e.g., Trauth and Niederman, 2006; Trauth, Quesenberry, and Huang, 2009).

A majority of the literature employs feminist theorizing, building on sociological and philosophical approaches, and suggests strategies for examining gender in technology organizations. Three dominant theoretical perspectives on gender and IT are reflected in the existing literature: the essentialist perspective, the social construction perspective, and the individual differences perspective on gender and IT (e.g., Chen, Mora, and Kemis, 2017; Trauth, 2002, 2011, 2013; Trauth, Nielsen, and Von Hellens, 2003). From those viewpoints, the living experiences of women in the IT field can be extrapolated to generate key themes. To summarize, the essentialist perspective focuses on the stereotypical assumptions based upon inherent biological differences between men and women, while the social construction perspective focuses on the process of that gender being socially constructed, which is based upon the mainstream social orders to learn to perform as a man or a woman. The individual differences perspective focuses on intersectional differences among women's subjective experiences in the field of information technology, which is also known as recognizing the subjective uniqueness from different perspectives. Following that, I provide an overview of the three most common theoretical viewpoints used in the field of gender and information technology studies.

The assertion of set, consolidated, and opposed women's and men's natures is known as essentialism (Wajcman, 1991, 2004). This viewpoint has spawned research on gender and technology. Under a positivist epistemology, gender is seen as a fixed variable that can be manipulated. By contrast, when employed in the technology domain, this essentialist perspective relies and focuses on biological intrinsic differences between men and women to justify differences in their relationship to technology and, by inference, women's involvement in the technology profession, without considering contextual factors. It is acknowledged that there is an on-going debate among organizational scholars who hold

feminist values about biology and destiny in which essentialism has been playing a part for a long time (e.g., Adamson, 2014, 2017; Adamson and Kelan, 2018; Cundiff and Vescio, 2016; Rotternberg, 2014, 2018; Tassabehji *et al.*, 2020). Men, as a group, are influenced by the utility of technology and make decisions about using technology based on different criteria than women, while women are influenced by social factors (Chen, Mora, and Kemis, 2017). According to this viewpoint on gender inequality in the technology profession, women and men should be viewed differently. Mentors, for example, may want to take different approaches when teaching men versus women (Venkatesh and Morris, 2000); and, by extension, business owners may want to plan different marketing strategies for men versus women. From this point of view, it is reasonable to conclude that there are two distinct workforces in the technology sector: a 'women in technology' workforce and a 'men in technology' workforce. Indeed, "the very definition of technology is cast in terms of male activities. We tend to think about technology in terms of industrial machinery and cars … The history of technology still represents the prototype inventor as [a] male" (Wajcman, 2004, p. 15). Therefore, it is not surprising that policies and practices for addressing the gender disparity in the workplace are almost exclusively focused on the ingrained inherent differences between women and men.

While the social construction viewpoint contends that relying exclusively on biological differences is inadequate to fully understand women's situations and relationships with technology, the impact of socio-cultural and economic influences must also be considered and investigated. The social construction theory, when applied to the technology area, describes how the social shaping of technology as male interacts with the social construction of gender in a way that pushes the technology sector beyond the domain of women (Trauth, 2002). By inference, the social construction of the technology profession as men's work plays

a role in women's participation in the field (Crump, Logan, and Mcllroy, 2007), without considering the role of individual differences among women. According to this viewpoint, women who address their under-representation status in technology may develop coping strategies in an attempt to fit into this 'male domain' or in an attempt to reconstruct the technology realm to become more of a 'female domain'. This approach is represented by Webster (1996), who reflects on the social shaping of gender identity while dissolving systemic differences between men and women at work and their relationships to technology, both of which have implications for women's relationships to workplace technologies. However, this perspective fails to examine individual differences among women, as there are many different types of women, rather than discussing the structural essence of sexual division in professions and technology at the group level.

Both the essentialist and social construction theories have been criticized for a few shortcomings in their assumptions, such as a lack of an empirical context to adequately describe women's roles and relationships in the technology workforce and a perception of gender and technology as fixed variables operating at the group level. Therefore, exploring and further discussing gender issues in the technology field from the viewpoint of a presumed woman is problematic because there are no universal women and women do not form a community with the same characteristics or attributes, such as origins, beliefs, attitudes, etc., but rather differentiate by class, race, sexual orientation, culture, and geographic location, etc (Trauth, Quesenberry, and Huang, 2008, 2009; Trauth, Quesenberry, and Yeo, 2008). Accordingly, the individual differences theory of gender and IT based on the theory of feminist standpoints as a new alternative theoretical foundation has emerged (Trauth, 2011, 2013). Individual differences theory of gender and IT enquires into how gender and the IT profession are socially shaped on an individual level (see Table 1). From the perspective of

individual differences, women have different socio-cultural factors that shape their involvement in IT constructs in various ways. That is, women as individuals are exposed to a range of socio-cultural factors that shape their attitudes and responses to social shaping in unique and individual ways, while it analyzes women at the group level (e.g., gender). As a result, the individual differences theory of gender and information technology acts as a modern conceptual paradigm for research in the field of gender and information technology.

Table 1: Individual differences theory of gender and IT constructs (adapted from Trauth, 2013)

High-level Construct	**Sub-category Construct**
Personal data	· Personal demographics (e.g., age, race, ethnicity) · Lifestyle (e.g., socio-economic class, parental background) · Workplace (e.g., job title, technical level)
Shaping and influencing factors	· Personal characteristics (e.g., educational background, personality traits/abilities) · Personal influences (e.g., mentors, role models, experiences with technology)
Environmental context	· Cultural attitudes and values (e.g., attitudes about high-tech and/or women) · Geographic data (e.g., location of work) · Economic and policy data (e.g., about the region of work)

The individual differences theory of gender and IT construct embraces intersectional differences among women and perceives them as individuals who have engaged with various influential factors in the IT profession. These influential factors are embedded in different social and cultural contexts where women constitute their multiple subjectivities and realities. Furthermore, these influential factors have constantly reshaped women's attitudes, engagement, persistence, and advancement in the IT profession in different ways (Trauth, 2011). Thus, the individual differences theory of gender and IT construct focuses on exploring the shaping and reshaping processes of different individuals who have been affected by different influential factors in their respective social and cultural contexts, which contains investigations into their intersectional differences and varied responses towards issues of gender, technology, and gender-technology relationships. In doing so, this conceptual framework traverses the essentialist and social construction perspectives by taking into account the intersectional differences among individuals, such as personal attributes, environmental factors, and other influential factors, to get a comprehensive understanding of women's living experiences and livelihoods in the IT workforce. To elaborate further on the adoption of this theoretical framework in the field of gender and IT studies, the differences within genders have been put into the spotlight, rather than between genders (e.g., Trauth and Quesenberry, 2007), manifested in seeing a woman in the IT profession as an individual who contains varied and distinct capabilities, competencies, and skills, and investigating women's responses to the fluid shaping and reshaping process "in a variety of individual ways" (Trauth, 2002, p. 103). These varied and distinct responses, in turn, would further affect women's participation, persistence, and advancement in the IT profession.

In the field of gender and IT research, the individual differences theory of gender and IT bridges the connections between different feminist approaches, including liberal feminism, socialist feminism, and postmodern feminism, discussed earlier. Trauth (2011) writes that:

> *"Consistent with liberal feminism, it is concerned with removing gender barriers to equal access. But it relates to socialist feminism's recognition of gender along with class as societal factors that explain the social shaping of technology and technology professions. The recognition in the individual differences theory of gender and IT on individual characteristics and experiences aligns it with feminist standpoint theory which emphasizes the situated knowledge of marginalized individuals. The influence of postmodern and poststructuralist feminism are evidenced in the recognition that women do not all speak with a unified voice"* (p. 577).

As such, this theoretical framing holds those constructs where women's agency and individual differences are constituted among men and women in the IT workplace accountable. In these constructs, women are influenced and reshaped in different ways, and in return, they react to the social shaping process in the male IT domain and navigate their working life in a variety of individual ways. Collectively, these constructs offer lenses to provide explanations to further understand women's work-life experiences in the IT profession and gender-technology relationships. This is because this theoretical framing considers the various influential factors that may facilitate or hinder women's participation, persistence, and advancement in IT career paths. Thus, the individual differences theory of gender and IT serves as the theoretical framework to guide addressing the three principal research questions and the following analysis in this present study. It also facilitates knowledge generation by examining the lived experiences of women in the IT workforce.

3.4 IT workforce as highly gendered: Masculine gender substructure and gender subtext in IT

Fields of engineering technology are mainly categorized as knowledge-intensive sectors and may have been referred to as ‘a man’s world’ (Watts, 2007). Engineering culture, for example, is marked by competition and individualism, as well as being sexualized and gendered (e.g., Hatmaker, 2013). Despite the fact that women perform a broad range of skills and attributes in the IT workplace, where men and women tend to play neutral and impartial roles, studies have shown that in order to fit in and be regarded as competent by male colleagues, women often employ masculine discourses and practices (Hass, Koeszegi, and Zedlacher, 2016) to fit into the male-dominated work culture (Hatmaker, 2013). While the twentieth century was marked by women entering non-traditional work domains and new legislative and regulatory structures promoting work-life balance, and the twenty-first century was also marked by women entering non-traditional work domains (Wallace, 2014), there is still plenty of proof of misogyny, gendered philosophies and values, and inequality in different industries, indicating that women’s advancement in workplace experiences is slowing.

The significant decrease of women dropping out of IT-related subjects at school and university has resulted in a low ratio of women in computing, electronics, and communications occupations in the United Kingdom, large parts of Europe, and Australia, as shown in a majority of Western countries (Vitores and Gil-Juárez, 2016). Meanwhile, Eastern Europe’s IT industry has been more equitable than Western Europe’s; for example, Bulgaria has the most gender-balanced IT workforce in the country, with the largest proportion of female tech employees in the Eastern Bloc at 27% (compared to 18 percent in the UK) (The

Calvert Journal, 2019). The fact that a socialist tradition positions women as having workplace liberation is at the center of state ideology. Added to that, the continuous investment in a modern education system, resulting in many outreach initiatives manifested in such things as technology related courses and programs, has helped the growth of women in the technology sector. The finding that the field of technology has a masculine image, predominantly male-preserving attributes, is in line with evidence from previous studies in ICT-related industries in other countries (e.g., Miller *et al.*, 2000; Crump, Logan, and Mcllroy, 2007; Watanabe, Naveed, and Neittaanmäki, 2017). On the contrary, research from emerging economies such as Malaysia reveals that women dominate computer science, and coding and programming are perceived as women-friendly careers, with men unwilling to compete for these roles (Mellström, 2009). Part of the reason is due to the intensive etherification of Malaysia's post-colonial culture, in which nationalist discourse and politics have almost become obsessed with modernity through technological progress and its implications for higher education. Socialist women have long been expected to lead towards scientific breakthroughs and, thus, they have become role models for a new generation. According to Gupta (2015), since high-tech jobs are office-based and require only mental, rather than physical strength, they are considered healthy for women. As a result, women are a promising group to encourage to enter the IT sector. Similarly, in the Philippines, according to another report, women make up 30% of the Philippine Computer Society, and their presence in the IT industry has not devalued their status (Salomo-Akpdeonu, 2005). It is not regarded as socially alienating; rather, its connection with technology does not appear to be a concern, and technical professionals are regarded as appropriate for women, and women in technology further fuel the supply of skilled labor demand. More women need to see and understand this, especially those who have been put off by stereotypical assumptions that working with technology is an emotionless, mechanical, and masculine profession. The

culture of technology seems to be changing, yet the masculine work role expectations still impose difficulties and challenges for women in technical work rather than the fact that they are a numerical minority.

To explain gender disparity at work implies being separate and unequal. Gender disparity is built into job design, pay determination, decision-making and supervisory power distribution, workplace physical design, and explicit and implicit rules for workplace conduct, according to Acker (2012). Thus, the assumption of gender neutrality in organizations is contradictory. The division of labor, cultural symbols, workplace relationships, individual identities, and organizational logic are five mechanisms that organizations continuously employ to perpetuate gendered environments, perceptions, and norms. Given the lack of studies that go beyond treating gender and technology as methodological parameters, as well as contradictions in workplace gender-related research, Acker (2012) invites researchers to investigate transformations in gendered organizations under current economic and social conditions. In a highly gendered environment where gendered subtext is evident and socially established job expectations vary between men and women, Acker (2012) stresses the importance of disentangling gender role expectations. Further, the established socio-cultural relationship between male power and technology, as well as the gendered working identities of women, needs to be investigated (e.g., Powell, Bagilhole, and Dainty, 2009). Thus, it is suggested that gender and technology studies could undertake more in-depth study into masculinity and femininity arrangements in a postfeminist and neoliberal context. Thus, in exploring the living experiences of women in the IT profession, I seek to explore how women categorize the relational dependence that is interconnected in the gendering of technology, or the technology of gendering. It is argued that gender and technology ties are often profoundly rooted in contemporary socio-cultural contexts, shaping information and technology usage,

design, and development, as well as gender and technology co-production. In this study, it draws upon earlier closely related work (e.g., Denissen, 2010; Hari, 2017; Kyriakidou, 2012; Moore *et al*., 2008; Pilgeram, 2007; Watts, 2007; Williams, Muller and Kilanski, 2012; Wijayawardena, Wijayawardena, and Samaratunge, 2017), however, it is distinct in how it attempts to empirically explore various aspects of contemporary socio-culture in developed Western society and the younger workforce in order to demonstrate how gendering work identities and the changing relationship between gender and technology are being embedded and shaped in a postfeminist and neoliberal sense. I point to the problematic nature of the mantra that *there are no women in computing,* instead highlighting the need to understand who is being marginalized in gender-IT relations and what is being overlooked for women in the IT profession. This includes playing with the possibility of new subjectivities and analyzing gendered discursive practices that have the power to hold the normative order in technology workplaces. Further, to open up the 'not-yet-known stories' concerning women's exertion of power and agency to challenge the grand narrative in this masculine domain. As a result, this study broadens and de-massifies perspectives on the essentialist categorization of women in the IT profession.

3.4.1 Women, influential factors and IT career

Existing literature has documented a variety of factors that may affect women's entry into IT careers and their subsequent persistence and advancement in IT careers (e.g., Ahuja, 2002; Armstrong and Riemenschneider, 2014; Armstrong, Riemenschneider, and Giddens, 2018). In particular, Ahuja's (2002) influential work on conceptualizing women's barriers and challenges women encountered at three different career stages, which refers to their career choice, persistence, and advancement in the IT field (see Figure 1). According to Ahuja

(2002), social and structural factors affect women's three separate career stages in IT: preference, persistence, and advancement. At the stage of career choice in IT, Ahuja (2002) states that "career choices are made during university education" and defines career choice as the "likelihood that a woman will choose IT as a career" (p. 22). The social factors identified that contain social expectations and work-family conflict will affect women's career choice and persistence in IT. Social expectations usually refer to the perceptions and biased views in a society, which further contribute to the shaping of society's stereotypical assumptions and expectations for women (Armstrong, Riemenschneider, and Giddens, 2018). Where there is a difference between different spheres, where the demands of women's participation in one sphere are incompatible with demands in another, work-family conflict is likely to arise. (ibid). The IT occupational culture, lack of role models, informal networks, lack of mentors, and institutional structure were also found to be systemic factors. Her propositions include that women's career choice and retention in an IT career will be affected by structural factors such as occupational culture and a lack of role models, while women's persistence and progression in an IT career will be particularly influenced by a lack of networks, mentors, and institutional structure. She defines career persistence as the "likelihood of not dropping out of the workforce" (Ahuja, 2002, p. 22), and "when the job status and salary become yardsticks of one's overall career performance it is the likelihood that a woman will advance in her career in the field of IT" (ibid, p. 22-23). Ahuja's (2002) gendered theory of IT career stages sheds some light on the present study, despite its dualistic and hypothetical nature. This is because their propositions associated with social and structural factors provide a parametric model of possible barriers that women may encounter during their career stages in IT, which ranges from career choice to persistence and advancement in the IT field. Findings from the exploratory investigation in this study will further extend debates on the in-between connotations of gender identity work in the IT field and the gender-technology relationship

and foster alternative discussions on women's underrepresentation in the IT field. Next, I briefly introduce Ahuja's (2002) influential model (see Figure 1) and propositions (see Table 2), along with a summary of other studies that have referenced her model, with a focus on investigating various factors that contribute to the underrepresentation and exclusion of women in IT from three different career stages.

Figure 1 A model of social and structural factors influencing women's career choice, persistence, and advancement in IT (adapted from Ahuja's (2002, p. 23) original model)

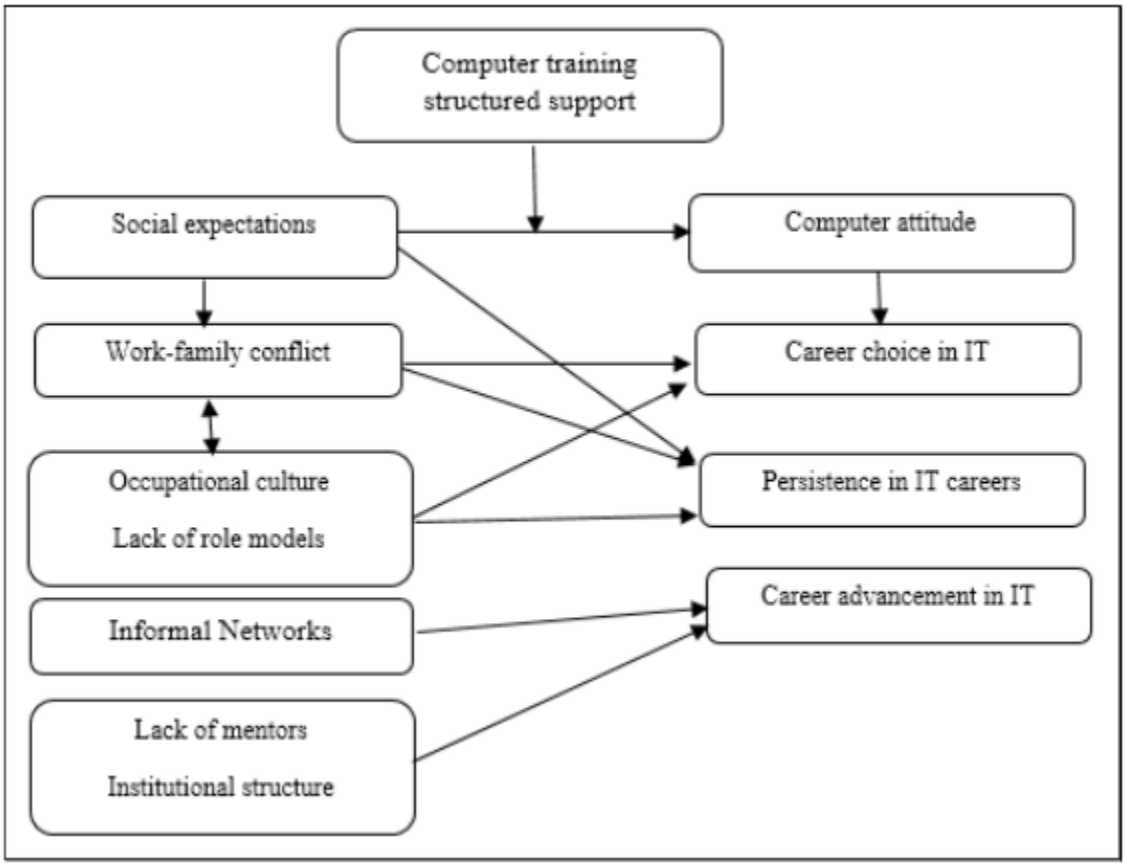


Table 2: The effects of the social and structural factors (adapted from Ahuja's (2002) model of social and structural determinants of women's career choice, persistence, and advancement in IT careers)

Independent variables	Proposition
Social factors	
Social expectations	Social expectations will negatively influence women's attitudes to IT and their use of technology.
	Women's attitudes to technology and their use of technology will negatively affect their IT career choices.
	Social expectations will negatively influence women's' persistence in IT careers.
Work–family conflict	Work–family conflict will negatively influence women's career choice in IT.
	Work–family conflict will negatively influence women's persistence in IT careers.
	Women in IT careers will experience a higher level work-family conflict than men.
Informal network	A lack of informal networks will negatively influence women's career advancement in IT.
Structural factors	
Occupational culture	Perceived occupational culture will negatively influence women's career choice in IT.
	Perceived occupational culture will negatively influence women's persistence in IT careers.
Lack of role models	Lack of role models will negatively influence women's career choice in IT.
	Lack of role models will negatively influence women's persistence in IT careers.
Lack of mentors	Lack of mentors will negatively influence women's career advancement in IT.
Institutional structure	Institutional structures will negatively influence women's career advancement in IT.

Despite Ahuja's (2002) influential model having been referenced widely, as reflected in both the Web of Science and Google Scholar, there is a lack of empirical studies validating this model comprehensively in the field of study, and there is also limited theory building based upon her model. It is worth noting that the recent extension of Ahuja's (2002) model by Armstrong, Riemenschneider, and Giddens (2018) initiates a small portion of new propositions on reimagining the impact of social and structural factors on women's persistence and advancement in IT professions. These propositions are based on the premise that social factors such as social norms and work-family conflict have a negative effect on women's IT career development, implying that there seems to be a change in emphasis such that work-family conflict does not have as strong an impact on whether a woman stays in IT as Ahuja's original propositions suggested. Rather, social factors can have a significant impact on women's advancing prospects in IT. Within the structural factor, they also identify that institutional/organizational structure can have a significant negative effect on women's IT persistence, a relationship that Ahuja did not propose. One of the main barriers that women in IT careers encounter is identified as gender discrimination (e.g., Adya, 2008; Allen *et al.*, 2006; Allen, Reid, and Riemenschneider, 2004; Armstrong *et al.*, 2007; Armstrong *et*

al., 2012; Reid *et al.,* 2010; Riemenschneider *et al.,* 2006). For instance, Adya's (2008) research findings reveal that American women in IT careers have experienced greater gender stereotyping and discrimination in comparison to South Asian women. She concludes that gender is culturally constituted and continues to influence South Asian women even though they migrate to a different culture. Another study of the barriers women in IT encounter concludes that ageism and a lack of respect are key barriers of concern (Allen *et al*., 2006). Further, according to Reid et al.'s (2010) findings in a comparison of men and women concerning their respective understandings of issues of gender discrimination, they conclude that men perceive these issues and/or barriers related to gender discrimination that women encounter in the IT field as too superficial.

There are several studies investigating gender differences and comparisons at work with a focusing lens on social factors such as work-family conflict and balance (e.g., Armstrong *et al*., 2007; Baral and Bhargava, 2011; Gorbacheva *et al*., 2016; Long, Segala, and Laidlaw, 2016; Quesenberry, Trauth, and Morgan, 2006). For example, female IT professionals in South Africa speak about gender differences and comparisons based upon perceptions of how they could divide their time dedicated to work (e.g., Long, Segala, and Laidlaw, 2016), saying that "being a currency exclusive to men as they were portrayed to be more flexible with time" (p. 7349). Similarly, Armstrong et al. (2007), who have also found that women in IT see their work and family as an interlocking system of time, stress, work, and family. Thus, it is concluded that successfully managing these interwoven links across the varied demands of different domains would be of help for women to enter, progress, and stay longer in the IT profession.

Another theme that emerged in those relevant studies that have referenced Ahuja's (2002) model is the gendering of work. For example, it is evidenced that many of the professional positions in technology are filled by men, e.g., systems architects, while women mostly hold softer positions, e.g., project management (e.g., Crump, Logan, and Mcllroy, 2007; Joseph *et al*., 2012). It is within the ingrained gender role expectations perpetuating such gendering of work, where men are believed to be better in technical, mathematical, and analytical aspects such as programming and algorithm development, which are more valued in the IT workplace (Joseph *et al*., 2012). On the contrary, women are believed to be better in human-related perspectives of everyday work and skills such as communication, coordination, and providing support, which is under-valued against the patriarchal and masculine standards in the IT workplace. Further, other influential factors are identified in the relevant literature when it comes to barriers and challenges women encounter in IT careers. This includes the IT work environment, understandings of exclusion (e.g., Adikaram and Wijayawardena, 2015; Wentling and Thomas, 2009), and the negative influence of the above factors on women in IT careers (e.g., Orser, Riding, and Stanley, 2012). Such influences of barriers and challenges perceived further shape and reshape women's response strategy in the technology field. For example, it is found that women in Sri Lanka working in IT firms are heavily skewed towards a man's world, where women are constantly required to prove themselves to their male counterparts, resulting in gender identities being compromised (Adikaram and Wijayawardena, 2015; Wijayawardena, Wijewardena, and Samaratunge, 2017). Such manifestations of women's abilities and competencies being undermined in a gendered IT organization could also, to some extent, seek explanations via person-environment (P-E) fit theories, which attribute individuals' choices of the work environment and jobs to their corresponding values and goals to achieve a better P-E fit (Nye *et al.*, 2012), which, in turn, leads to better job performance, career advancement, and satisfaction (Kenny and Donnelly,

2020). According to Wentling and Thomas (2009), who have found that the IT culture is competitive and restrains women from advancing and developing further in the U.S. IT field. Thus, an inclusive, supportive organizational culture could be of help to address the issues of concern, yet it is believed that the IT work environment is perceived as exclusionary and unsupportive to women, which is manifested in many other scholars' perceptions of the IT work environment as a negative influential factor constraining women's career advancement (e.g., Crump, Logan, and Mcllroy, 2007; Trauth, Quesenberry, and Huang, 2009).

It is also worth noting that Gallivan's (2004) study shows different but interesting results, based on a quantitative study of the gender differences in career advancement in the IT profession in the U.S., also regarding Ahuja's (2002) model. It is concluded that there is no relationship found between gender and perceptions of levels of technical or non-technical skills, which are usually perceived as mandatory criteria for career progression in the field. Another study, also conducted in the U.S. IT field, reports that fairness in accessing career advancement opportunities is found to positively affect job satisfaction for both women and men (Kim, 2009). This study aims to investigate multiple aspects of what constitutes female millennials' maneuvering an IT career and the stories of them, in which the exploring process will include the discovery of individual differences in women's attitudes to technologies, challenges and barriers encountered, work-life navigation, coping behaviors, etc.

3.5 Changing demands in addressing gendered interactions at IT work

Male dominance, in terms of power relations, ensures the continuation of hegemonic practices in workplace interactions and decision-making processes, which further contributes to women's participation in technology-related occupations being constrained (Hari, 2017).

Women are more likely to have intuitive and preconceived conceptions about what it looks like and future obstacles to pursuing a career in a male-dominated discipline in a culture exacerbated by traditional societal expectations of 'male' and 'female' professions (e.g., Hirshfield, 2010; McGee, 2018). The conventional theories are inadequate to resolve the problems and difficulties that women in IT face, where their career paths are often regarded as essentialized and therefore deviant from the male norm (Bierema, 2016). Essentialism is a cognitive bias based on gender assumptions and rooted in a patriarchal system and culture. It assumes inaccurate and outrageous perceptions of how women act in institutions in the absence of changes and individual differences. Women's career development and progression have been described as deviations from the standard, in comparison to men's more commonly linear and upward trajectories. As a result, it is clear that women face challenges, and female business heroes in such environments provide essentializing strategies such as *Lean in* (Sandberg, 2013) to achieve career success. However, it is being criticized as pseudo feminism because it reinforces the gendered hierarchy in companies and marginalizes women subtly (e.g., Adamson and Kelan, 2018).

Another stereotypical assumption women face is that they are the family's ideal caregivers, while men remain at work as the breadwinners. This is an old stereotype that is increasingly evolving due to societal perceptions of the ideal worker, who is committed to the company, has masculine attributes, and is a man (Bierema, 2016). Women are still held responsible for the household and children, and their loyalty and integrity are often challenged when they start a family. When it comes to women in leadership positions, the situation is exacerbated because they are required to balance all facets of their lives, including families, children, and jobs (Adamson and Kelan, 2018). This indicates that for women to oversee a combination of high-demand IT work, the family remains an obstacle. The gendered disadvantage in the

workplace is not limited to having a job; it also has a substantial effect on women's career growth opportunities in the IT sector. In the technology workplace, informal patriarchal behavior expresses itself in traditional male-female gender role expectations. These expectations mirror masculine characteristics such as competitiveness, toughness, aggression, individualism, mission orientation, technological competence, and goal-orientation (e.g., Kelan, 2008). As a result, women are more likely to be under stress than men, who find the masculine essence of technical work more enjoyable. This rhetoric also influences how people recognize attributions of gendered discrimination that women experience in the workplace during pregnancy and how they are unable to return to their former position after maternity leave (e.g., Cundiff and Vescio, 2016). Possible reasons to explain this are relative to the previous work-life balance discourses, in which the use of 'choice' and 'individualized' ignores the reality of power relations and conflicting interests in workplace interactions (e.g., Todd and Binns, 2013). In *The Rise of Neoliberal Feminism*, Catherine Rottenberg (2018) illustrates that the core logics of balance discourses are ideas of time and effect. To explain, as entrepreneurial, neoliberal subjects, women should spend their time and energy developing careers and delaying motherhood (e.g., by freezing their eggs) while they are young in order to achieve the promise of happiness and secure their future living and livelihoods in the form of work-family balance. Yet the concept of a 'balancing' point is an ambiguous and slippery notion that is almost subject to individual boundaries set based on their life status and human/career capital. In a recent study, a female interviewee, an engineer, revealed her negotiation with her husband on the decision to have one kid only, because "I wanted a career and he wanted a career. So I think it's a lot harder … have more children. There is no question." (Khilji and Pumroy, 2019, p. 1046). As signaled, existing studies have converged upon similar experiences among female engineers, and in many of these cases, women conform to the existing gendered ideologies in such a masculine domain

and experience discrimination and male prejudice (e.g., Miller *et al.*, 2000; Crump, Logan, and Mcllroy, 2007; Watanabe, Naveed, and Neittaanmäki, 2017). Thus, it is not surprising that discrimination and male prejudices are still perceived as the main challenges women in the IT profession face, whether they are expressed in formal policies and visible resources or in informal events that embody destructive stereotypes and male resistance within the masculine organizational culture.

Female role models may serve as moderators of identity threat assessments and/or reactions, assisting women in maintaining their identities secure in their professional roles, especially for those in leadership positions (Hoyt and Murphy, 2016). Although male role models have received much more media attention, with so few female role models for girls, the effectiveness of female role models becomes critical because they show that success in the stereotyped sphere is possible. While exposure to highly successful female role models can deflate and deter women, they also have the potential to inspire women to overcome negative stereotypes in the field of technology (Good, Woodzicka, and Wingfield, 2010; Hoyt and Murphy, 2016). These women will increase other women's ambitions to work in highly skilled IT jobs by promoting a sense of social belonging, encouraging other women, and reducing individuals' sense of self against possible identity threats. Such a sense of belonging among members of social networks and gender diversity are important components of an organization's social capital, which could be translated from individuals' levels of mutual purpose, trust, and cooperation within the organization (Georgiadou and Syed, 2021). From a management standpoint, it is vital to take steps in order to address gendered barriers and challenges. In this vein, more successful collective actions could be encouraged, resulting in the development of value creation and unity among different community members within an organization.

3.5.1 (Self)-organized and community-based IT collective

It is worth noting that recently, many provocative scholars have investigated the burgeoning forms of self-organized, postmodern feminist communities that enable technology and gig workers to seek a site of training, collaboration, advice, mentorship, and support outside of their workplace (e.g., Kost, Fieseler, and Wong, 2019; Petrucci, 2020). Similarly, the internal networks for diversity and inclusion created among the marginalized employees in the workplace also become a popular site with a collective attempt to address organizational gender inequity (e.g., Bierema, 2005a, 2005b; Dennissen, Benschop, and van den Brink, 2019, 2020). Here, in this section, I would particularly focus on discussing the published work on exploring gender-inclusive groups and communities, both in-company and out-company, to promote greater gender equity and equality in the IT workplace.

Sandberg (2013) writes that "we get closer to the goal of true equality with every single one of you who leans in" (p. 11) and her approach of leaning in to address gender inequity is referred to as Facebook feminism (Faludi, 2013). Her call for this approach is mainly about encouraging women to take individual responsibilities to be released from the gendered socialization in the IT domain that consistently holds them back from competing with their male counterparts at work. This new Facebook feminism corresponds to the rise of neoliberal feminism (e.g., Fraser, 2013a, 2013b; Oksala, 2016; Prugl, 2015; Rottenberg, 2014) and/or postmodernism (e.g., Gill, Kelan, and Scharff, 2016; Kennedy, 2013; Lewis, Benschop, and Simpson, 2017). The postfeminist stream provokes the view that women could have it all in the work context by drawing upon neoliberal capitalist thinking and approaching inequities as entrepreneurial, market-oriented, and neoliberal subjects (McRobbie, 2013; Rotternberg,

2018). It supports the view that challenges of gender inequity that women encounter at work could be addressed by individual choices and actions, which can lead to more involvement in a competitive, fragmented market and empowerment in their own circumstances. In addition to the work of *Lean In*, Sandberg also helps in forming Lean-in Circles where many women could meetup apart from the workplace, in which the forming of this site aims to improve women's status at work (Faludi, 2013). She further comes to the conclusion that these circles have promoted individual-level actions against gender inequity in an organizational setting (ibid.), in which the change also aligns with the application of such feminist logic in the context of the neoliberal capitalist market where these IT companies are constituted. In fact, such an approach of creating internal networks for diversity and inclusion purposes against organizational inequity is intended to lead towards radical organizational-level changes. An organization's culture is socially constructed and consists of a variety of social ties that bind and manage individuals within the construct, influencing their everyday practice in order to achieve work-related goals (Ibarra and Barbulescu, 2010). The term 'social network' has been frequently used to depict the varied aspects of interpersonal interactions, patterns of daily practice, and resource exchange in organizations (e.g., Combs, 2003). Previous studies have documented how social networks affect communication and conflict, proximity, resources and relational exchange, social cognition and acknowledgment, and issues of trust in the workplace (e.g., Gargiulo and Benassi, 2000; Labianca and Brass, 2006; Nelson, 1989; Podolny and Baron, 1997; Rivera, Soderstrom, and Uzzi, 2010). Scholars have also concluded that these internal networks for diversity and inclusion in the workplace mostly focus on individual changes and development instead of dismantling the structural oppression attached to the entrenched patriarchal and masculine standards (e.g., Bierema, 2005a, 2005b; Dennissen, Benschop, and van den Brink, 2019, 2020). This may be explained by the fact that many of these networks are designed and formed to inspire participants to complete

work-related tasks and pursue their personal goals. Despite such limitations, these in-company diversity networks still shed light on ways in which how technology professionals could benefit from networking and other sources of professional advice to address gender inequity. These networks, which fuel the growth of individuals' deliberate self-interest in response to favorable or problematic workplace circumstances, may disrupt or develop a sense of belonging and shared identity within the organization (Georgiadou and Syed, 2021; Ibarra, Kilduff, and Tsai, 2005).

According to Petrucci (2020), postfeminist communities are groups of people, non-profit organizations, and/or businesses that organize politically around gendered topics based on postfeminist assumptions, priorities, and strategies. The aforementioned Lean-in Circles are one example of postfeminist communities. One of the main purposes of these forms of self-organized and community-based collectives in the IT field of work is to improve individual employees' statuses at work eventually. Such a purpose could be achieved by receiving relative resources and collective support, in particular, outside of their workplace, which, in return, individuals are likely to benefit from these networks and support to improve their competencies and add values (e.g., Gray *et al*., 2016; Kost, Fieseler, and Wong, 2019; Schwartz, 2018). It is found that those IT professionals engaged in creating supportive sites are embedded in professionalism and entrepreneurialism (e.g., Petrucci, 2020), where they can collaborate on projects, develop skills with peers online and offline, seek support in both technical training and administrative management in a safe environment, and transform their social networking associated with their professional work in IT (e.g., Gray *et al*., 2016; Schwartz, 2018). Members engaged in these (postfeminist) communities can meet both online and offline and are usually interlocked by having shared interests and needs, social

connections, and common goals (MacQueen *et al*., 2001). They may also engage in unified actions associated with their respective geographical regions and/or organizational settings.

The creation of these postfeminist communities and the utilization of these associated connections and resources are perceived as beneficial to those IT professionals, which is manifested in women's ways of coping with the barriers and challenges encountered as a collective, i.e., with increased power and status to voice against gender inequity and discriminatory practices in the IT workplace. Such sites of the self-organized, community-based collective also empower those IT professionals involved to make individual choices and actions against gender inequity and discriminatory practices in the workplace. In alignment with the rise of neoliberalism and the postfeminist approach, it is encouraged that women who want to succeed in their careers along with a fulfilling domestic life should take personal responsibility (e.g., McRobbie, 2013), transforming themselves into market-oriented, self-reliance, and self-care agents. This also echoes Sandberg's argument that a woman should pursue a successful career first, to be happy, and ultimately be a better wife and mom. Another similar example is Ivanka Trump's *Women Who Work*, perpetuated by the logic of the neoliberal capitalist market and postfeminist approach. She claims that working women should act as an enterprise, dismantling the divide between work and domestic domains (Rottenberg, 2018). Yet it is also worth noting that some scholars argue against the negative influences of neoliberal feminism on social solidarity (e.g., Hodgson-Wright, 2001), as "one of the crucial features in feminist activity is that women come together as women to provide mutual support against patriarchal oppression" (ibid, p. 12, cited in Petrucci, 2020). Thus, it is argued by feminist scholars that the focus on personal responsibility as a professional in the patriarchal discourse is a backlash against feminism, which is emphasized by neoliberal feminism and post-feminism (e.g., Liu, 2019). The emphasis on women's

freedom of choice and status, and women's taking personal responsibility to empower themselves, almost exclusively at an individual level, seems to have a controversial impact on further engaging women in activities of providing mutual support to challenge patriarchal and masculine standards, and ultimately to address women's structural oppression.

3.5.2 Harnessing gender as a barrier to inclusion

Following the preceding discussion, it is essential to consider the multiple realities of these skilled women in the IT profession to explore how to address the persistent issue of gender inequality. Proponents of gender equity and equality must also continue to raise awareness of the structural existence of gender inequalities and discrimination manifested in various forms, questioning masculinity and individualism as the fundamental light for social interactions and power dynamics. Breaking down stereotypical assumptions about gender role expectations, on the other hand, is a slow process. Further, the continuous influences of stereotypical assumptions of gender role expectations on recruitment hinders women's entry and their retention in predominantly male-dominated fields in general (e.g., Woodfield, 2016). Thus, it reinforces the acceptance of the thought of hegemonic masculinity and masculine ideology in technology, which further contributes to legitimizing associated practices in a broader cultural and organizational context, e.g., informal work practices, behavioral norms, rituals, and languages (e.g., Acker, 2009, 2012; Crump, Logan, and Mcllroy, 2007; Workman-Stark, 2015). What becomes apparent is the need for businesses, women, and HR departments to rethink the associations between gender and technology, as technology businesses need skilled workers with advanced technical skill sets and HR management as a key department in exerting the enterprise strategy in answering questions such as 'why do we lose the talented women in the pipeline and how can we promote them? Are we sure we are using the

best talent? How to help women to get top jobs in high-tech?'. There are two main reasons for the increasing interest in this sector. One cause is the common perception that human resources play a critical role in creating a competitive advantage in companies operating in knowledge-based economies and developing regions (Nied, 2016), and the other is linked to labor market shifts, where the need for specialists in areas such as high-tech has become urgent for those modern technology firms, as well as the difficulties in hiring them (Woodfield, 2016). Among the skilled workforce fulfilling the technology pipeline, a prominent group is women, which makes the application of gender inclusion in human resources development practices a rectification of women's presumed deficiencies and a reflection of changing the gender-technology relationship within a broader organizational practice agenda.

Gender inclusion may be of value for technology businesses underpinned by a workforce with desired skillsets regardless of their gender orientation (e.g., Kossek, Su, and Wu, 2017). This virtuous circle is good for businesses in considering gender diversity in parallel with the management of a skilled workforce rather than separately. Given that half of the workforce is women, there is benefit in addressing gender biases and discriminatory behaviors at work by considering gender inclusiveness for organizational performance (e.g., Festing, Knappert, and Kornau, 2015); and vice versa, counting these professional women will assist businesses in building a business case for gender equality initiatives (e.g., Tatli, Vassilopoulou, and Ozbilgin, 2013). Understanding gender in daily behavior and embodied practice owes much to West and Zimmerman's (1987) influential article, which can be seen as a development of one of the most cited statements in the field of gender, that "one is not born, but rather becomes, a woman" (De Beauvoir, 1993 [1949]: 281). Gender is a socially constructed, performative, and embodied construct; it is associated with *doing* rather than *being*, and thus,

gender representations are fluid rather than essentialized, thereby contradicting some earlier and on-going feminist approaches. There is also evidence of women who hold significant positions of power and influence at the top of corporate ladders are experiencing tensions in activities and practices in organizations, underpinned and perpetuated by gendered competitions and role expectations (e.g., Marvin and Grandy, 2016; Mavin and Yusupova, 2021). Gender-biased practices are conceptualized as practices that represent beliefs, attributes, and qualities that are more closely attached to one gender than the other. This suggests that employees with traditional feminine value orientations might not be completely considered in the creation of a standard routine of organizational practice (e.g., Festing, Knappert, and Kornau, 2015). The fundamental premise is that organizational processes are built on inequality regimes, thereby reproducing gender disparities in status (Acker, 1990, 2006, 2009). The traditional distribution of the labor force, which men attribute to paid work while women, on the contrary, are assigned to unpaid domestic work, has long been the societal norm in many countries. As a result, the public and private spheres have split, with the public sphere comprising hierarchical institutions governed by men's power in the past. Organizational practices in technology are often considered to be more consistent with traditional masculine value orientations (e.g., aggressiveness, competition, high ranks, and control) than taking stereotypical feminine value orientations (e.g., care, sensitivity) into account fairly.

According to the Equality Act 2010, sexual orientation discrimination and gender reassignment discrimination are also unlawful in the UK. To put it simply, examples of sex discrimination include treating someone (an applicant or employee) unfavorably based on their sex and denying an employee's equal access and opportunities to progress at work because of an individual's sex (CIPD, 2020a). Organizational strategies, through growing the

number of women entering workforce pipelines and changing recruiting and promotion practices, are acknowledged to play a critical role in creating workplace inclusivity and breaking patterns of discriminatory practice against women (e.g., Bilimoria, Joy, and Liang, 2008). The way organizational practices are structured and implemented, on the other hand, can be counterproductive. From a human capital-based value perspective, the increasing demands of individual competitiveness, development, and resources are inevitably crucial when it comes to an employer's perceived evaluation of individual employees (e.g., Hooi, 2019). As 'products' of knowledge, skills, and 'pipelines', individual employees are attributed to increased or decreased stakeholder returns, benefits, market share, and operational costs to meet an organization's strategic goals. Such a measurement approach based on almost exclusively performance and resources overlooks human experience and their worth attributed to the economy (Sambrook, 2012). Instead, this approach simply marks the pursuit of organizational goals which are entrenched in capitalist values. Thus, such resource-based views have been countered by scholars who hold feminist values and who advocate for a more humanistic, employee/person-centered approach to further learning and development (e.g., McGuire, Germain, and Reynolds, 2020). These scholars give voices to those oppressed in the workplace by recognizing structural and reproductive labor inequalities in the career context and explaining how privileged values and power dynamics perpetuated in the workplace have further exaggerated the inequalities under the scientific positivist management approach (e.g., Bierema, 2010). For instance, Kormanik and Nwaoma (2015) argue that an inclusive organizational culture that builds upon shared values of equality and diversity reiterates the importance of an organization's efforts in attending to individual needs while respecting and valuing individual differences. Escaping such resource-based stances opens up alternative discussions of possibilities towards more democratic, humanistic, and ethical leadership and management in today's organizations, regardless of

fields. It also marks the establishment of space to further promote equality and social justice practice within mainstream human resources management and development.

Yet the reality is that sex-biased selection procedures (e.g., Powell, Bagilhole, and Dainty, 2009; Williams, Muller, and Kilanski, 2012; Festing, Knappert, and Kornau, 2015) and a persistent gender pay gap (e.g., O'Neill and O'Reilly, 2010) remain in a variety of organizational practices. In line with such examples, organizational practices may be associated with discriminatory behaviors (Denissen, 2010), resulting in a decrease in the probability of women being recognized and established as talent, suggesting low levels of gender inclusiveness. This is because men have used covert barriers and gate-keeping that are difficult to control instead of the barriers anticipated by dominant group members (ibid). Meyers and van Woerkom (2014) outline the influence of underlying philosophies, including exclusive/stable and inclusive/developable approaches, that underpin HR practices. The exclusive and stable approaches are led by a small elite group of the workforce, which is only filled by pivotal employees with high potential and performance. On the contrary, the inclusive and developable HR approaches are led by the whole workforce, advocating that everyone has the potential to fill the pipeline of a skilled workforce through proper training and development. Having a better consideration of how and why the inclusion of gender can contribute to an organization's sustained competitive advantage will benefit from getting insights into current approaches that underpin organizational practices for professional development. It is evident that many enterprises adopt exclusive approaches to develop and retain their skilled employees (e.g., Swailes, 2013), leaving inclusive approaches under-employed. It excludes individuals who are in lower ranks and less privileged ones in organizations, while, on the other hand, organizations may lose their opportunities to develop

individuals who may have played key roles in areas such as innovation, technical expertise, etc.

Some notable barriers hinder women from accessing managerial and/or leadership positions in the workplace, which are embedded in essentialist assumptions and gendered competitions, which further constrain women's progress in organizational settings (e.g., Mavin and Yusupova, 2021). Thus, it is not surprising that women consider organizations with diversity management more attractive, particularly those women who are highly skilled and/or hold managerial positions. Women identified barriers such as a lack of mentors, social and cultural expectations for women to take on more family responsibilities than their male counterparts, and structural oppression that limits women's opportunities for advancement in a career context. The influence of these barriers seems exaggerated when a society, which is constituted by individuals, expects societal values grounded in collectivism, e.g., in some parts of East and South Asia (e.g., Woodhams, Xian, and Lupton, 2015). It appears necessary to emphasize the importance of addressing gender equity by further promoting diversity and inclusion in the workplace. Gender inclusivity breaks down these obstacles by removing gender barriers to greater acceptance of talented women. Despite the persistent nature of how gender stereotypes are produced, reproduced, and operated in male and female-dominated professions from the perspectives of both men and women, there is room for considering and implementing practices to achieve diversity and inclusion. Gender inclusiveness, as part of the formulation of intervention strategies of diversity and inclusion, could be of help in promoting skilled women to achieve pivotal positions in gendered organizations, and ultimately change the masculine culture of the IT workforce.

3.6 Conclusion

This chapter presents an overview of the gender and technology literature, which ranges from the theoretical foundation of feminism, which is based on three waves of feminist movements, to theoretical perspectives adopted in the existing gender and IT research and relevant studies investigating the underrepresentation of women in the IT field. To summarize, feminist research has paved the way over the past decades, which range from liberal feminism and socialist feminism to contemporary-postmodern feminism. These threads of feminist theory have been adopted by scholars to extend scholarly debates in the fields of gender and IT research. In particular, feminist theory has been used to conceptualize women-machinery relationships and contribute to reforming the static relationships between women and technology. As aforementioned, the liberal feminism approach focuses on addressing the underrepresentation of women in IT by removing gendered barriers, e.g., granting equal access and opportunities in career advancement for women in IT. In doing so, liberal feminists are recognized for their contribution to promoting equal access for women to enter the IT field while contributing to the persistence of women in the IT profession. Yet, despite the effort on addressing the underrepresentation of women in IT, liberal feminism has been criticized for seeing technology as neutral and does not question the shaping and reshaping process of the technology field as a masculine domain. Thus, the approach does not address the underlying reasons that caused such inequality between men and women in the IT workforce. Rather, the liberal feminism approach attributes women's underrepresentation in IT to their lack of participation and engagement in the field, and therefore, women are not able to recognize and reach their potential in IT jobs like their male counterparts. Moving forward, the socialist feminism approach provokes the emphasis on exploring the gendered nature of technology and the embedded masculine culture in this domain. Socialist feminism

contributes to understanding the gendered nature of technology, which constitutes a variety of influential factors in a particular social and cultural context. Further, social feminism argues against the neutrality of technology, rather, technology itself is shaped and reshaped by gendered relations and meanings in society. Thus, seeing technologies as social artifacts recognizes the gendered relations and meanings that are materialized and manifested in such things as technology design and use, which are constituted by male power and thus, exclude women. Men are perceived as the primary users and designers of machines and technology in society, and such stereotypical assumptions are ingrained within the patriarchy and the capitalist mechanism. Over time, the postmodern feminist approach has emerged to challenge the entrenched system of patriarchy and hierarchy and, further, to call for feminist resistance through recognizing individual differences among women and emphasizing individual responsibility to empower women. From the postmodern feminist perspective, women should not be viewed as a unitary group sharing the same identity. Instead, they should be released from norms and cultural expectations to constantly construct and reconstruct new (and multiple) identities. The shaping and reshaping process may also involve intersectional differences and could be viewed as fluid and performative with the potential and possibility to transform power dynamics, gender relations, and women's empowerment in today's digital society. Instead of portraying women as victims of machinery and technological development, postmodern feminists focus on exploring the possibilities and prospects that new technologies could offer to advance women's careers in technology and in changing gender-technology relationships.

Three main theoretical perspectives have been adopted in the field of gender and IT research, which are known as essentialism, social constructionism, and individual differences. The

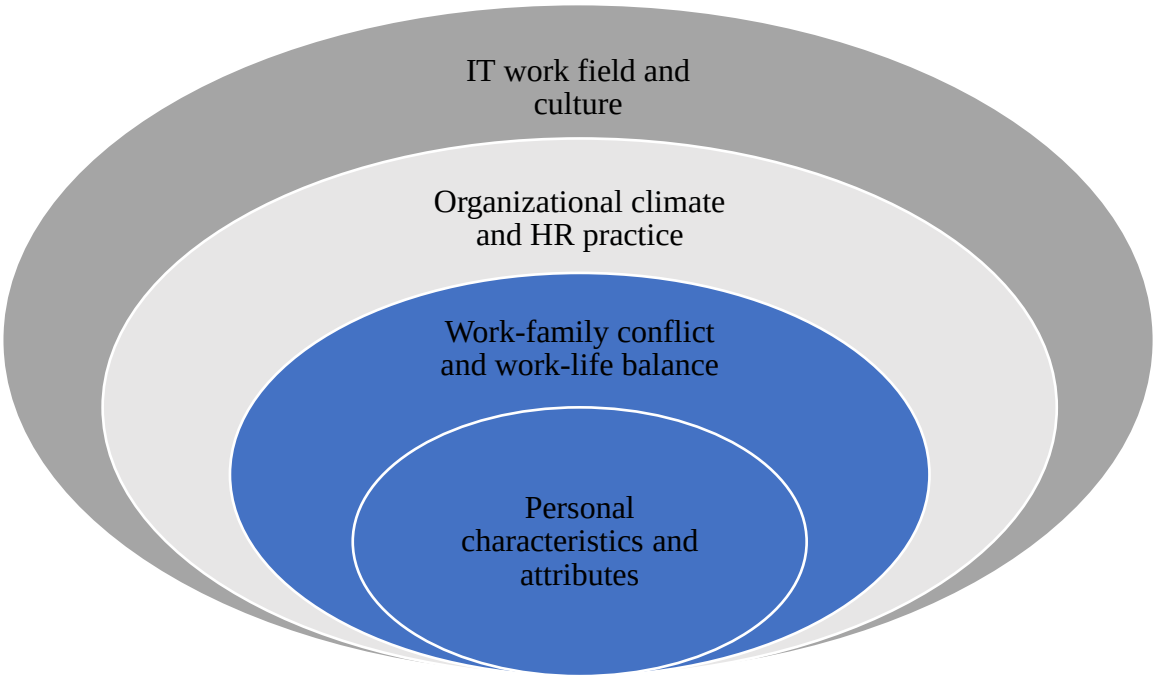
individual differences theory of gender and IT is adopted in the present study as the theoretical framework to guide addressing the aforementioned research questions and the following analysis. The adoption of this theoretical framework further makes knowledge production possible by exploring the living experiences of women in the IT profession. To explain, this theoretical framing sees those constructs of individual characteristics, shaping influence, and other environmental factors as accountable, in which women's agency and individual differences are constituted among men and women in the IT workplace. In these constructs, women are influenced and reshaped in different ways, and in return, they react to the social shaping process in the masculine IT domain and navigate their working life in a variety of individual ways. Collectively, these constructs offer lenses to provide explanations to further understand women's work-life experiences in the IT profession and gender-technology relationships. This is because this theoretical framing takes into account the varied influential factors that may facilitate or hinder women's participation, persistence, and advancement in the IT profession.

In recent years, there has been a rise in the number of studies looking at the underrepresentation of women in wider STEM fields (e.g., Armstrong, Riemenschneider, and Giddens, 2018; Hari, 2017; Fernando, Cohen, and Duberley, 2018; Kenny and Donnelly, 2020; Makarem and Wang, 2019; Tassabehji *et al*., 2020). In reviewing the existing literature on investigating women's underrepresentation in IT across several western developed countries, various barriers and other influential factors have been documented that may affect women's career entry into IT careers and their subsequent persistence and advancement in this field (e.g., Armstrong, Riemenschneider and Giddens, 2018; Hari, 2017; Kenny and Donnelly, 2020; Tassabehji *et al.*, 2020). These studies identified and documented barriers to

women entering, progressing, and remaining in IT careers based on biological sex differences and their associated assumptions on gender role expectations, further discouraging women from progressing and career advancement. In addition, the culture of male dominance in the IT field and the lack of mentors and other forms of social capital, e.g., informal networks, contribute to the underrepresentation and exclusion of women in the IT profession. Further, work-life conflicts are perceived as having negatively affected women's persistence and advancement in the IT workplace, where workers are usually required to work long hours to meet clients' demands while keeping up with the fast-changing technologies and coping with extensive work stress. For individual IT professionals, it seems inevitable to consider what approaches they can take and in what ways in which their human agency could be increased in order to make a change and improve their status at work. For example, it is worth noting that there are a burgeoning number of varied forms of self-organized, community-based associations that enable female IT professionals to seek a site of training, collaboration, advice, mentorship, and support outside of their workplace. Similarly, the internal networks for diversity and inclusion established within the company among marginalized employees in IT have become a popular site with a collective attempt to address structural oppression and other forms of inequality that women in IT encounter. Along with the changing nature of IT work and IT workers, it is also required for tech companies and employers to invest in attracting and retaining enough skilled IT professionals to maintain their attractiveness to these skilled workers. To achieve this, there is a need to gain an in-depth understanding of the multiple, sometimes paradoxical realities of what constitutes a female IT professional's identity at work, interlocked with overall work-life experiences and wellbeing, in the context of today's changing nature of the IT market. This includes exploration of varied factors in different constructs, such as challenges, struggles, motivations, and incentives that women encounter in IT work. Thus, this research project aims to gain a better understanding of the

career experiences of professional women in IT, with a focus on investigating the multi-realities of the millennial generation of women in the IT profession. The choice of focusing on millennial women in IT is in alignment with the changing nature of skilled workers in fulfilling the shortages of today's IT market - a promising group being perceived as a vital workforce in the IT field. Hence, opening millennial women's career experiences in the IT profession is an approach to speak out against these stories in this field. In doing so, this research addresses what is typically left 'unsaid' behind in their 'modern' working lives and livelihoods. Instead of complying with the entrenched image of an ideal worker exerting productivity, efficiency, and value creation and practices of technology firms, this investigation moves beyond the male dominance and discourses in the IT field. This is achieved by further exploring manifestations and strategies for individual resilience to break patterns and collective resistance against the structural oppression faced by women in IT. To summarize the main findings from the literature, the most important factors that could boost or hinder women's career paths in the IT profession are described as environmental, organizational/structural, and social factors (see Figure 2).

Figure 2: A model of key findings from the literature on understanding multiple factors affecting women's career choice and development in the IT field (author's own)


IT work field and culture
Organizational climate and HR practice
Work-family conflict and work-life balance
Personal characteristics and attributes

Chapter Four Methodology and Methods

4.1 Introduction

I start this chapter by introducing my research philosophical position underpinned for this research project and reflect on varied reasons underneath of these choices made, in alignment with the research purpose and the nature of research questions outlined in Chapter One. This chapter outlines my qualitative research design as an approach to explore the living work-life experience of the millennial generation of female IT professionals. Next, I explain my sampling approach, data collection techniques and reflected on issues encountered during the data collection process. I then move on to discussing the data analysis part, which describes the application of thematic analysis in this study. This is followed by a rationale of why this analysis method has been used when analyzing data. The whole process illustrated how the methodology is defined, as "a way of thinking about and studying social reality" (Strauss and Corbin, 1998, p. 3). I finish this chapter by supplying the research validity, reliability, and ethical considerations during my conduction of this research project.

4.2 Philosophical position underpinned in this research project

The primary research purpose for this study is to gain a better understanding of the career experiences of the millennial generation of female IT professionals. Rather than complying with the entrenched 'ideal worker' ideologies and practices of technology firms, this research project explored the potentials for individual resilience as well as collective resistance against the male-dominated discourses in the IT field. Opening millennial women's career experiences in the IT profession is an approach to speak out of those overlooked stories in

this field and in doing so, this study further addresses what is typically left unsaid behind their modern working lives and livelihoods. More specifically, the following research questions have been addressed (which are also outlined in Chapter One Introduction):

RQ1: What attracts millennial women into IT work?
RQ2: What are the barriers and challenges that women in IT face in their profession (and/or in balancing their professional and personal life?) and what are the underlying reasons?
RQ3: How do these women in the IT profession navigate and negotiate with these challenges encountered and why?

In terms of the epistemological position taken for this research project, I start by reiterating how the term epistemology is defined, as "a theory of knowledge, a theory of how human beings come to have knowledge of the world around them - of how we know what we know" (Lewis-Beck, Bryman, and Liao, 2004, p. 309). Epistemology originates from the Greek words epistêmê (science, knowledge) (Eikeland, 2007) and confronts with "knowing how you can know" (Hatch and Cunliffe, 2006, p. 13), establishing the relationship between the researcher and what is being researched (Hussey and Hussey, 1997). More importantly, epistemology is a philosophical position concerned with the existence, origins, and limits of knowledge creation, as well as the possibilities that knowledge can offer (Hamlyn, 1995). Furthermore, it is "embedded in the theoretical perspective and thereby in the methodology" (Crotty, 2003, p. 3).

Choosing an acceptable and appropriate philosophical position for any research project is critical, since it affects the overall research design and methodology (Hussey and Hussey, 1997). Broadly speaking, there are three predominant approaches in the field of gender and

IT research, which include positivism, interpretive and critical standings. To explain, when a positive epistemological position applies in the field of gender and IT research, the research aims, and objectives are usually attributed to answer research questions on *whether* and *where* differences between women and men are located. Trauth and Howcroft (2006) once stated that such thinking draws upon essentialist approaches to research on gendered competitions. Added to the above, such thinking is almost exclusively based on stereotypical assumptions which originated from perceived biological sex and the discovery of gender distinctions. This means such threads are not emphasizing explanations of why these distinct assumptions and claims have arisen and continue to be dominant in the field, as well as the relevant theory development on these overlooked aspects apart from the mainstream argument. On the contrary, when an interpretive epistemological position is adopted in the field of gender and IT research, the research usually "focus[es] on understanding how these gender differences have come about" (Trauth and Howcroft, 2006, p. 273), with a typical research purpose of gaining a better understanding of various influential factors underneath the gender inequalities in the IT field. Research that draws upon this paradigm adds the context to the research dialogue, in other words, the context of where the relationship between gender and IT has been established and taken place. It is also acknowledged that such interpretive research is inclined to put forward individual differences through the lens of the social construction of reality. Furthermore, when a critical approach is adopted in the field of gender and IT research, the research usually invokes theories such as contemporary feminist theory. The research purpose for these studies is mainly to understand power dynamics, and further, to challenge the entrenched system that reproduces inequalities (Howcroft and Trauth, 2008). This also includes the marginalization of vulnerable and precarious IT workers. In doing so, critical scholars hope to create a better workplace environment for all the people who work in the IT workforce.

The epistemological position underpinned by this research project is interpretivism, complemented by critical epistemology. Furthering insights from a 'purely' interpretive approach to discovering individual experiences of these female millennials in the IT profession, a critical lens is adopted for further investigation of multiple factors and underlying reasons that have constrained them from equal participation and career advancement in this field. This process also involves considerations of the broader cultural, structural, and organizational oppression, in which these multi-level factors have been invoked in technology research referred to as individual differences of gender and IT construct. Detailed reasons for the adoption of this epistemological position are present as below, which go in line with the research purpose and the nature of the research questions outlined for this project.

First, interpretivism is adopted as an epistemology approach. This choice is made in line with the research questions and the nature of the phenomenon of being researched, which is about *understanding* different reasons and the varied influential factors that may have helped and/or hindered women's choices and sources of options associated with their career experiences in the IT profession. According to Walsham (1993), who states that interpretive epistemology is "concerned with the approaches to the understanding of reality and asserting that all such knowledge is necessarily a social construction and thus subjective" (p. 5). Choosing an interpretive philosophical position means that I take on the belief that I refute positivist-quantitative thinking and, instead, assume that realities are socially constructed by human beings through individual behaviors, actions, and social interactions between different people. I draw upon Orlikowski and Baroudi's (1991) acknowledgement that "*understanding* social reality requires understanding how practices and meanings are formed and informed by the language and tacit norms shared by humans working towards some shared goal" (p. 14),

in which the choice of the interpretive epistemology paradigm allows me, as a researcher, to conduct an in-depth investigation into these female millennials' lived work-life experiences in the IT profession. And by doing so, I can gain a better understanding of these multi-vocal stories, on which further theorization of the phenomena of interest will be based. The reason for taking on this philosophical position is also in line with Orlikowski and Baroudi's (1991) explanations on interpretive research, who have described that this category of studies is almost exclusively "directed at understanding the deeper structure of a phenomenon within its cultural context by exploring the subjective and intersubjective meanings that people create as they interact with the world around them" (p. 5). In a word, taking on an interpretive approach in this study provokes assumptions of what women in technology look like, which relies on the perceptions of human beings who are directly intertwined in the field, which sheds light on how knowledge can be generated and understood. The adoption of an interpretive approach equips me as a researcher to proceed in understanding the perceptions of and from the perspective of female IT professionals in this project, because this approach did shed a light upon "the complex world of lived experience from the point of view of those who live it" (Schwandt, 1994, p. 118).

This research project explores different reasons and the varied influential factors that may have helped and/or hindered women's choices and sources of options associated with their career experience in the IT profession. And accordingly, how they navigate and negotiate those challenges recognized along the journey has also been researched. The whole process involves how they perceive, respond, cope, make sense, and even challenge circumstances when they have been treated unequal or unjust. This reflexive process is based on reflections of their daily working life and their individual experience in the IT field, such as engagement in the IT learning and development community and dealing with different employers,

managers, peers, subordinates, and clients, etc. Yet, when it comes to *challenging* or *questioning* the monolithic grand narrative in studies of gender and IT construct, the limitations of the interpretive approach are emerging. This has also been recognized by Trauth and Howcroft (2006), who explained that the "limitation of the interpretive approach is that the focus is on understanding the social influences, not questioning them" (p. 142). Therefore, critical epistemology was adopted as a complementary action, to move beyond understanding the richness of the phenomenon of interest by also questioning *why*.

It is acknowledged that critical epistemology supports the claim that social reality is historically constituted, which is shaped and reshaped by human beings (Myers, 2013). Myers (2013) also stated that "although people can consciously act to change their social and economic circumstances, critical researchers recognize their ability to do so is constrained by various forms of social, cultural and political domination" (p. 43). In other words, it means that an individual's capabilities to make changes concerning the situations and circumstances they are involved with are constrained by a variety of contextual factors. Thus, the critical epistemology underpinned by this research project enabled me to consider the wider climate of the *suppressed* and *inequality* at IT work, and the nature of these underlying factors. Additionally, critical studies in IT usually assume that women are incompatible with IT work (e.g., Trauth, 2011), where structural oppression and gendered competition are maintained in the power dynamics. As a result of using critical epistemology as a complement to interpretive epistemology, I was able to investigate the individual experiences of these female IT professionals while also taking into account broader cultural, structural, and organizational oppression. It further allowed me to discover those factors that have been constraining female IT professionals from equal participation and career advancement in the field and underlying reasons. This process would also unveil the curtain of the discovery of individuals' multi-

facets during their work-life experiences with regard to these female professionals in the gender and IT construct.

4.3 Research approach

There are two main types of research approaches underpinned, namely, the deductive approach and the inductive approach, and the choice of research approach should be in alignment with the primary research purpose and research questions. This study takes an inductive approach, and the reasons for the choice taken are presented as follows:

It is acknowledged that when an inductive approach applies to a study, "the researcher begins with an area of study and allows for the theory to emerge from the data" (Strauss and Corbin, 1998, p. 12). This can also be described as a systematic process to "analyze data in primary qualitative research" (Thomas and Harden, 2008, p. 1). The choice of taking on an inductive approach goes in line with the primary purpose of adopting an inductive approach, which is usually for analyzing raw data sets, looking for themes of significance, dominance, and frequency, etc. After analyzing these research findings, the researcher could move beyond these descriptive findings on a phenomenon of interest towards a further theory development (Thomas, 2006). From this vantage point, it appears that the findings of this study could be generalized to a larger scale (Bryman, 2004), for example, by expanding the sample size. As previously outlined, the primary aim of this study is to gain a deeper understanding of the career experiences of millennial women IT professionals. Rather than adhering to long-held "ideal worker" philosophies and practices of technology firms, this research project explores the interplay between individual agency and structural factors, as well as the potential for individuals to act against the male-dominated discourses in IT work. Thus, an inductive approach, aligned with the interpretive approach and critical lens, has been adopted as the

research approach for this project. This allows me to obtain and investigate in-depth individual living experiences and intersectional differences among those female IT professionals from the millennial generation, and in doing so, I fulfil the research purpose of gaining a better understanding of the living experiences of millennial women in the IT profession. I unveiled their working lives within a site of multiplicity from different aspects. Further, the individual differences theory of gender and IT construct and the dynamics of inequalities have been utilized as points of reference, which on the other hand, indicate that some questions asked in interviews are guided by the literature. Questions to ask during an interview include, but are not limited to:

• What made you choose to work in the IT profession and how did you land your career in this field?

• Can you describe your regular working day routine and your role at your workplace?

• What does it feel like to work with your male colleagues (e.g., supervisors, subordinates, peer colleagues) in your organization? Do you find it different from working with female colleagues? If so, how could you describe the differences?

• How would you describe the working culture? What aspects of where you work do you like best and why?

• What is your view of the lack of women in the IT profession, and, if applicable, in the firm where you work? Do you consider there is a need to encourage more girls to study and further promote more women to enter the IT field? If so, what is your advice for those women who want to have a career in the IT profession? If not, any reasons?

These open-ended questions allowed participants to express their feelings, emotions, and experiences while also identifying the aspects of the job, the working environment, and their life outside of IT work that are most important to them. Thus, it can be said that a

predominantly inductive approach was adopted for this research project, identifying common patterns and themes within the data sets collected, while the critical lens fed through in data collection and analysis at a later stage as a complement to the social constructivist stance of this research.

4.4 Research design

This research project took on a qualitative approach which combines inductive and exploratory research designs. This choice was made to answer the research questions, which started with "what" and "how" questions. Thus, qualitative research is considered the most suitable approach to respond to these research questions outlined for this research project. The key focus of this research is to explore women's real-life experiences in the IT profession, their perceptions and actions in response to challenges and struggles encountered, which have been described and analyzed via an inductive approach. This includes gender-related challenges and incentives encountered during their work-life experience. Added to the above, how female IT professionals navigate and behave in their career context cannot be seen as an isolated concept. Thus, I perceived their navigation and coping behaviors as an important puzzle piece, taking on various aspects of social, cultural, structural, and individual practices into account, that sometimes are perceived as individual resilience and also collective act against women's underrepresentation and discrimination in the IT profession. Such an approach allowed me to explore and develop an in-depth understanding of the subjective realities of these female IT professionals within a site of multiplicity, and to understand their feelings, emotions, attitudes, and subsequent behaviors and/or changes resulting from their living work-life experiences. This research project was built upon an interpretive understanding of female IT professionals from the millennial generation, and the

direct personal contact carried out enabled me to understand what has been going on in their lives and livelihoods, their perceptions, and how they feel and behave to cope with the realities accordingly. An interview methodology adopted for this in-depth investigation would make sense of their motivations, struggles, and changing actions in ways that are perceived as meaningful for these women in the IT profession, within their respective social constructs and cultural contexts. This methodological choice was also made in alignment with the philosophical positioning discussed earlier that underpins the present study and the role of the researcher (myself), who has been engaged in the process of construction, interpretation, and reconstruction of the meaning creation based on women's various responses. As aforementioned, the predictive style attempts to explain why and how something happened, while the exploratory style is used when the researcher wants to become acquainted with relevant observations, settings, and concerns (Blumberg, Cooper, and Schindler, 2005). Therefore, via taking on this qualitative approach, I have been able to provide a new landscape that unveils the social construction process of those women's working life experiences in the IT profession, which contains an in-depth understanding of their motives, values, perspectives, expectations, feelings, struggles, paradoxical moves and insights on the reasoning behind their behaviors. Further, this subjective stance and qualitative process enables me to understand what matters during women's construction and reconstructions during their career paths, what is perceived important for those millennial women in the IT profession; and further, what are their perceptions and subsequent behaviors in response to the ongoing, fluid yet processual challenges, incentives, changes, actions, and encounters. This process also unpacks the complexities and multi-facet realities of how these factors have facilitated and/or hindered women from breaking through barriers encountered for individual resilience, career advancement, and collective resistance for a more meaningful, enjoyable, balanced, and soul-searching experience in the IT profession.

Data for this research project was gathered in the form of in-depth semi-structured interviews, to get close to the realities of women's living experiences in the IT profession. Such a methodological tool provided the evidence needed to understand and learn the local language circulated in the IT field, and to capture the moments of how and when those female IT professionals choose to enter (and stay in the field), engage with others during their working life and seek patterns of how they interact, make moves to overcome challenges encountered (if there are any), and navigate their career paths. I use a multiple perspective approach to further obtain an understanding of individual differences of views, feelings, and actions in response to the perceived challenges, struggles, motives, and incentives from those female IT professionals who participated in this study. As a result, these women's living experiences and genders are perceived in such a way that they are performatively (re)constituted and further understood within the IT construct's norms. Next, I will describe the process of data collection, including sample selection in more detail.

4.5 Research methods

4.5.1 Sampling approach

This research project requires rich descriptive data to unveil the stories and unmask the realities of the working life experience of female IT professionals from the millennial generation. Thus, qualitative interviews are utilized as the methodological approach to achieve this research purpose - phenomenologically exploring women's lives and livelihoods in the IT profession and answering the research questions outlined at the beginning of this chapter. A purposive snowball sampling comes with a genuine goal of locating specific

people, circumstances, and scenarios that could be of interest in answering the research questions. Thus, the adoption of this approach ensures women who participated in this research project have had real-life experience in the IT profession and/or continue to have an IT career, irrespective of whether there are multiple challenges present. In this research project, interviewees are initially reached out and recruited by the researcher through three main approaches. First, as a former employee who has worked in two IT firms, I contacted a few female colleagues in the research and development (R&D) departments I have worked in the past and asked them to participate and share their work-life experiences in the IT field. Second, I ask them for references of other colleagues, friends, and/or co-workers who may have an interest in sharing their career experiences and life stories to participate in this research project - an approach known as snowballing. I have also been following-up with those potential participants through social networks, explaining the purpose of this research project, how it would be conducted, outlining the research questions, and inviting them to participate. Once the potential participant agrees to participate, I process to the next stage: to schedule a conversation. Third, I have been consistently active in participating in coding workshops that are almost entirely for girls; and training sessions, such as programming marathons organized by IT communities, where I have had the opportunity to reach out to other female participants to discuss the project and ask if they would like to participate by sharing their work-life stories. These stories map how they have landed an IT career and living experiences of their professional and personal growth in IT work. In the meantime, I also ask those women who have participated in this study for further references for recruiting other potential participants who may have the same interest in sharing their different life stories (snowballing).

There are no strict lines delimiting limits on the sample size for qualitative research, nor on the role of sample size for qualitative research, as "the qualitative inquiry typically focuses in-depth on relatively small samples, even single cases, selected purposefully" (Patton, 2002, p. 230). It suggests that the sampling size for qualitative research almost exclusively depends on the purpose of the research. Similarly, Marshall (1996) also highlights that "an appropriate sample size for the qualitative study is one that adequately answers the research question" (p. 523). Qualitative research, as opposed to quantitative methodologies, must be flexible in terms of its research design, the sampling approach, and the process of data analysis, i.e., the approach to interpreting materials obtained (Marshall, 1996). This indicates that the researcher does not know how many subjects are required to completely address the research questions raised at the start of the project, as new themes and interpretations of different phenomena come to a natural end, also known as data saturation (Bryman and Bell, 2015). Despite the above discussion, Patton (2002) also suggests researchers "specify minimum samples based on expected reasonable coverage of the phenomenon given the purpose of the study and stakeholder interests" (p. 246), as a reasonable sample seems crucial in quest of "the purpose and rationale of the study" (p. 245). This also implies that the minimum samples could be flexible and amendable, which means that if additional samples are not able to supply the best answers to the research questions, then these additional samples will not be a valuable dataset to the research. And vice versa, if additional samples are needed to best answer the research questions, then additional interviewees, preferably with similar backgrounds, profiles, and characteristics, would be further selected, which limits the pool of potential samples to achieve the purpose of the study. A table of participant characteristics is present as below (see Table 3). Next, I move to describe the process of interviews for this study.

Table 3: Participant characteristics

IT professions	Technical IT positions	Managerial IT positions	IT analysis positions	IT service positions	Other IT positions
	48%	8%	12%	20%	12%
Levels of education	Higher Education Diploma	Bachelor's degree	Master's degree	MD/Ph.D. degree	
	8%	44%	32%	16%	
Years of professional experience	0-2 years	3-5 years	6-10 years	10 years+	
	16%	56%	20%	8%	
Ethnic origin	White	Black	Asian	Mixed/colored	
	24%	20%	48%	8%	
Age ranges	Under 25 years	25-35 years	35+ years		
	28%	64%	8%		

4.5.2 Interview process

Twenty-five women participants from the millennial generation who have lived experience of IT work are chosen, all of whom have been working with (and for) trending IT businesses and units across several 'hot' regions in the field of software technology and information services, including the United Kingdom, members of the European Union, the Bay Area in the United States, and Australia. Job titles for their roles at work in IT are known as front-end/back-end programmer, full-stack developer, cloud and site-building engineer, quant analyst and user interface/experience designer, etc. The length of interviews is between half an hour and an hour and forty-five minutes, resulting in an average duration of seventy minutes. This approach derives from social constructivist ontology and interpretive epistemology and further stretches towards a critical positioning as a complement, which means that it aligns with the power of obtaining "information-rich cases strategically and purposefully" (Patton, 2002, p. 243). It sees information obtained from interviews as adequate and reflective accounts (e.g., Alvesson, 2003), as a way of gathering and further producing knowledge via voicing out social interactions and engagement with social realities. It also shows that there is no one single truth that can be acquired from interviews, and interviewees are also not repositories of knowledge, rather, they act as constructors in the process of knowledge production, where interviewers and interviewees are both constituted and act as a part of this collaborative knowledge production process (Gubrium and Holstein, 1999). In this research project, this approach adopted helps me to make sense of different scenarios of challenges and struggles encountered among millennial women IT professionals. More importantly, orienting these accounts towards an exploration of career navigation and behavioral change at work will reconstruct whether the norms and practices established in the IT workforce are reinforced, or whether new forms of resilience and resistance become

enacted instead. This approach also assisted me in guiding women IT professionals to revisit and rethink their distinct and shared ways of working, from both technological and practical development perspectives. Hence, this process opened up alternative possibilities to reimagine the emerging approaches of how millennial women professionals engage, interact, learn, and develop in the IT workforce, and, in particular, offers insights into what a collective, communal approach, as a shared living experience, could bring for those women IT professionals in a career context, and where the meaning stands in terms of the togetherness, shared spaces, and IT communities they are affiliated to and/or serve.

Interviews are regarded as crucial sites for comprehending the construction and reconstruction of subjects, subjectivities, and subjectification (Mazzei and Jackson, 2012). They are sites for catching a glimpse of discursive practices, reflected in these interactive conversations. The materials of these conversations are departing points, in which the embedded content extracted from these conversations could be further used for inquiries into the mechanisms, processes, and procedures in organizational settings, identity work, and knowledge production in the field of study (Bonham and Bacchi, 2017). Simultaneous conversations and interactions with these women IT professionals helped me to understand my research 'subjects' through entanglement with discursive practices and mechanisms at IT work. I have asked these women how they think a person's gender affects the work they do as women IT professionals, often rephrasing the question as, "have you ever noticed any difference between men and women in your profession or ever been experiencing any difficulty as a woman in a technical role at work?" This has dragged them to differentiate themselves, taking some parts out of their lives and livelihoods under scrutiny and focusing on those specific parts of their lives and livelihoods and not others. Most of them have paused for a moment and shifted in their chairs. One of them (participant 18) let out, "Hum, that's a

good question. To what extent would you like to dig into it?" This echoes with another woman participant's (participant 21) response - slow and reserved with a sense of curiosity, saying "What's this for? Well, I need to think about this for a second, I have not been thinking about it." Others, on the contrary, took on a paradoxical tone as they talked. When I asked one of them from a minority ethnic group (participant 7) about whether being part of a minority group and a woman of color in IT affected her career development, she immediately said, "This may sound strange, but no. I have been quite oblivious to the fact that I look different to people around me, for most of my life." Data collected from these participants provides evidence of factors that may have helped and/or hindered their career advancement and challenges encountered along the way. Issues of gender, age, ethnicity, educational background, and technical skills permeated the analysis of varied factors that may contribute to women's perceptions and choices about their professional journey in IT work, and whether the factors helped or hindered.

The interviews conducted for this research project are semi-structured and open-ended in nature, where the participants can reach their best capacity in voicing their experiences unconstrained (Creswell, 2009), and thus, expressing their own opinions from varied perspectives during these interactive conversations. This also follows Kvale's (1996) introduction of the qualitative research interviewing - a method being used to "understand the world from the subject's point of view, to unfold the meaning of people's experiences, to uncover their lived world [before] scientific explanations" (p. 1), which aims to "obtain descriptions of the life world of the interviewee with respect to interpreting [the] meaning of the described phenomenon" (p. 5-6). Semi-structured interviews allowed me to conduct initial, and flexible conversations occurring around descriptions of everyday working life and routines between the interviewer (myself) and interviewees, where follow-up questions and

discussions around the research questions could be carried out further in more depth. Although the number of interviews can be seen as a limitation, the majority of interviewees purposefully selected as aforementioned are able to supply information by sharing their living experiences and livelihoods, including but not limited to discussions on life and career journey, role expectations, working environment, organizational culture and interactions with other IT professionals at work and off work, and perceptions of bringing about change against challenges and issues of discrimination encountered. Given the philosophical underpinnings of this research project, it is worth noting that some interviewees, particularly those who have been referred by others who have participated in the study, are reluctant to talk in detail about their feelings and emotions in response to challenges and difficulties they have faced at varying life and career stages at the start of the conversation. There are a few reasons that could explain this. First, as a stranger to them, there is a lack of trust and no stable relationship has been established between me and the interviewees and thus, to some extent, interviewees may hold back their feelings and tongues when they share their feelings and difficulties along with their life and career histories in IT. Second, the intention of showing a good side, in ways of presenting themselves as an inspirational figure, a 'role model' who has achieved some milestones that they are very proud of, may have also contributed to this.

In alignment with the adoption of a critical positioning as a complement in this study, further questions that stretch towards exploring *why* have been raised, such as "how did that structural/organizational inequality and discrimination experienced and/or observed make you feel". This allowed me to move beyond being an observer in an interpretive interview and saying nothing while simply listening to the interviewees, and instead, I was able to take a further step to investigate a broader context within the gender and IT construct, depending

on the responses of the interviewees. To elaborate, I have explored the multi-facet stories of the contradictions about an individual's paradoxical feelings, motives, actions, and emotions about these various challenges, power constraints, and suppressions experienced or observed during their professional lives in IT. In doing so, various manifestations of intersectional differences are reflected among these female IT professionals. Additional individual cases of women industrial experts further feed the rich data sets by answering the left parts of the questions and objectives unanswered, and in some ways, exceed the aim, research questions, and purpose of this research, whilst also reaching natural data saturation. Thus, the datasets collected would be rich in nature and provide an insight into the research questions set for this study, with new themes and patterns emerging from the data gathered.

The interview schedule is designed in alignment with standard interview protocol, which includes instructions to guide the interview process and categories of questions to be asked (Creswell, 2009). The interview guide can be found in the appendix. It is important and necessary for a researcher to have these guidelines upon conducting interviews, and in doing so, will also help in increasing the research reliability. The interview guidelines are designed by myself, and I have consulted with my principal Ph.D. supervisor. Further, a pilot study has been carried out with two women IT professionals before starting the actual study, to evaluate the interview guidelines and sub-questions. According to Yin (1994), the pilot study is helpful for researchers to refine their plans for data collection - both the data collection process to be conducted and the content of the data to be gathered. These interview questions have been slightly rephrased in order to guide those participants to supply rich descriptions, which are based upon reflecting on their own life stories and career experiences in the IT profession. Some further questions were also added, in relation to participants' changing positions and workplace (if applicable) during the period of the data collection process. Such

reflective processes allow participants to further make sense of their behaviors, changes, feelings, emotions, and actions, and in doing so, I was able to reveal the multi-facet stories of these millennial women in the IT profession that have been overlooked in the past.

During the data collection process, I have encountered a few difficulties. For instance, some interviewees did mention that the audio recorder could possibly affect their relaxed mood in expressing themselves freely in a well-organized way. I have also been asked to pause the recording in some cases, such as when the interviewee requires extra time to think about some answers and organize what messages she wants to deliver. Some interviewees have been interrupted, such as when the participant received phone calls or interrupted by the participant encountering colleagues from work during the conversation. Recorded interviews have been transcribed immediately after the interviews have been taken. The gathered data is well-organized and ready for data analysis, with approximately 150 pages of interview transcripts. Next, I move to describe the process and methods for analyzing the data collected for this research project.

4.6 Data analysis

When it comes to analyzing qualitative data, there are three main aims suggested by scholars (e.g., Flick, 2013). First, it is about to "describe a phenomenon in some or greater detail" (Flick, 2013, p. 8). What accounts for the phenomenon? It could be the stories and counter stories during a particular period (Boje, 2001), and subjective experiences of an event that occurred among a group or with a specific person (Czarniawska-Jeorges, 1998, 2004; Kociatkiewicz and Kostera, 2016). Third, to "develop a theory for the phenomenon under study from the analysis of empirical material" (Flick, 2013, p. 8). Thus, the process of data

analysis in this research project is also about achieving these aims. I have manually analyzed the data following Easterby-Smith, Thorpe, and Jackson's (2008) seven-step guide, starting from a process of familiarizing myself with the data gathered, coding, categorizing concepts, linking codes, reflective memo-writing, and re-evaluation. It is also noted that I have been moving back and forth to engage with the data comprehensively in order to guarantee continuity, coherence, and clarity. This is to gain an in-depth understanding of the construction and reconstruction of these relations between categorized concepts and linked codes. The data collected has been iteratively coded several times with categories and subcategories being established throughout the process. Discrepancies have also been considered, and as a result, these have either been brought forward for further analysis or dismissed after careful consideration. Speaking of methods used for data analysis, thematic analysis has been employed.

4.6.1 Thematic analysis

Thematic analysis has been employed as an approach to organizing those stories of female millennials in the IT profession, since "themes give stability to understand living-story experiences" (Boje, Haley, and Saylors, 2016, p. 393). All transcripts from interviews have been analyzed by thematic analysis, with coding as a first step to analyze the data collected. Coding is a process of "naming segments of data with a label that simultaneously categorizes, summarizes and accounts for each piece of data" (Charmaz, 2006, p. 43). The coding process usually follows two main steps, which are known as initial coding and focused coding. During the initial coding process, I have familiarized the data gathered line by line and event by event to reflect and categorize what has been going on with these female participants' career journeys in the IT profession, in relation to challenges, struggles and incentives

encountered, and what they have been doing to navigate and cope with these difficulties to make changes. It is acknowledged that line by line coding is of great use to 'locate' both explicit and implicit meanings of the content extracted from the data (Charmaz, 2006). During this process, I have remained open-minded to identify all possible theoretical directions, as the aim of this initial coding step is more to explore and gain a provisional, general, and comparative sense grounded in the dataset (Charmaz, 2006; Creswell, 2009). I have moved onto focused coding after developing analytical directions from the initial process. The focused coding procedure includes a selection and categorization of the most significant and trending codes created during the initial process. This process has been followed up with further identification of primary themes and subthemes associated with common passions, motivations and struggles, and other influential factors in their career navigation and coping behavior shared by female IT professionals. Through this process, I was able to locate the individual differences of gender and IT construct a suitable analytical sense to interpret those multi-realities from female millennials' living experiences and livelihoods in the IT profession. It is worth noting that the two-step guide followed for coding in this research is not a completely linear process. It is often required to move back and forth to engage with the data comprehensively and gain an in-depth understanding of the data, in order to guarantee continuity, coherence, and clarity. In addition, memo-writing is also known as an important phase during the data analysis process. As suggested by Glaser (1998), memos are informal analytical notes generated during the research process, particularly during the coding process. The memo-writing process helps to map the conversations analytically between the researcher and the data (Lempert, 2007). It helps researchers to have continuous data engagement phases and thus, it further assists researchers to translate analytical thoughts in a more sophisticated way and crystalize the main thesis

(Charmaz, 2006). A summary table of key themes and illustrative examples is provided (see Table 4).

Table 4**:** Key themes and examples

Personal attributes	Attitudes to technology	Since when I developed my interest in blogging as a hobby via free website builder, I was like managing and creating my own design of images, aspects I feel exciting to share in my life, and develop sparkling content which I feel I could offer the others with something interesting and inspirational stuff… [When it comes to] the actual web development, I love the feeling of that there is no same days…I have varied set of challenges during everyday work and different problems to resolve. I build [entertainment] websites [that] perfectly combine my love …and coding (P1). I wanted to be able to develop applications when I first started to learn to code…to build something that reflects your enthusiasm and passion. Give it a shot if you have an idea, you are interested in. If you don't have a plan, let what you need to know next guide your learning (P9).
	Sources of motivation	UI (user interface) design is a combination of methods and tools that allow us to solve real problems and craft a truly functional, useful, and enjoyable design…We help people's lives better, we create the best possible experience that addresses their needs, we impact real-life experiences (P14). Life is [a] house and you are locked out. Your dream is right behind the front door. Are you going to stand outside in the cold or will your try the backdoor, every window, and crease to find a way in? ... Nothing is going

		to stop me from getting there and if anything tries, I will find another way. (P2)
	Lifestyle	I was willing to see this lifestyle as a viable choice because I am young, and these are definitely the last few years I will have without a family, baby, or mortgage… I was financially secure and had no romantic commitments. It was the ideal combination to be able to take advantage of this once-in-a-lifetime chance to travel the world and live a more fulfilling life…Developers do a lot of head-down work, and real-time online [communication] through video calls and asynchronous chats makes it unnecessary to be in the office all the time…I believe digital nomadism is the way to go…a life reset, which I desperately needed at the time…I was able to slow down, work less, find out what I wanted and what my goals were, meet new people and cultures, and gain a wider perspective on life because it had helped me to slow down, work less, figure out what I wanted and what my goals were (P10).
Roles of others and the organization	Influence of family	We were well off which meant that our family could afford the latest tech…my mum ran a computer store where we grew up…mostly my siblings and I stayed up all hours playing games…It also meant I was handling in [the] printed assignment at a time when this was not the norm, so I was very familiar with computers from an early age…and was never discouraged from using them or pulling them apart to see the insides (P7). When I was deciding what to study, what major, at university, I wanted to study computer science or biochemistry, but my family persuaded and

	pressured me to pursue a career in medicine, so I chose biomedical science at the end of day. That may sound gloomy, but it is the reality when it comes many college students, teenagers selecting majors or disciplines…In retrospect, I did enjoy studying biology and chemistry, so it was not entirely [what] my parents want, though I think biochemistry is probably what I wish I had pursued instead (P11).
Influence of others	With my manager and mentors, I really hit the jackpot…One thing they told me was that we needed to get this busy attitude out of my mind, and that they would never be too busy to help you [juniors] out. And that pledge of support stuck with me. It means a lot, that for [experienced] mentors could appreciate good work and be open to criticism, when there is space for improvement. Also, you would never be that senior to learn from new starters and juniors, so I always bear that in mind (P22). Speaking publicly, in front of a large number of audiences, forces me to become a stronger self-starter when I learn new technology and tools. Back in those days, we had [imported] a bot service…and I wanted to learn more about it, so I pitched a talk about bots a few months in advance and began researching how they work. It went well, and I created a bot for audiences and clients attended during my demo talk to use, and to ask question (P5).
Influence of HR practices	I'll be starting my second year at this organization soon, and because I haven't received a formal promotion, I feel like I've stayed too long…I was headhunted for the next job, which would require me to do many different things, all in the field of information technology. Having a diverse range of IT experiences has given me plenty of ammunition to figure out what I want and don't want from my next job. In the tech sector, it seems that hopping

		jobs, rather than sticking in one position, is the best way to get significant raises and promotions (P3). I recall having an interview with two male co-workers, and the other two were going to say yes, but I was hesitant. I thought his technical knowledge was adequate for the job, but I was hesitant to speak with him. His tone was condescending in some way. That was enough for the majority of my teammates to change their minds and say no. They prioritized my comfort over his technological skills, which I think says a lot about the people I work with (P16). The organizations I have been part of…programs in place to try and ensure gender diversity of positions of responsibility…But these programs are not always without their own problems. Sometimes they can foster resentment from men who feel they may have been overlooked due to some form of quota… Even a number of my female colleagues, who have been positioned advantageously with respect to these policies, recognize it, and become expectant due to the policy, rather than their own merits (P15)
Challenges and barriers	Work intensification and work-life balance	When your passion and what you do for a living [are] on the same level it can be truly powerful but can also be self-destructive when you don't take proper care of yourself. And this is a place I struggle with but am trying very hard to be a lot more mindful. Disconnecting from our passions can be difficult, but burnout after burnout can cause a lot more harm than good…It isn't about being able to code throughout the night, 24/7 running on energy drinks. It's about optimizing yourself for success with a healthy balance of good food, sleep and rest…organizers may try to [take] some time from workshops related to well-being such as mindfulness, mediation, and yoga,

	rather [than] serving fizzy drinks and pizzas that it gives folks a bad idea as to what a good programmer is all about (P13). To be honest, looking back on the past that I've been moonlighting, it came at a tremendous sacrifice…I feel good at the end of the day when I work this hard, but it feels like I could live my whole life just working with this kind of mindset…When you're on this like work, grind mentality, you just think oh I can work a little a bit more, I can work a little bit more, what's another day? And you feel proud of yourself but what about everything else in your life you know (P25).
Discrimination at work (e.g., gender, race, age)	I am always in the middle of fire because of the competitions between myself and those younger boys straight from University, my peers in the same department…I won't deny they seem more energetic, physically maybe, most of them work extra hours at night, and seems to perform 'better' in a way of simulating with my boss, a middle-aged white man, especially towards his expectations of task delivery… I was down for quite a time especially when he shows dissatisfaction with my work progress and I started to question if I am qualified to do the job… over time I kind of lost my confidence in mastering my work until probably another year and a half and it seems back on track, rebuild our work-relationship and work on new projects (P24). Internal bias in ethnic groups is no laughing matter, and it can be very passive-aggressive in my experience. I've become painfully conscious of how discriminatory the society can be…I've heard so many stories and [have] also been the target of prejudice against people with darker skin

		tones because it connotes people from South Asia…I'm at a loss for words to describe where the origins of this prejudice and discrimination come from. Is it necessary? Is it possible to be jealous? What is nationalism? (P21) Despite the fact that I have always appeared optimistic, I have experienced imposter syndrome on many occasions, especially when I was the youngest panelist. Why should older people listen to you? I started to question what new information [I can actually] bring to the table that they don't already have…I've gathered a lot of experience and additional values that I can bring to the discussions after a lot of encouraging affirmations and taking a step back, and it's only after that point that I have appeared to be respected by others (P12).
Navigation approach	Seeking freedom and autonomy	On the other hand, since no one can disturb me at any point, I have a lot of control [as a remote worker], and it is easy to get into my zone. It would be easier for me to concentrate producing when I am being left alone for long periods of time (P4). You will need to look for work and learn about new social norms… and apply for a visa, grab a quota as a foreigner … A transfer and move job abroad involve a great deal of preparation and research… I am not eligible to get a work permit automatically when I target tech positions based in Australia, I did invest a lot of effort on and applied loads of companies after I moved here on a work holiday visa…I have to work around how long can I legally remain in that country, and will I be able to find a sponsored job to extend my right to work? How's the job market going? How can I get around etc. (P18).

Community support	It was very interesting that we created a community straight away because we were all on the same boat, but we were all learning from each other (P17). I was under-employed for about six months or so, and during that time, I suffered from extreme anxiety and financial difficulties…I started to look ways out as an independent contractor to take on my own projects, but it is not easy when you are not that senior who has years of handful experiences and some contacts to start-up in the industry. I joined an IT local community and learned to be a full stack developer you know so you would appear more competitive. And participating in this group helps me to reach out potential contacts and after about eight or ten months, I kind of firmly establish a foothold… I adore this nurturing culture and help me stay connected with peers and learn during the challenging period (P19).
Taking initiatives	I do think that initiatives can positively impact upon hiring rates of women in tech companies, but that in itself is not an answer if the work environment is toxic…[xxx] for example, has diversity and inclusion policies and has partnered with the [xxx] program, but it was only last year we had the [xxx] memo fiasco which demonstrated there are still huge barriers to overcome (P8). Simply recruiting is not enough to be considered substantial…It is filling a gap that went ignored previously…should flow at a much deeper and intrinsic level…Recruiting people of varying sexual orientations and gender identities requires you to ensure that the environment you are inviting them into is both supportive and safe. Strong empathetic and inclusive values need to permeate every part of your organization (P6).

4.7 Research validity and reliability

The criteria of qualitative research validity refer to "assessing whether the information obtained through the qualitative data collection is accurate" (Creswell and Clark, 2010, p. 211). The primary research purpose for this study is to gain a better understanding of the career experiences of the millennial generation of female IT professionals. Rather than complying with the entrenched 'ideal worker' ideologies and practices of technology firms, this research project aims to investigate the multi-realities of these female IT professionals by looking into individual work-life experiences against the male-dominated discourses in IT and opening up female millennials' career experiences is an approach to speak out of those stories in this field. Thus, human beings and subjective experiences are the primary sources for data collection and further analysis in this qualitative inquiry. Research validity is built upon the philosophical positioning that underpins this study and relies on responses gathered from my research subjects. Further, a summary of research findings has been shared with my research participants, ensuring their delivery of messages has been captured accurately on my side. Further, research findings are discussed in a site of multiplicity and have also been compared with relevant literature on women and IT from the past. This increases the level of research credibility by diminishing unintended bias that could exist in any interpretive research.

In terms of external validity of qualitative research, which usually refers to research generalizability, which is known as "the extent to which the findings of a qualitative study can be generalized or trusted to other situations" (Merriam, 2009, p. 234). In qualitative analysis, the word "generalization" is often omitted or used cautiously (Parker and Northcott, 2016). Scandura and Williams (2000), for example, claim that interpretive studies appear to

make generalizing conclusions about their results without dwelling on the grounds for such generalizations or how they could be justified. It is crucial to distinguish between empirical and statistical generalization in order to understand the essence of such constraints, which usually occur in qualitative inquiries (Rapley, 2013). Empirical generalization is concerned with producing localized discourses about contexts or phenomena and then generalizing the findings beyond the reach of the settings (Parker and Northcott, 2016), while statistical generalization is concerned with statistical power against the general public (Rapley, 2013). In this study, although statistical generalization was not achieved, generalizability could still be achieved by replicating this qualitative research logic and design to future investigations into the changing nature of the gender-technology relationship in the IT workplace and the career experiences of women in the IT profession in different contexts, and thus empirical generalization will be achieved.

Research reliability refers to "the extent to which there is consistency in the findings" (Merriam, 2009, p. 234). In this study, reliability has been achieved by presenting the philosophical positioning underpinned and rationale, qualitative research methods, and methodology, data collection and analysis supported by existing literature in the field of women and IT research, and thus, findings from this research could still be sustained even if the research logic replicates in other studies.

4.8 Ethics

It is worth noting that there are several concerning ethical issues that may arise in organizational studies, as suggested by Bryman and Bell (2015), which mainly involves potential harm to participants and researchers, lack of informed consent, and issues of

privacy. The primary research purpose for this study is to gain a better understanding of career experiences of the millennial generation of female IT professionals and opening up female millennials' career experiences is an approach to speak out of those individual stories in this field. Thus, qualitative interviews designed for this research require me to ask my research subjects about their real-life experiences in IT work, perceptions, and reflections on their living experiences and livelihoods during their career journeys. No physical harm has been involved in this research. Prior to the start of the data collection process, mandatory procedures to obtain ethical approval have been followed, to ensure ethical research practice. It includes a research information sheet debriefing the purposes of this project and a consent form indicating what to expect when participating in this study. All this relevant information about the nature and purposes of this research has been provided to each participant when scheduling the interview. They have been asked about their willingness to sign the form and if they want to be audio recorded or not prior to the interviews. Each participant has been informed of their right to participate or decline their participation freely, and their right to withdraw from the interview at any time with no further questions asked. It has ensured that there would be no intrusion of individual privacy and participants have been given full confidence to refuse to answer any question that they did not want to answer.

Participants are informed of the data confidentiality and anonymity that have been applied in this study. Information related to organizations that participants have been working for has been kept at a minimum and masked as necessary to ensure the anonymity of individuals, such as the organization name, type, and precise location. As suggested by Lee (1993), that failure to protect anonymity could cause damage to participants' reputations and their careers within their respective organizations, or even the broader industry they are engaged with. It is also true that some participants did mention that they had been given training by their

employers on issues of data privacy during informal conversations. It means that some personal experiences that could be traced or identified within the specific organization and information they provide may cause a conflict of interests. Thus, I have diminished the potential identification of individuals participating in this study by masking any identifiable information that could be linked to respective participants and using digit codes to represent participants. This study has received ethical approval by the research ethics committee.

4.9 Conclusion

This chapter presents the philosophical positioning that underpins the study, followed by rationale for the various reasons underneath these choices made, in alignment with research purpose and the nature of research questions. The epistemological stance that underpins this study is primarily interpretive, and critical epistemology is used as a complement. Next, the inductive, qualitative research design to explore the living work-life experience of the millennial generation of female IT professionals is outlined. This is followed by presenting details of the data collection process, including the sampling approach and short reflections on issues encountered during the data collection process. Semi-structured interviews are adopted for gathering data for this research. Further, the data analysis approach is discussed, which involves the combinatory use of thematic analysis. This is also followed by a rationale of why the two different types of analysis methods have been used in combination when analyzing data. This chapter concludes by discussing the research validity, reliability, and ethical considerations in this study. The next chapter will present the main research findings.

Chapter Five The stories of female IT professionals from a millennial generation

5.1 Introduction

Upon starting to write this chapter, I am inspired by feminist and civil rights activist Audre Lorde's (2007) observation that 'there is no such thing as a single-issue struggle because we do not live single-issue lives' (p.138). It inspires me, as a researcher, to discover what is overlooked behind women's stories in this field of study when the mainstream scholars adhere to a 'logic of trajectory, strategy and purpose' (Höpfl, 2011, p. 32), and thus, implying the normalcy of masculine credentials of 'rigor', 'hardness', and 'penetrating conclusiveness' (Phillips, Pullen, and Rhodes, 2014, p. 316). As a result, gendered writing becomes more visible and subject to debate. It focuses on permitting a diverse range of effective voices and texts by establishing intellectual spaces for capturing and conveying various types of expression (e.g., Ahonen *et al.*, 2020; Pullen and Rhodes, 2015). Instead of complying with the 'ideal worker' philosophies and practices of technology firms, I explore the potential for individual resilience as well as collective resistance against the male-dominated discourses in the technology workplace. Opening female millennials' career experiences in the IT profession is an approach to speaking out those overlooked stories in this field. Thus, this chapter adopts a storytelling approach to unveil the lived experiences of the millennial generation of female professionals in the IT domain, by answering the following research questions (outlined in Chapter One Introduction) for this research project:

RQ1: What attracts millennial women into IT work?
RQ2: What are the barriers and challenges that women in IT face in their profession (and/or in balancing their professional and personal life?) and what are the underlying reasons?

RQ3: How do these IT-skilled women navigate and negotiate with these challenges encountered and why?

This chapter is organized as follows: first, illustrating the multiple factors that helped and hindered women's choices and advancement in technology during their career trajectory; second, describing each theme and the interplay between different factors in more detail. In other words, these core factors and primary themes are variously but tightly interwoven with the captured moments of women's living experiences. An individual's patterned nature of choices has to change to pave the way for lives and livelihoods as a result of changes in values, beliefs, and career preferences during interactions with the organization and others at various stages of life (e.g., Armstrong, Riemenschneider, and Giddens, 2018; Fernando, Cohen, and Duberley, 2018; Khilji and Pumroy, 2018; Lewis and Simpson, 2017; Lewis, Benschop, and Simpson, 2017; Peturcci, 2020). Specifically, four main themes emerged from the findings which frame the overall positioning of the millennial generation of female IT professionals.

By analyzing the lived experiences of millennial women in non-traditional IT employment, a number of themes and subthemes have emerged from the data which answer the above research questions on what brings these women to IT work, what challenges and difficulties are associated with their working experiences, and how they navigate and cope during their career journeys. Common reasons revealed for 'what brings these millennial women to IT' include: exposure to coding and technology in a setting which enables them to see the versatility and multifaceted prospects of IT work to motivate them to develop career preferences in IT; personal attributes and abilities match the characteristics of IT work which they find attractive; and the influence of someone close to them. Generally, female IT

professionals/practitioners in this field enjoy the work they are doing. Challenges arising from their work experiences are more likely to be associated with organizational members at/-off work and work/life conflicts than with the work they do, and they are eager to seek more 'allies' around them. In particular, to seek those IT professionals who collaborate with other IT professionals from marginalized groups, who do not demand to be in the spotlight but constantly look for ways to learn and improve. While there are many common storylines, there are also individual differences. I have absorbed the ambivalent nature of simplified tensions (e.g., Kossek, Su, and Wu, 2017; McGee, 2018; Vitores and Gil-Juárez, 2016) in perceiving privilege and inequality, as an individual and a collective, to unveil the 'paradox' of the lived working life experiences of a younger generation of female IT professionals.

Much of the literature has been monolithically anchoring women's work-life experiences in male-dominated IT fields as working mothers, romantically attached to partners or husbands, who have been constantly enduring contradictory demands these pose on them (e.g., Armstrong, 2017; Rottenberg, 2018), which further reveals the nature of the mainstream gendered-ness. What I want to bring in here, in this analysis, is an embodied and ethically engaged view of social practice and dynamic relations, which frequently confronts the individualistic preoccupations with and attachment to the desired individual autonomy, and the associated expectations of an autonomous self that is led by masculine-oriented intentionality and rationality. It is to challenge that "the tendency to conform, to normalize, to secure and control" is the pathway to destruction or resist seemingly meaningless and sometimes self-defeating ways of making a stable and secure self (Levin, 1985, p. 74). This allows individuals to avoid a life filled with meaningless pursuits, rather, contribute themselves to projects that could enable them to discover their "true and authentic self so as to recognize [their] potential" (Knights and Clarke, 2017, p. 343). Guided by the individual

differences theory of gender and IT construct, main themes presented here include: 1) Personal attributes, e.g., lifestyle, workplace, attitudes and values; 2) Personal influences, e.g., family, others, role of the organization and practice, and economic and policy influence about the region of IT work; 3) Challenges and barriers e.g., work intensification, work-life balance and discrimination at work; 4) Navigation and negotiation strategy during their work-life experiences in the IT profession.

5.2 Personal attributes

The empirical data illustrates three key personal attributes that the millennial women exhibited in their pursuit of the IT profession: attitudes to technology, motivation, and work/lifestyle.

5.2.1 Attitudes to technology

As suggested by previous studies on STEM women's careers (e.g., San Miguel and Kim, 2015), being passionate about what they do and confident in carrying out work would have a positive impact on fostering career progression. In another study researching women in the US IT industry, it claims that only when women perform with confidence and appropriate attitudes at work will they be able to advance in their career (Orser, Riding, and Stanley, 2012). This is exemplified by an expression that "through confidence building, I have learned to take those initial assumptions in my stride" (ibid, p. 84). The following examples present findings that go in line with manifestations of self-efficacy in pursuing a career (Aaltio and Huang, 2007; Makarem and Wang, 2019) and person-environment (P-E) fit theories (Kossek *et al*., 2017; Nye *et al.*, 2012), but expand them by showing that women's attitudes and work passion, associated with a high-level self-interest development in technology, are

primarily attributed to these women's career entry into IT and continuous career development to achieve an increased agency. Participants express their perceptions and feelings of what meaningful work looks like to them or what makes work meaningful. They suggest that finding meaningfulness at work is profoundly personal and individual, and such interests in IT work would foster their finding a sense of purpose in becoming an IT professional in the long run. This is interpreted as a representation of having different priorities among millennial women, that are associated with sources of meaningfulness and creativity at work.

> *Coding is very creative … front-end development is like painting with code instead of brushes…. To see the shapes and colors and fonts falling into place. It is, in my opinion, the perfect way to combine my interest in art and design with my interest in coding.* Participant 4

> *[When it comes to] the actual web development, I love the feeling of that there is no same days. I have varied set of challenges during everyday work and different problems to resolve. I build [entertainment]websites [that] perfectly combine my love of [XX] (personal interest of a form of entertainment) and coding.* Participant 1

Usage of words such as 'interest' and 'love' which indicate women's attitudes to coding are pointed out, implying their strong intention of injecting personal interest into their technology work. But self-interested development in technology does not mean pure pleasure or enjoyment, rather that they often encounter challenges and difficulties during their daily work. One of the above participants carries on talking, which illustrates how her choice of profession matches where her interest lies, which further facilitated her landing on technology.

> *While being a web developer, it is not something I have planned for, but I'm glad it comes this way … since when I developed my interest in blogging as a hobby via free website builder I was like managing and creating my own design of images, aspects I feel exciting to share in my life, and develop sparkling content which I feel could offer the others with something interesting and inspirational stuff…I enjoyed it but soon I realized… website templates cannot meet my demands so I started to learn the front-end and then back-end development … To be honest I was not good at building separate sites on my own and I never imagined it would become such an important part of my online life. It helped me in many aspects of daily life, communication…and landing a full-time employment in IT in the end [of university life].* Participant 1

While women's interest does appear in many of those career studies for equality, diversity, and inclusion, it is often perceived as a 'fitting' factor in response to the male-dominated work environment and expected roles for female employees at work. For example, Diekman, Brown, Johnston, and Clark's (2010) study suggests that gender differences in people-oriented interests and communal goals do provide an important explanation for women's underrepresentation in male-dominated occupations such as fields of STEM. In other words, the stereotypes about STEM careers as things oriented toward masculine attributes often conflict or are seen as incompatible with the communal goals that many women would desire to achieve a balance between career and family. However, it fails to recognize the impact of women's self-interest development in technology on their professional identity and personal resistance to their entry into IT work.

The evidence below suggests that the interwoven self-interest development in technology and individual preferences would ultimately facilitate women's career choices, in which the process has been described as a 'natural' progression. This is, to some extent, because those with meaningful lives tend to produce more positive feelings, such as being passionate about investing efforts and contributing to something beyond work.

> *My interest in … cloud computing started from [the point] my team [colleagues] recently brought [cloud service system] into the infrastructure … Turns out [this service system] is much bigger and robust in services than [any system] what we have used in the past and [have] never imagined … I have been actually considering about to take a further step to move into cloud engineering as a career track after my two IT support positions, and I spent some time to get the cloud training done on the and I think it was just a natural progression in interest.* Participant 3

> *I can't recall [if there is] a specific event that led me [to] break into [the tech], I felt very natural [to land in this field] … When I was about 15, a couple [of] other friends and I started a mini-web agency, taking some clients and do [tech] projects together.* Participant 10

From the career preference perspective, gendered career paths and inequalities attribute intensively to the interactions between women's interests, values, goals, and characteristics of the work environment (Kossek *et al*., 2017). Specifically, this view draws upon person-environment (P-E) fit theories, which attributes individuals' choices of the work environment and jobs to their corresponding interests, values, and goals to achieve better P-E fit, which in return, leads to better job performance, career advancement, and satisfaction (Nye *et*

al., 2012). This view does explain some female participants who may tend to opt-out of certain jobs or fields, due to their perceived misfit between the work environment and their career preferences.

> *I used to be a journalist before I started coding... My first job since switching careers was as a back-end developer... The business was fantastic, but my goal was to merge my journalism experience with my love of coding in some way. I used [XX] (a social media site) as a journalist to keep track of breaking news and post stories. So [XX] seemed like the right place for me... The whole thing took a long time, about 6 months. I had [rounds of] interviews and code tests during that period. It had been a lot of hard work, but when I found out I'd gotten the job, I felt like it had all been worth it.* Participant 9

In the above example, the way she developed indicates that there may be a connection between passion and determination throughout the making of a career change, which is exemplified by her constant development of professional identity and coding skills. She continues to suggest that, in a sense of, to simply fulfill or be driven by where an individual's passion lies.

> *I wanted to be able to develop applications when I first started to learn to code…My advice is to build something that reflects your enthusiasm and passion. Give it a shot if you have an idea you are interested in. If you don't have a plan, let what you need to know next guide your learning.* Participant 9

Likewise, the below female participants also gave their advice to others on possible directions they can take further for career development; both of which resonate with the idea that there is no 'one size fits all' approach or direction for each person, but what matters is to find sources of excitement for sustainable learning and development.

> *I would say focus on learning the fundamentals and the areas that interest you. You don't have to learn both [the] front end and back end. Obviously having knowledge of both is always helpful, but it's okay to focus on learning just one area … It's part of the excitement but it is also very overwhelming so pick something you enjoy and learn that otherwise you can get burnt out easily.* Participant 22

> *I'd consider your career direction, ideal team size and business size, innovations or products you'd like to work on, and even your work-life balance. Without naming names, I have several friends who work at the sites registered, listed companies, and some are very happy, some are overworked, and some have left because they were bored. It'll just vary a lot from person to person, so it's best to find out what you're really after*. Participant 16

The above examples demonstrate that a positive attitude towards technical work associated with constant learning and development, and work passion would directly affect an individual's persistence in IT careers. In studies of STEM fields, self-efficacy is regularly referred to as a woman's confidence in her capabilities to pursue a career (e.g., Makarem and Wang, 2019) and recognition of a woman's competence and talent (e.g., Aaltio and Huang, 2007). One of the female participants in the above study conducted by Aaltio and Huang (2007), who is an IT professional, expressed that, "I obtained the current position because

I'm qualified." (p. 235). Similarly, in the following example, self-efficacy is one of the participant's distinct individual attributes that contribute to her pursuit of a career in technology.

> *As a female quant [analyst] in a highly competitive industry, I believe I am a role model for girls and women who aspire to make a contribution to technology … I hold a Ph.D. degree in applied mathematics … I have significant experience in delivering mathematical models and quantitative analysis tools for projects across a range of fields. These projects involved [the] application of advanced mathematics, computer science, software engineering, and programming…* Participant 15

A commonality is that they do identify and acknowledge their competencies and talent. This resonates with those women who are seen as competition-oriented at IT work (e.g., Crump *et al.*, 2007), and for many of them, personal development and career focus have become inextricably intertwined. She continues,

> *Last year my team of five won first place to raise funds for [XX], a charity that helps in-need entrepreneurs in impoverished countries develop their businesses. [Our] team turned a £1 seed capital into [XXX] (a five-figure number in GBP) in one month and was selected to present the business idea to the CEO of [XX].* Participant 15

This can be interpreted as implying a woman with a high level of self-efficacy is likely to be prepared for complex tasks, address tough problems and find new assignments that would be beneficial for further career development. It to some extent supports Buse and Bilimoria's

(2014) research findings, that the higher level of self-efficacy women demonstrated, the more persistent they were in STEM-related professions.

5.2.2 Sources of motivation

In previous studies of women in broader STEM fields, the need to prove one's self is seen as the primary external motivator (e.g., Hatmaker, 2013; Makarem and Wang, 2019). Specifically, these women are likely to follow a path of developing technical skills and reconstructing professional identities to showcase their competencies, through which to achieve career advancement. But during the process, a sense of uncertainty is revealed when it comes to self-evaluation of individual competencies behind extrinsic motivation. The following findings expand and reconfigure this uncertainty of self-evaluation by revealing women's feelings of self-value and self-worth at work, which are intensively drifted by the recognition of experienced superiors, who are predominantly men. In addition, these findings align with San Miguel and Kim's (2015) findings of women's glorifying accomplishments and pursuing excellence as sources of internal motivation to achieve career goals, yet the following findings differ from their findings in that women are found to achieve their career goals by setting a clear career path. This is amplified by female millennials' non-linear and sometimes winding career paths in IT.

> *In the early days of my career, I worried a lot about style. I would look at so much amazing work and try really hard to be just like it. I found projects difficult to get through and was never satisfied with the end result … My work did not have a common thread and I definitely don't think anyone could have pointed my work out as distinctively mine …It was only after a new employer commented that diversity in my*

> *portfolio was a good thing did, I begin to really believe in what I was doing. Where I saw messy, he saw a strong level of adaptability. After that, I adopted no style as my style … [which's] exciting to me and makes me feel like I'm making the best impact that I can as a [user interface] designer.* Participant 6

This is, to some extent, echoed with Hatmaker's (2013) research findings, which demonstrates how women negotiate their gendered attributes and professional identity as an engineer to be influential in work, which is always critical to career progress. It is expressed by one of the women engineers, saying that "...it was a defining moment. It was defining to the extent that I was hell bound and determined to prove I was the best engineer they ever hired.... It gave me a determination at that point." (p. 389). Upon such achievement being recognized, feelings of the need to prove oneself at work are alleviated, and one becomes more improvised. She continues,

> *By nature, I don't look at anyone as competition. Instead, everyone around me [is] my future collaborators, my muses, my accountability buddies, my inspirations … Amplifying the people around you [don't] diminish you or your own work...I think it makes it shine all that much brighter.* Participant 6

This short story traces the subtle stresses and changes in how the participant makes sense of her distinguished ways of carrying out work and moving forward. The following is another slightly different example of combining regular employment and a second job, through which the participant demonstrates an individual's embedded self-conceptions of identity, value, and commitment to their lives and livelihoods. It also implies the benefits of monetary rewards that IT work can bring, which are recognized; and, thereby, such employment

advantages serve as an attraction and incentive for women in technology. It is also worth highlighting that, with the demand for a new generational workforce to fulfill the IT personnel, millennial women are seen as much a product of neoliberal capitalist regimes as men. Thus, it is not surprising that some younger workers are being forced into acquiring such a 'normalized' identity work in IT occupations, which is manifested in a constant pursuit of self-determination, freedom and productivity, which could possibly have a negative impact on their mental health and wellbeing.

> *Moonlighting has been an incredible experience and a very nice side income. I've been … moonlighting, and regular employment so I sometimes hit 100hrs of work. But I thought it would be a good opportunity, so I started moonlighting eight months ago … I'm here almost every Saturday I can manage … so I've really tested my limits on how productive or how efficient I could be ... And now that I'm getting older, that comes at the expense of spending time with friends, going for fun days, I even spent the last vacation week working.* Participant 25

The below evidence shows that self-recognition of the value of what they do is another common response - as an important intrinsic motivator during career experience, for a pursuit of meaningfulness. This is mainly related to individuals' most compelling themes and their exposure to the subject dynamic range during their work-life experience.

> *UI (user interface) design is a combination of methods and tools that allow us to solve real problems and craft a truly functional, useful, and enjoyable design … We help people's lives better, we create the best possible experience that addresses their needs, we impact real-life experiences.* Participant 14

> *Perhaps it's because of my educational context, but I've always liked and found sense in consuming a vast volume of dense knowledge and then spitting it out in a more easily digestible form... I'd like to make these resources and service systems available to people who are interested but can't decode the technical jargon... I don't believe that a lack of technical jargon can prevent women interested in learning about technology from using the [learning] tools.* Participant 23

Also, to find a sense of purpose or being goal-oriented at work is revealed. One of the participants conveys her determination behind the intrinsic motivator by providing personal mottos - two quotes that are perceived as a way of framing her situated practices during the work-life experience.

> *Sometimes you have to leverage plan A for plan B, maybe even plan C for plan D, to get to Plan A so you can reach plan B;*

> *Life is [a] house and you are locked out. Your dream is right behind the front door. Are you going to stand outside in the cold, or will you try the backdoor, every window, and crease to find a way in?* Participant 2

She carries on illustrating her personal mottos,

> *Basically, if I can't get what I want at that moment, either because I lack the money and resources or timing is just off, I find a way. It may seem like I am going off track,*

> *but I am really finding a different route to get to my destination. Nothing is going to stop me from getting there and if anything tries, I will find another way.* Participant 2

This indicates her internal force that drives her to work hard and to achieve goals, despite the various difficulties that she had to overcome during her winding career path. In San Miguel and Kim's (2015) study, women in STEM fields are found to achieve their career goals behind intrinsic motivation by setting a clear career path, glorifying accomplishments, and pursuing excellence, as expressed by one of the participants in "It's just getting the plan and knowing exactly what you have to do… so you have to have your plan and your goals" (p. 142). Yet, what is typically at stake but remains unsaid is that goals do not always remain unchanged, and that motivation as/in waves in different phases of women's lives is often contested from time to time.

> *I am grateful for the opportunity to go through... because it gave me a taste of what working in the biopharmaceutical industry is like. I discovered from the experience that I didn't want to be a lab technician or do any lab work, which is the primary career direction that my degree leads to... spend more time on my interests, which contributed to almost unintended networking with people in the tech side... something I never expected might happen. I am really excited to look into the possibilities and see what it is like... So, right now, I would say that my career plans... are pointing in the directions of where my interests and hobbies are [lying upon] … But who knows where I may go?* Participant 11

However, rare attention has been given to women's abilities to pursue their hobbies or any other important aspects in different phases of life that may be relative to their changes in how

to work and live. The above example shows a self-driven career behind intrinsic motivators, that the accessibility towards varied sources of options is intertwined with the framing of motivation which waves across an individual's work-life experience.

5.2.3 Lifestyle

The following findings resonate with Woldoff and Litchfield's (2020) recent work - a vibrant ethnographic portrait of digital nomads in Bali, Indonesia, while expanding their work by capturing other forms of contingent workers in IT (e.g., IT freelancers, digital nomads, independent contractors, and/or other outsourced/non-permanent IT workers). In the meantime, depicting a growing community of female millennials in IT who are actively pursuing a lifestyle of freedom, independence and equality, using technology to perform their jobs, travelling far and wide, and going as much as they want. This group of female IT professionals reflects a modern and rapidly rising community of mostly younger professionals, millennial workers, who are looking for fulfilment in both work and life. The next story traces one of the female participant's transitioning processes from a full-time IT professional to a digital nomad. By describing the changing process, she is aware of the *privileged* situation she was in, before and during the change, that she is single, childfree, and not entangled with the weight of financial burdens.

> *At the time, in New York City, I worked as a product designer and front-end developer. I'd been there for four years and felt like I wanted to make some major changes in my life. I had a fantastic career, but after almost three years there, I was itching to work on a different issue... I was willing to see this lifestyle as a viable choice because I am young, and these are definitely the last few years I will have*

> *without a family, baby, or mortgage. I was financially secure and had no romantic commitments. It was the ideal combination to be able to take advantage of this once-in-a-lifetime chance to travel the world and live a more fulfilling life.* Participant 10

The lifestyle changes that occurred in the above example could be interpreted as a way of liberating women's normalized modes of working, by bringing fresh blood and veins to pursue meaningfulness and enriching work-life experience. With reference to Markula (2003), who writes that "the ethicality of self-care arises from a concern for one's actions as an ethical subject aiming at the renewal of the self" (p. 99), it is also suggested that lifestyle changes originated in demands of self-care could further make changes to the employer-employee relationship at work (e.g., Johansson and Edwards, 2021). Generally, these female professionals who would go to great lengths to change their work/lifestyle are centered on a more natural progression and a notion of developing their own self and agency to meet higher demands of autonomy and control of work. Their previous experience of remote or freelancing IT work with clients, on and off, which helps with financial stability, and the versatility of IT work makes this shift of working mode feasible. Such a shift of modes of working would further develop the women's professional identities and affect their approaches to work-life navigation. In particular, when it comes to career decisions that are associated with autonomy at work, as such to live a meaningful life.

> *Developers do a lot of head-down work, and real-time online [communication] through video calls and asynchronous chats makes it unnecessary to be in the office all the time... For me, I believe digital nomadism is the way to go... a life reset, which I desperately needed at the time... I was able to slow down, work less, find out what I wanted and what my goals were, meet new people and cultures, and gain a wider*

perspective on life because it had helped me to slow down, work less, figure out what I wanted and what my goals were. Participant 10

Added to the above, the fact that millennial women are marrying later and delaying having kids is one response to their career aspirations, and advances in technology are helping support women's lifestyle change and providing tools for flexible work arrangements. Similarly, another single, childfree woman (participant 12), shares her experience of living on a flexible but regular employment, where she later turns to working on a part-time basis in order to develop her web-development (IT) skills while accommodating her own web-design company's needs. It resembles other non-standard/traditional work arrangements, such as hybrid entrepreneurship (e.g., Solesvik, 2017), which combines employment and self-employment and has been recognized as a preferable choice for women.

5.3 Role of others and the organization

Through the analysis, the importance of others and organizational practices that have a direct influence on millennial women's work-life experience in technology have been identified. Women's interactions and relationships with others, individually or collectively, within or outside of work, influence their learning, development, and being.

5.3.1 Influence of family

The following findings differ from Hass, Koeszegi, and Zedlacher's (2016) research outcomes, in which the role of parents is broadly acknowledged, but only fathers are specifically pointed out. These fathers are seen as key role players and/or role models in

influencing women's interest and career choice in such male-dominated technology fields and also as a source of women's career capital upon entering the field in the first place, exemplified by fathers introducing important contact to their daughters (e.g., Duberley and Cohen, 2010). The following findings extend the above work by recognizing the role and influences of both parents and other close family members rather than fathers only. The influences of partners/spouses are also demonstrated. The importance of parents is recognized, particularly when it comes to women's interest in technological development during childhood, relative subjects learning, and career choices. The concept of a new breed of intelligent learning environment, also known as a leaning companion, was initiated and redefined during the last decade, based on the application of wider networked learning techniques and cognitive science to the advancement of intelligent tutoring in educational systems (e.g., Chou, Chan, and Lin, 2003). For example, one of the participants credits her parents for their cultivation of computers and education during her upbringing.

> *We were well off which meant that our family could afford the latest tech … my mum ran a computer store where we grew up … mostly my siblings and I stayed up all hours playing games …It also meant I was handling in [the] printed assignment at a time when this was not the norm, so I was very familiar with computers from an early age … and was never discouraged from using them or pulling them apart to see the insides.* Participant 7

Another woman reflects upon the role her parents played in her choice of study in science.

> *When I was deciding what to study, what major, at university, I wanted to study computer science or biochemistry, but my family persuaded and pressured me to*

> *pursue a career in medicine, so I chose biomedical science at the end of day. That may sound gloomy, but it is the reality when it comes many college students, teenagers selecting majors or disciplines…In retrospect, I did enjoy studying biology and chemistry, so it was not entirely [what] my parents want, though I think biochemistry is probably what I wish I had pursued instead.* Participant 11

Similarly, as a chief technical officer (participant 12), her parents noticed their daughter's curiosity in creating and building a computer when she was around six years old. As such, they enrolled her in summer programs of women in engineering, where she got involved in full-stack development boot-camps, computer science clubs, and other technology events. She continues her computer sciences studies at the university level and organizes a community that helps make computer science fun for kids. Upon completing education, the role of parents also manifests in providing support when it comes to choosing a career.

> *Despite my parents were not familiarized with the tech field back in those days, I am so thankful that they are still very supportive of where I am leading my life.* Participant 22

In addition, women who have partners or spouses, whether within or out of the field, show recognition of the important role of their partners in influencing their entry into the IT field and career development.

> *If it had not been for him (her partner) I would not have applied for a web developer position, which inevitably began my career. I didn't believe I stood a chance. He was*

the one who managed to persuade and convince me … He thinks about everything, including how it could affect me. Participant 1

We (herself and her fiancée) work for the same tech firm, for developing software systems. When we were dating back then, he asked me out and we spent quite a lot of time fixing bugs, and it was fun. And he is far more experienced in the back end, so I learned a lot from him, technically, from time to time, and I expect to grow further towards an experienced, senior developer. Participant 18

5.3.2 Influence of others

Reflecting upon their entry into IT and career development, these female participants stress the significant influence of others who are close to them besides family members, both within and out of the work domain. And in particular, when it comes to their integration into the technology world and how they deal with relationships with colleagues, managers, and other individuals working in the IT field. The following findings go in line with Armstrong, Riemenschneider and Giddens's (2018) study of women's career persistence and advancement in the IT profession by recognizing the influences of social and structural factors, but more importantly, expanding them by showing the power of IT communities as effective external sources for these female IT professionals to gain human and capital resources (out of the workplace) to enable them achieving an increased agency to counter the structural oppression and improve their status at work.

When these women are asked about the future role, they would like to portray the majority respond as a team leader or senior IT engineer/developer, especially those who are currently

at an early career stage in the IT field and can be characterized as of lower status in hierarchy and power. Others wish to start a new 'business' or independent projects where they can find more control of (them)selves, monetary rewards, and meaningfulness. The women are motivated and influenced by their respective female team leaders or managers. Two participants, for example, discuss how their team leaders and project managers influenced their (re)construction of professional identity, social interactions, and relationships with others in the field.

> *I think my team leader, also a project manager, has been doing a great job. I admire how she effectively handled multi-tasks and projects collaborated with different groups and during our meetings, she has extensive knowledge [of] what has been going on, any potential difficulties or problems like that, so she has the capabilities and confidence to lead her groups … I would say she is a role model for me in a sense, that I want to be like her in the future*. Participant 21

> *With my manager and mentors, I really hit the jackpot…One thing they told me was that we needed to get this busy attitude out of my mind, and that they would never be too busy to help you [juniors] out. And that pledge of support stuck with me. It means a lot, that for [experienced] mentors could appreciate good work and be open to criticism, when there is space for improvement. Also, you would never be that senior to learn from new starters and juniors, so I always bear that in mind.* Participant 22

The above examples also illustrate that women benefit from receiving the support of experienced mentors and managers, especially those who are women, and relative guidance at work. Their extensive knowledge and skills in IT further contributed to the women's

building stronger cases for career development. It is also demonstrated that non-technical skills are vital to attaining managerial roles, such as task management skills and project management skills. To gain the respect of subordinates, and peer colleagues, among other things, IT professionals also rely, in part, on an individual's technical expertise, which is manifested in task delivery and work performance. Further, one of the participants points out the impact of senior colleagues, mentors, and/or managers, mostly (white) men, on her integration into the technology world during her early career stage. This experience has transformed her perceptions of professional identity and ways of managing relationships. She reveals increased assimilation into the technology culture, which is male-dominated, and subsequent changing behaviors performed in the workplace.

> *I joined their IT team straight out of school … I got a lot of support from the graduates who started in the division the same year. They were four to five years older than me, and they took me under their wing … the majority of my mentors and managers were men. Mostly white men. So, it is hardly surprising that I became like them. I think this is what has contributed to my completely out of proportion sense of entitlement and why I was blinded to the ways in which I was different from those around me.* Participant 7

Her changing behaviors, along with her establishment of self-values and role expectations, are assimilated to the patriarchal and hierarchical standards embedded in the entrenched white supremacy, which is exercised by those who are represented by leaders, particularly white men. The above example, in a way, could be seen as future tokens, who move from being tokens to a 'titled' group (Kanter, 1977). Future tokens, as suggested by Kaushik and Pullen (2018), could be described as an employee who lacks power in hands positioned at

lower levels of hierarchy but wishes to be like one of those in charge at higher levels of hierarchy, and thus, "the management would groom them as future tokens" (p. 115). On the other hand, it is argued that token women often feel isolated because of their solitary status, but the increased number of women could make a difference, as they are more likely to enjoy their increased influence on challenging the male dominance over daily organizational operations (Durbin, Lopes, and Warren, 2020). According to Kanter (1977), the ultimate goal in organizations is to achieve a balanced number. This is partly due to the positive results that enhanced numerical balancing could offer for women in male-dominated IT organizations, such as greater tolerance of intersectional disparities. There is also an emerging phenomenon of token women not being permitted to become full members of a group that has a prerequisite for dominance hierarchy but may be expelled for not displaying expected behaviors by them (e.g., Arfken, Bellar, and Helms, 2004). The above example shows that the participant credits the support of her established male colleagues with contributing to her future exploration of her career journey. This resonates with Hass, Koeszegi, and Zedlacher's (2016) research findings that the support of senior males and their extensive social networks have contributed to women's career advancement in the field of science and may be of great help for them in securing future competitive jobs and funding awards.

It is recognized that women usually face challenges in those fields of work where male dominance is prevailing and formal in-company mentoring support is limited (e.g., Durbin, Lopes, and Warren, 2020; Germain, Herzog, and Hamilton, 2012, Martin and Barnard, 2013). The following findings show the influence of others, mostly outside of the workplace (e.g., tech communities), on women's thinking about a job change, reaching out to potential and/or future employers, and further development in the field. This goes in line with Petrucci's (2020) work, in which she found that training, mentoring, and support are perceived as

accessible for both women and non-binary practitioners in technology through engaging with these gender-inclusive meetup groups in the US, but this finding also extends her work by further recognizing other locations and/or regions of work (such as in the UK) where local IT communities could also be located. One of the participants, a woman of color, shares her experience of how she nailed her first IT job without any prior subject knowledge or proper education in technology. She's been participating in coding courses in a local IT community formed by women who code, where she was given the developmental opportunity to take a step forward by joining a project-based IT training program run by an IT firm. This is where she begins her IT journey.

> *It was very interesting that we created a community straight away because we were all on the same boat, but we were all learning from each other … By the end … I gained enough confidence to deliver a speech in front of many people at [XXX] (current employer) and in my technical skills and knowledge. I personally know exactly how much a [XXX] (a particular IT community) can give you … had such a positive impact.* Participant 17

According to Bourdieu (1986), a combination of the working and potential resources associated with an institutional and permanent network of mutual knowledge and recognition has been categorized as social capital. This means that a network of actors, equipped not only to share common qualities, that can be seen in others or in one's own hand, but also unites permanent and interconnected forces, produce the combined resources and power. Having the same qualification or educational degree is one example of a united force and shared commonality (e.g., Georgiadou and Syed, 2021). It is also worth noting that membership in a group is related to access to certain aggregations of capital and resources, which is often seen

as a macrosocial advantage of the dominant group. For example, when it comes to white women versus women of color in work settings (Sanchez-Hucles and Davis, 2010). Furthering insights on the support that other women in the field could offer, another participant also shares 'what helps' during her learning and development of technical knowledge. She benefits from giving talks at developer events, where she can engage with other female IT professionals in the community. And this experience ultimately translates to her technology expertise.

> *Speaking publicly, in front of a large number of audiences, forces me to become a stronger self-starter when I learn new technology and tools. Back in those days, we had [imported] a bot service at [XXX] (current employer), and I wanted to learn more about it, so I pitched a talk about bots a few months in advance and began researching how they work. It went well, and I created a bot for audiences and clients attended during my demo talk to use, and to ask questions.* Participant 5

Millennial women in IT also stress the importance of continuous learning, no matter what career stage in IT they are in or the status of the level of power they are in. For example, one of the participants expresses that "I need to continue learning to feel fulfilled" (Participant 3). Furthermore, the assistance of a seasoned mentor as well as the extensive social networks that IT communities could offer could help these millennial women in IT approach competitive opportunities in the field. These could potentially contribute to women's career development in technology and make a difference to their professional status in the field. Similarly, as an 'outsider' without prior relative subject education, another participant shares how she's been trained by the tech community which led a career change into the IT field, revealing its influence on her knowledge development in technology. In addition, starting an IT career in a

new place is considered a huge jump. The underlying reasons for women's changing current job locations include regional variations of the job market in respective fields, but more importantly, it is perceived that there is so much space and opportunity for professional growth. The following findings go in line with Kozhevnikov's (2020) study on the impact of city-specific factors on skilled foreign workers, but they are shown in a different career context, in which a few influential city-specific factors such as the labor market, local community, and lifestyle are recognized. Members of these local IT communities, particularly those women who did and still actively participate in their engagement with these communities, are often fueled by various discussions of features and changing trends that have occurred in the IT labor market, through which an ongoing influence on their work-life experience has been demonstrated.

> *It's crazy that you can complete a 12-week course with no previous experience and be hired as a junior developer after graduation... [though] you won't graduate with the same breadth of expertise as anyone with a four-year degree, you will graduate with practical experience, which employers highly respect... Almost anyone who decided to pursue a career as a developer after completing the course would be able to take on the job… To be honest I had no desire to live in London … A few of my classmates (from the coding course run by the IT community) are living in London, which is fantastic. I still manage to catch up with a few of them sometimes… It is true that sometimes countries abroad offer more job opportunities … Unfortunately [XXX] (current employer) doesn't have any engineers in Sydney (her hometown).* Participant 9

What remains unrecognized or unsaid is about women's awareness of their 'gender fatigue' especially in women-only spaces, i.e., less desire to continue proactively engaging with these communities in advocating or activism against the suppressed embodied experience at certain life course stages. The following findings resonate with Durbin, Lopes and Warren's (2020) explanation of those women who may be reluctant to join any women-only space to challenge male dominance. They attribute women's hesitations about joining such women-only spaces for mentoring purposes to their high visibility, single-gender focus, and backlash from peer colleagues, which involve both men and women. Reasons also include that some women in male-dominated occupations perceive joining such women-only spaces as controversial because of their willingness to blend in with highly masculine culture (e.g., Wright, 2016) and to achieve the desired identity.

> *In the 20 or so years, I've been in the workforce and attending events, I feel like this conversation has been had to death. Obviously, there must be a need for it, seeing as it is still happening. In which case, I would rather make space for another woman who is more excited or motivated to speak about her experience, than me taking up space and feeling bored by it.* Participant 7

Another trending approach to how IT communities operate for mentoring and training purposes is based on online and/or social media platforms these days, through which members involved exchange knowledge, develop technical skills and competencies, and share expertise with other group members. As participant 8 states that "the vast majority of the old school societies in which I used to participate now run via Facebook groups". It is undeniable that online mentoring breaks through geographical and organizational boundaries, enabling a wider audience to join, engage, learn and develop. Thus, online mentoring

platforms would ultimately benefit those under-represented groups (e.g., Durbin, Lopes, and Warren, 2020) who may have limited access to those niche IT communities, which are more likely to operate on the site of and/or cooperate with those prominent IT firms. However, online interactions and virtual engagement become more time-consuming and unresponsive in some ways, as well as less effective for millennial women in IT in receiving mentoring and training support, reducing their desire to participate even further. The following description goes in line with Rowland's (2012) critique of E-mentoring, who states that virtual communications via those online platforms are less effective in comparison to mentoring practices organized across traditional face-to-face settings. As participant 8 further explains that,

> *Some of these niche groups have found it increasingly difficult to thrive as a result of social media. Facebook and other social media sites provide a perfect central point of touch while still consuming a lot of time... This is perfect for keeping in touch, but it loses the character of the group that made each one special... Perhaps I'm too old to be aware of sloppy web forums and the niche microsites and personal web pages that these groups have sprung up around.* Participant 8

To summarize, those millennial women's participation in IT community activities facilitates their access to crucial career-building resources, including technical knowledge, career advice, and emotional support by developing and maintaining social bonds with others. In a community with a broad reserve of social capital, collaborative and joint actions are arguably easier. This could be explained by the fact that individual members of a community shape social capital through collective actions including the formation of formal and informal networks, the acceptance and endorsement of normalized principals of operation and conduct

within these networks, and the approaches towards collaborative actions, for achieving common goals. In this way, women can strengthen their power as a collective while improving their agency.

5.3.3 Role of organization and HR practices

Organizational roles, specifically in the form of HR practices (e.g., promotion and developmental opportunities), influence these women's career experiences and subsequent turnover intentions. Access to promotion, rewards, and progression opportunities, such as job title changes, increased salaries, and professional development, are evidenced to have a direct influence on these millennial women's motivation, fulfillment, and satisfaction in the current job.

> *I'll be starting my second year at this organization soon, and because I haven't received a formal promotion, I feel like I've stayed too long... I was headhunted for the next job, which would require me to do many different things, all in the field of information technology. Having a diverse range of IT experiences has given me plenty of ammunition to figure out what I want and don't want from my next job. In the tech sector, it seems that hopping jobs, rather than sticking in one position, is the best way to get significant raises and promotions.* Participant 3

Nonetheless, this finding also highlights challenges associated with a fulfilling career and HR practices of IT firms, such as the prevalence of non-linear progression typified by women's frequent job-hopping, and its deterring effect on women's satisfaction and loyalty to a company. As she explains,

> *Even my bosses are telling me that I need to leave or quit and come back to renegotiate in order to get the salary I want... It seems pointless to me that I'll have to come back with an offer to get them to balance my salary request... Why don't you skip the bureaucracy and just give me what I'm sure I'm attributable? That does not seem to be the case though.* Participant 3

Further, the elements of work culture are often visible (e.g., Schein, 1992), manifested in such things as HR practices that can symbolize shared beliefs and values among colleagues in an organization. For example, one of the participants who occupied a managerial position on the organizational ladder spoke about her male colleagues:

> *I recall having an interview with two male co-workers, and the other two were going to say yes, but I was hesitant. I thought his technical knowledge was adequate for the job, but I was hesitant to speak with him. His tone was condescending in some way. That was enough for the majority of my teammates to change their minds and say no. They prioritized my comfort over his technological skills, which I think says a lot about the people I work with*. Participant 16

The above scenario described in the context of recruitment traces the embedded work environment and organizational sociology. Similarly, another two participants describe their workplace as a friendly, comfortable, and diverse work environment. Usage of words like "family, a second home, warmth and support" is flashing up, reflecting a comfortable work environment surrounded by "nice and good colleagues", but some of those who work in the field still practice gender (e.g., Adya, 2008; Armstrong *et al*., 2012; Orser, Riding, and

Stanley, 2012). The following findings opine the women's recognition of the tokenism present in varying degrees, e.g., at higher levels of power and hierarchy and further practical actions in the workplace, that is limited to consoling these women employees in IT firms. It is worth noting that such mannerisms, to some extent, have been rooted in daily social interactions and behaviors. Thus, fundamental changes to gender inclusiveness are required, rather than for symbolic reasons.

> *Simply recruiting is not enough to be considered substantial… It is filling a gap that went ignored previously … should flow at a much deeper and intrinsic level ... Recruiting people of varying sexual orientations and gender identities requires you to ensure that the environment you are inviting them into is both supportive and safe. Strong empathetic and inclusive values need to permeate every part of your organization.* Participant 6

> *There are many things that companies in this field can do to demonstrate their commitment to diversity and inclusion, and it's the right thing, they must do so. It's not enough to make a donation to some coding communities like women who code and then walk away... I wouldn't want to be the only one, the only woman, working on a project, even I mostly work remotely. That causes so much emotional baggage that I can't imagine how difficult it would be to succeed in such a setting.* Participant 19

It is common that organizations have a series of policies or programs for promoting equality, diversity, and inclusion. These policies and programs are designed by HR management professionals, aiming to provide equal opportunities and treatment of employees. Those employees at lower levels of the organization are expected to enact these policies. Policies,

on the contrary, are open for interpretation. Ironically, it means that attempts to achieve inclusiveness or equality can reproduce more exclusion or inequality, explained by one of the participants.

> *The organizations I have been a part of …, programs in place to try and ensure gender diversity of positions of responsibility … But these programs are not always without their own problems. Sometimes they can foster resentment from men who feel they may have been overlooked due to some form of quota … Even a number of my female colleagues, who have been positioned advantageously with respect to these policies, recognize it, and become expectant due to the policy, rather than their own merits.* Participant 15

The policy-practice gap demonstrated in the following examples and the lack of two-way communication between leaders and other employees also highlight the separation from the protection of power. This further implies that efforts are required on both bottom-up and top-down equality and diversity interventions in organizations and different forms of allies at work are needed. White men, for example, who fight for gender equity and equality. Effective allies are defined as those who are successful at working in solidarity with members of marginalized groups, such as women and other minorities, and who are usually those in positions of power who advocate for social justice (Nash *et al.*, 2021). Thus, individual differences and diversity of all employees in an IT firm should be taken into consideration and accountability for gender equality and diversity needs to be recognized as belonging to everyone.

I do think that initiatives can positively impact upon hiring rates of women in tech companies, but that in itself is not an answer if the work environment is toxic. [XXX](an IT firm), for example, has diversity and inclusion policies and has partnered with the [XXX] program, but it was only last year we had the [XXX] memo fiasco which demonstrated there are still huge barriers to overcome. Participant 8

It depends on who you've been working with, and I believe a top-down approach is needed to make a difference.... I am now owing a small business providing IT services and solutions for my clients, and a technical writer to support some coding courses for young girls in the community… To treat your employees and peers in the field equally, you must respect them as equals...I doubt that the majority of women perform at a lower level than men when they hold the same level roles at work. Participant 20

However, the fact is that many workers who wish to be allies find it difficult to go beyond self-interested alliances in the name of gender equality and to satisfy their ambition to be a "hero" in deconstructing injustice faced by certain groups of employees. In this vein, these people see themselves as heroes who can save others but become defensive when their actions are questioned (Nash *et al.*, 2021). A white woman working to combat racism in the workplace, for example, may intellectually understand racism but become defensive when a person of color points out an inappropriate word or phrase she used in a meeting that may offend people of color. In an organization, the meaning of diversity has been partially referred to as 'others' - those employees from marginalized backgrounds or minority groups. Such an implicit understanding of diversity exaggerates the burden of responsibility for inclusion towards those employees from marginalized or minority groups who are presumed to seek inclusiveness. For instance, even when businesses implement policies to benefit

women (e.g., Bailyn, 2011), they are presented as a compromise within current societal assumptions rather than a fundamental job restructuring, which is neither to promote radical change in the division of gendered labor nor to promote radical change inequity and inequality. It is also evident that today's technology organizations are placing more responsibility towards women employees to *fit in* rather than creating *fit* for women (e.g., Armstrong, Riemenschneider, and Giddens, 2018; Wijayawardena, Wijayawardena, and Samaratunge, 2017).

5.4 Challenges, barriers, and coping strategies

Previous research has shown that women in engineering and technology face a variety of challenges throughout their careers, with gendered segregation in male-dominated occupations and gender-role stereotypes being frequently discussed (Kossek, Su, and Wu, 2017). Work and family problems have been described as career obstacles for women in IT, with difficulties such as caring for children and the elderly while juggling the demands of the job (e.g., Glass *et al.*, 2013; Orser, Riding, and Stanley, 2012). Another career obstacle for women in technology is a lack of mentoring resources. Even when mentors are available, these women are expected to pursue management careers rather than technical careers, mostly because of their people and communication skills (e.g., Cardador, 2017). Different challenges and barriers are identified in this present study, as these female IT millennials have shown. The struggle to strike a balance between IT work intensification and personal life, discriminatory cultural/social interactions which could marginalize women and other minorities, including women of color in IT and younger IT workers, are two of the most frequently mentioned. Millennial women in the IT profession also use a variety of methods to manage their daily working lives and overcome these obstacles and difficulties in order to advance their careers in IT. Three approaches are often used: pursuing independence and

autonomy, receiving community support, and taking initiative/proactivity, to seek the meaning of IT work, find purposes and inspiration from a combination of working, living and being. This would result in improved women's agency and status empowerment at IT work, as well as the alleviation of organizational-level gender inequities and inequalities.

5.4.1 Struggling with work-life balance and well-being

According to the empirical evidence, most women in the millennial generation workforce would prefer a flexible lifestyle or proactive change, but balancing work intensification and well-being/mental health becomes the most difficult challenge. Reflecting upon millennial women's work-life experience, how to achieve healthy, balanced, and more control of themselves simultaneously is challenging. That would affect individuals' well-being. In the following quote, one participant attributes her struggle to her interest and passion in programming work being over-exploited.

> *When your passion and what you do for a living [are] on the same level it can be truly powerful but can also be self-destructive when you don't take proper care of yourself. And this is a place I struggle with but am trying very hard to be a lot more mindful. Disconnecting from our passions can be difficult, but burnout after burnout can cause a lot more harm than good.* Participant 13

The above participant carries on explaining why issues of well-being come to her radar, mostly relative to workplace stress and the increased demands of productivity. Attributions of intentionality and rationality are often conferred on identity, as if it were an asset to be obtained through meticulous planning and deliberate actions.

> *It isn't about being able to code throughout the night, 24/7 running on energy drinks. It's about optimizing yourself for success with a healthy balance of good food, sleep and rest … organizers may try to [take] some time for workshops related to well-being such as mindfulness, meditation, and yoga, rather [than] serving fizzy drinks and pizzas that it gives folks a bad idea as to what a good programmer is all about.* Participant 13

Similarly, another participant is pointing out that mental health issues have emerged recently considering workplace stress, yet many remain puzzled or unconcerned. This does echo recent gestures promoting the establishment of mentally healthy workplaces concerning employees' both mental and physical health, which have been highlighted by the Chartered Institute for Personnel Development (CIPD, 2020b). It is followed by intervention suggestions, aiming to promote an open and inclusive work culture – that employees could feel comfortable and confident to discuss issues of challenges, stress, and mental health they have experienced and/or are currently experiencing. This would change the way that people view and interact with fellow workers or other individuals working in the field, manifest in her below reflection. Thus, it requires further understanding and attention to emotional struggles, wellness, and the well-being of employees in the workplace, which are also associated with ethical practices in workplaces.

> *The combination of being a bit oblivious plus working in places where well-being was not prioritized and almost taboo to discuss … Working in smaller businesses and especially with like-hearted people, you see more of your colleagues, well you see more of their whole selves. Their whole messy selves. With all their complexities and*

> *nuances and everything that makes them who they are, including their well-being.* Participant 7

Johansson and Edwards (2021) also note that there is a growing emphasis on promoting 'healthy' lifestyles and discourse of well-being in the workplace in some Western societies such as in Sweden, which focuses on individual happiness. Yet in the contemporary labor market, women are perceived as sponges, ready to absorb any change in the workplace. In this regard, an idealized self-image is subject to recognition and affirmation from others in daily "interpersonal interactions that are social rather than psychological in both their genesis and their outcomes" (Knights and Clarke, 2017, p. 341). This is further exemplified by the depictions of unproblematic lives of women across western countries - as "never having it so good" through highlighting individual choices associated with their companion balance in domestic domains, which Catherine Hakim's (2006) work asserted. The claim that women are provided with a choice of life, either focus on career or family and home, challenges the prolonged constraints placed on women and gender discrimination discourse which is no longer an issue. For example, one of the participants spoke about how she navigates toward a 'balance', implying that there is still 'a life' outside of work.

> *I was still coding on the side when I first started as a developer. I'm now attempting to strike a balance between studying the basics, working on a side project, and taking time off.* Participant 9

This way, the narratives of single, childfree women may be perceived as unconcernedly enjoying a boost of independence, flexibility, and productivity corresponding to a strong emphasis on individual choices and at the same time, free from care work. Although an

individual's self or identity is often linked to social well-being (e.g., Knights and Clarke, 2017), this does not rule out the possibility of using it to elevate the self above others. Feelings of tiredness, over-stretched, and exhaustion are flashing up. Such an emotional burden affects an individual's well-being and may further force individuals to change emotions or even suppress their actual feelings in order to assimilate themselves with others at work, for a sense of self-achievement. The following example also resonates with Utoft's (2020) recent self-questioning of "When work-life balance often means work-family balance, can there be a life for single, childfree women, or is work the only thing left? (p. 8)". Such depictions further manifest the broader symbolic order in that women can reflect and reproduce, while challenging and reconstructing the wider social and cultural norms.

> *Since coding bootcamps are difficult to get through because of their very intensive nature, and I care about how we keep ourselves energized and satisfied at a coding bootcamp, I launched a local based platform to run 'happiness' coding bootcamp last year for a group of younger women, some of whom may just enter this field straight out of school. I am committed to promoting a healthy and fulfilling work life... I've struggled with anxiety and depression in the past, and when I went searching for help, I discovered there was very little available for young people.* Participant 23

The above example further demonstrates that how lifestyle behaviors are becoming signals of individuals' level of self-discipline, self-control, and reflexivity in creating a new self, associated with their identity work. Although it may seem like they represent the fully dedicated, unencumbered, and unburdened ideal worker (Acker, 1990), who has no work conflicts with family demands to achieve a gendered work-life balance (Sørensen, 2017), they are neither problem-free. For instance, the single women's aspect or single-living

perspective is generally overlooked in current scholarly debates (Gao and Sai, 2020), and the narrative that single, childfree women need to be nuanced. Being forced into acquiring 'normalized' identity work, the 'free' self, and productivity further reinforces the mental health conditions of these female IT professionals, especially when it comes to social isolation and loneliness in the workplace.

> *A mixture of isolation, anxiety, and depression was also a concern for me. In general, I will remain in one area for a few weeks before moving on to another... I found those moments to be very isolating because there isn't much potential to be social in a meaningful way unless you can quickly join an established [local] community.*
> Participant 10

Isolation and loneliness are rarely researched in organizational contexts, although these are some of the main challenges encountered by virtual employees (e.g., Collings, Hislop, and Cartwright, 2016; Daniel, Domenico, and Nunan, 2018). It is clear that advances in modern technology enable more women to work outside of the traditional workplace; in the meantime, some tech firms have shifted toward remote or virtual work to reduce operational costs while broadening the pool of attract and retain top talent. In other words, this transition to a "virtual workplace" is a by-product of information and communication technologies and an efficient way to execute business ventures (Gao and Sai, 2020). But challenges also arise for those employees who work remotely, being physically detached from workplaces and organizations. Unlike Woldoff and Litchfield's (2020) findings from an expatriate digital nomad hub in Silicon Bali, Indonesia, in which they elucidate how digital nomads create a versatile yet intimate community abroad in the company of like-minded others by first following their transitions into freelancing, entrepreneurship, and remote work. The

following findings contradict their study by showing a remote worker, a woman's challenging period of transformation and difficulties in managing relationships with other co-workers across the entire organization.

> *The hardest part for me personally anyway is the soft stuff like team building and getting to know your colleagues … all this comes naturally when you share the same physical space but when you are remote it takes so much longer to build …we rarely messaged each other unless absolutely necessary we were more inclined to quietly do our tasks … it worked alright but it was at best boring and at worst mentally draining … They do what they can to include us but obviously we can't fly down there every time they go out for a beer*. Participant 4

For single women who live alone, coping with all the tension and anxiety that comes with moving to a new city takes a lot of energy. Another dilemma is associated with the gap between job mobility and employee mobility. For example, when it comes to dealing with work permits while moving abroad.

> *I was homesick and cold for the first six months of my stay. My girlfriends, the blue-sky days, and living so close to the beaches are all things I miss... I'm certainly going to return to... one day...where I'd like to call home... I adore the tech culture there, and I'm sure something interesting will arise.* Participant 9

> *You'll need to look for work and learn about new social norms… and apply for a visa, grab a quota as a foreigner … A transfer and move job abroad involve a great deal of preparation and research… as I am not eligible to get a work permit automatically*

> *when I target tech positions based in Australia, I did invest a lot of effort on and applied loads of companies after I moved here on a work holiday visa…I have to work around how long can I legally remain in that country, and will I be able to find a sponsored job to extend my right to work? How's the job market going? How can I get around etc.* Participant 18

This finding shares similarity with another woman's experience - participant 10 in this study, which further resonates with another millennial worker, Lucy, who is known as the visa runner nomad in Woldoff and Litchfield's (2020) latest study of *Digital Nomads In Search of Meaningful Work in the New Economy*. For those who are romantically attached to partners or spouses of men, they would have to consider their ability to move freely or be easily moved. Budget constraints are also an issue of concern.

> *As you know, I work here in the Netherlands, and my partner is based in Oxford. He managed to spend a weekend about once a month or twice a quarter, and sometimes I come to see him as long as I'm available to do so. It is consuming for sure, and costs a fortune, but for now there seems no better option because of our work and prospects maybe… I would persuade him to look for jobs after he gets his MD and gains extensive experience. It seems not sensible for me to turn down [xxx]'s offer (a leading tech firm) and leave for a completely new country and start over* Participant 12.

> *Now that I'm working remotely, I've been thinking about relocating …I'd also love to move abroad if given the opportunity, probably not forever but for a while to see what it's like. What's holding me back is mainly two things … [My partner] would need to*

> *find a job too or I'd have to move alone which would be pretty sad. I live in a place with a very low cost of living here … The same amount of money would only cover a tiny bedroom … having to downgrade so much would suck.* Participant 4

One of the participants observes that work and family issues are constantly identified as career barriers to women working in IT. It resonates with other research findings that women in STEM have been struggling with childcare and elderly care while consuming the pressing demands for career advancement on their own (e.g., Kameny *et al.*, 2014; Orser, Riding, and Stanley, 2012).

> *This is an unfortunate thing that I see happening in many different communities, starting from the smallest community we are all part of, family, where women sacrifice career growth to ensure their homes are functioning well and their kids' and partners' needs are met.* Participant 7

Likewise, another participant also reveals her choice of being a freelance developer conforms to her role of being a 'mother', whose focus lies on a high degree of childcare needs and the weight of financial burden as a divorcee. Being released from routine standardized work, she has access to flexibility to accommodate childcare needs, but from time to time, she has been at risk of losing financial stability that affected her well-being.

> *I returned to full-time work when my son was around two to three years old for roughly a year … the pros of freelancing are very much centered around my children. I am able to walk them to school ... pick them up. I have more flexibility … [but] I can't always guarantee that clients will pay on time … It can be incredibly stressful*

> *knowing you have children to feed when you're sat in your overdraft for the hundredth time in a month. Consistent, regular pay from a full-time job would fix this but would crush my soul.* Participant 8

Part of the reason stems from her losing the benefits of being a romantic partner or spouse of a man who usually shares financial and emotional burdens in a dual-income household (with or without kids). She carries on talking about her life status changes, which have affected her work and well-being.

> *I was scared that I would fail financially and emotionally … There came a point where I was at rock bottom … For a long time, I'd assumed that marriage was basically what you did when you couldn't be bothered to find someone better … perhaps to gain some sort of financial benefit. I had no idea that relationships didn't have to be about tolerating someone you vaguely liked at one point when you were young. That it did not have to be all about sacrifice and giving up yourself, that you don't have to change to suit someone else's whims and needs.* Participant 8

She demonstrates her cognitive evaluation involved and emotional struggles before and during the change of working mode. A reflection of emotional labor is emerging. It turns out these suppressed thoughts are released in a way to reshape a woman's emotional and embodied selves, which has a direct influence on further individualistic choices.

5.4.2 Discrimination at work

Occupational roles and organizational practices in the IT industry are reinforcing the stereotypes of women in the IT profession (e.g., Hirshfield, 2010; McGee, 2018). For example, there are various tech companies that unintentionally convey stereotypes manifested in their inherent masculine language, such as using language that's towards one gender (male). One of the participants' comments on job posts when she looks for an IT job, things like "he should be able to do this" (participant 11) are flashing up. This implies an entrenched stereotypical image of a male worker in this field, making women feel marginalized and isolated in their own profession.

When it comes to the 'real world', gender is not the only cited exclusionary criteria among these women in the IT profession. The strain to either adhere to hegemonic expectations or promote their authenticity at work creates dissonance between professional and personal growth for women from minority ethnic, marginalized or disadvantaged groups (e.g., Ossenkop *et al.*, 2015). The following female participant talks about her experience of working as a developer in an IT firm where she herself could be characterized as a double minority in that environment – a woman, and a black woman, and concedes that women of color amplify the possibility of being excluded.

> *I was in a small cohort of maybe twenty people who were all people of color… Our days weren't full of learning to code, we were also being part of the tech industry and different technical roles that exist … Coming into the real world, being on a real tech team, was very different from a boot camp … I feel this way because I am not surrounded by people who look like or have much in common with me. I've always been surrounded by older white men, who are very cool, but it's nowhere close to the same dynamic.* Participant 2

Generally, the "corporate culture … can also be seen as a tool for repression, domination and hegemonic perpetuation of an élitiste group within organizations and society at large" (Ogbor, 2000, p. 597). The "older white men" from the above quotes serve as a connotation to link implicit exclusionary practices and behaviors to organization culture, which originates from the dominant ethnic (white) men's values and norms embedded that represent the organization's dominant ethnic masculine culture. Added to the above, the following story belongs to another female participant from an ethnic minority of Asian origins. It represents the image of the 'ideal worker' within the specific context, that is not only gendered (Acker, 1990), but also embodies the most desired forms of hegemonic discourse as reflecting the dominant ethnic mindset.

> *I am always in the middle of fire because of the competitions between myself and those younger boys straight from University, my peers in the same department… I won't deny they seem more energetic, physically maybe, most of them work extra hours at night, and seems to perform 'better' in a way of simulating with my boss, a middle-aged white man, especially towards his expectations of task delivery… For a while, my test results with a programming trial were not enough to stir the pot, well I know the results are not good and he expects more based on the allocated time given, but sometimes I feel it's just his actions [that] hurt my feelings when he starts to question my skills… I was down for quite a time especially when he shows dissatisfaction with my work progress and I started to question if I am qualified to do the job… over time I kind of lost my confidence in mastering my work until probably another year and a half and it seems back on track, rebuild our work-relationship and work on new projects.* Participant 24

Similarly, another two participants, both from East Asian backgrounds, characterized themselves as disadvantaged. To rephrase a quote from them, *being a woman in tech, especially coming from a more traditional background*, describes how dominant ethnics discriminate against and perpetuate their culture and identity within the constraints of their dominant ethnic in-group. Without indicating a particular point of reference for comparison, the following quote implies the dominant ethnic's categorical thinking when categories are dichotomized within the specific context.

> *Internal bias in ethnic groups is no laughing matter, and it can be very passive-aggressive in my experience. I've become painfully conscious of how discriminatory the society can be... I've heard so many stories and [have] also been the target of prejudice against people with darker skin tones because it connotes people from South Asia... I'm at a loss for words to describe where the origins of this prejudice and discrimination come from. Is it insecurity? Is it possible to be jealous? What is nationalism?* Participant 21

The word "white supremacy" is often used to describe the racialized social structure that has existed for decades (Feagin, 2013) that consists of 'totality of the social relations and practices that reinforce white privilege' (Bonilla-Silva, 2006, p. 9). Gao and Sai (2021) also claim that white supremacy is deeply ingrained in Western society and is demonstrated in individual behaviors complying with the dominance of white solidarity where women and minorities are excluded, which further reproduces inequalities and reinforces the system of white supremacy. But taken-for-granted beliefs and the hegemonic norms of the dominant group's identity, which is enacted and performs its power in daily interactions, reproduce the dominant ethnic masculine image (e.g., Dar *et al*., 2020) and set the standard for

organizational behaviors. It creates a sense of silence on the dissemination of the minority group's identity, which would further constrain their consciousness to guard against upon, other than assimilation.

> *I have been a cultural chameleon, I personally never noticed being treated differently. I must have been though, thinking back, I just never noticed or felt it.* Participant 7

> *It's taken a long time for me to be completely open about my sexuality. Partly because I always thought it was the least interesting thing about me and partly because … you just don't know how people are going to react, so you protect yourself.* Participant 6

When individual differences confront the hegemonic norms, everything can be compared against them, which is unsurprisingly perceived as forms of deviation from the normative practices. Thus, it can explain why minority ethnics, for example, women, engage and interact with other individuals in a way that seeks comfort through easy communication and assumptions based on shared descent (Ossenkeop *et al.*, 2015), leading to the establishment of a sense of connection and recognition at work.

The following examples illustrate general institutional practices, such as categorizing the age range of employees or candidates intended for assuming years of experience, as a sign of evaluation of an individual's skill level and performance. Due to their younger age, millennial women are frequently undervalued at work, attributing to a perceived lack of experience or skills compared to more senior members of the field. Institutional or industrial practices like this are often based on a dominant frame of reference, i.e., older white men, and therefore reflect more of the dominant customs.

Participants' responses also suggest that this is not the first time they have been confronted with a situation like this. Instead of challenging the custom, they seem to be used to it and therefore blend themselves in. This might make younger women's professional identity sink in the field but reinforce the position of the dominant group identity.

> *Despite the fact that I have always appeared optimistic, I have experienced imposter syndrome on many occasions, especially when I was the youngest panellist. Why should older people listen to you? I started to question what new information [I can actually] bring to the table that they don't already have…I've gathered a lot of experience and additional values that I can bring to the discussions after a lot of encouraging affirmations and taking a step back, and it's only after that point that I have appeared to be respected by others.* Participant 12.

> *Clients who refused to pay me because they believed I could get away with it, or clients who wanted to pay me less because I was young, and so on. Because of my youth, an interviewer once told me to my face that he didn't trust me, my resume, or [my] experience.* Participant 10

The above examples illustrate how age bias towards the younger workforce is perceived as one of the distinct challenges that millennial women in tech encounter, hindering them from being acknowledged and recognized as qualified and skilled professionals in the IT field. It goes in line with studies such as bystander behavior at work (e.g., D'Cruz and Noronha, 2011), which reveals younger workers are often being targeted by the bullies (men), and most of whom are remaining silent as a vulnerable group across different male-dominated work

and organizational settings (e.g., Nordbäck, Hakonen, and Tienari, 2021; Zawadzki and Jensen, 2020). As such, it is suggested that management and organizational scholars need to rethink and celebrate differences in the changing IT workforce, to stand up against how the dominant constructs being recognized as moral authority to "correct the underrepresented" (Gao and Sai, 2021, p. 186) and marginalize others, including women and other minorities.

To summarize, open and latent resistance to equality and diversity exists across IT companies and organizations in general. This can be in the form of active opposition or the form of passive blocking change. Open resistance is often articulated as a fear of losing status, power, and hard-earned benefits. It takes the form of deliberate racist or sexist practices that prevent staff from minority or marginalized groups from being promoted. Latent resistance can hide behind the discourse of merit or cultural fit, justifying the lack of advancement of certain members of an employee group. Leaders using this type of reasoning say that these diverse employees do not have the skills and knowledge considered essential to perform the role, when in fact, they mean that these staff lack the relevant cultural or social capital. The barriers to achieving equality and diversity in organizations are significant, and if a simple set of policies and practices can solve the diversity problem is not only naive but can make things worse. It is only by accepting the true scope of the challenge and making an embedded and long-term commitment to overcoming it that organizations can make real progress.

5.5 Conclusion

This chapter builds on the idea introduced earlier, that beyond complexity is a common response to the various challenges, difficulties, and incentives encountered in IT work. By unraveling the multiple realities of those millennial women in IT work and how they cope

across different situations, I developed a greater appreciation of the ambivalent nature of their ways to cope with and resist male dominance and patriarchal practices during their working life experience, where contradicted identities and resistance are fused in a co-existent and co-dependent fashion. Pechenkina and Liu (2018) acknowledge that as long as we are resisting, there is no right or wrong way to do it. Bronwyn Frederick (2010) also writes on the different ways that marginalized women, as 'others', can resist the dominance and empower themselves, saying that: "there are those who are undertaking [resistance] through the legal and political rights arenas both nationally and internationally, those who write about it through analytically researched academic papers challenging the status quo, and others who do so through creative narrative prose and pieces of art" (p. 548, cited in Gao and Sai, 2021). Thus, I argue that a simplified category of what brings women to or what compromises them to stay in the IT profession, either positive or negative, cannot fully explain women's various responses. I evidenced the reasons for and navigating and negotiating strategies associated with their embodied working experience, which further indicates that the millennial generation of female IT professionals often focus on seeking values, meaningfulness, purposes, and inspirations of a combination of working, living, and being.

The analysis of this study's findings presented above documents how female millennials navigate their working life in the IT profession and their coping strategies to counter challenges amplified by other forms of difference in a gendered construct, and individual behavior change and (re)construction in line with their work-life changes. Rather than simplifying women's gender, race/ethnicity, age, place of residence, and education level as mutually exclusive categories of experience and analysis, this study brings multifaceted careers and the multiplicity of work-life into the dialogue. I investigated women's work-life experience in a more nuanced manner, through which I unmasked the 'paradox' of living

experiences of female IT professionals from a younger generation. The individual differences theory of gender and IT has been employed as an analytical lens. It encompasses the complexities of the tensions between challenging norms and changing work-life experiences in IT, which haven't been voiced and remain taboo in neoliberal society. The findings are presented in a way of traversing the traditional organizational and gender boundaries and translating social constructivist philosophy and inequality regimes through empirical work. In line with the focus of the three research questions, I also extend prior work (e.g., Makarem and Wang, 2019; Sullivan and Baruch, 2009) by responding to their calls for further research with an emphasis on non-traditional and non-linear careers. In this way, the present study contributes to offering new perspectives and fostering alternative discussions. Although coping strategies of conflicted feelings and emotions are not explicitly discussed that involve the paradoxical interplay of knowing and not knowing which provides the vitalism of behavior change by these women, this study unveils two distinct reactions in response to their ambivalent emotions and feelings, namely silence and resilience.

Employee silence has been recognized in organizational settings (e.g., du Plessis, 2020; Gao and Sai, 2020) due to its own set of potentially negative consequences for individuals' (Milliken *et al.*, 2003, p. 1563). In return, silent subjectivities are more likely to be perceived in a positive light, with labels associated with 'fitting in' or 'knowing how to play the game' (du Plessis, 2020, p. 3). As a result of gendered structure, culture, and practice in science and technology fields, female scientists have been observed using a distancing strategy, i.e., avoiding other women who perform attributes associated with femininity, as a behavior that contributes to framing women as outsiders and impeding their success in many fields (e.g., Rhoton, 2011). Resilient actions are manifested in their passive and neutral behaviors, some of whom have been using a mixed style to increase their *link* and *fit* the prevailing work role

expectations while adopting masculine attributes and exhibiting self-confidence. As a result, coping strategies such as compromising gender identities, impression management, and proactive engagement have been categorized as distinct approaches for women in male-dominant science and technology work across several developed regions and developing countries such as India (e.g., Kaushik and Pullen 2018; Makarem and Wang, 2019; Wijayawardena, Wijayawardena, and Samaratunge, 2017). This could be interpreted as implying that paradoxes of coping strategies are flashing up, as part of the experience of blurry boundaries between working and personal lives. The connotations of coping, resilience, and resistance within an ambivalent space should further account for further investigating 'women in technology' i.e., what brings women to IT work, what affects them in making work-life changes, and what influences their engagement and advancement in the IT profession.

Chapter Six Women, technology and feminism

6.1 Introduction

This study echoes Hall's (2002) evolutionary work on contemporary careers, which shifts focus to a 'process' that encompasses all work-related activities that take place over an individual's life course. It also indicates that these women's career development in IT is complicated, which manifests in multiple factors intertwined that hinder and/or advance their career progression, which are embedded in the ingrained IT structural inequalities and cultural barriers. Participants in this study have spoken about their work experiences and progression through various phases in a retrospective manner, which means they won't speak about how they ended up taking certain decisions in response to the influence of those norms. Instead, they reflected on how they wished they had done something differently or in the same way as others, and what that meant to them. As a result, these women have followed Weick's (1995) framework of sensemaking, in which they noticed a discrepancy while reflecting and speculated about meaning (Vaara, Sonenshein, and Boje, 2016; Weick, 2012). The retrospective nature of sensemaking 'captures the reality that people can know what they are doing only after they have done it' (Weick, 1995, p. 24). When reacting to interview questions, they actively considered the actions they took, recognized their differences from the norms, and offered propositions to explain their actions.

This chapter is organized as follows:

I start by summarizing the main findings extracted from my empirical work and discussing how they relate to the existing literature. I bring these findings into an overarching discussion in which I can unveil the multifaceted careers of women in the IT profession from a younger generation and make a multiplicity of their working, living, and being open for discussion. Instead of simplifying women's gender, race/ethnicity, age, place of residence, and education level as mutually exclusive categories of experience and analysis, I highlight that subjective work-life experience remains the reality for these women in the IT profession to cope with. I also illustrate how their initiatives to enhance agency and status empowerment at IT work, as well as their mutual efforts to address organizational-level gender inequities and disadvantages in everyday workplace interactions, have an effect on their work-life navigations mediated by social and technological changes. It is manifested that female millennial IT professionals share values such as access and inclusivity in the IT space, entering the workforce, technology learning and skill enhancement, networking and making connections through IT communities (see 5.3.2, for example), and gaining confidence and feeling empowered to speak out and make their own rules in order to seek change for women in the IT workplace (see 5.3.3, for example). I then move on to summarize the theoretical and empirical contributions of the present research, which arise from the theory of the individual difference of gender and IT construct, a timely response to the prior work that calls for further research with emphasis on non-traditional and non-linear careers. In so doing, I contribute to offering new perspectives and fostering alternative discussions behind women's underrepresentation in technology fields. These multi-vocal intersectional differences revealed through those stories of millennial women (see 5.4, for example) bring fresh veins to the existing debates on the gender-technology relationship and the in-between connotations of gender, work-life navigation, and attitudes to technologies. I argue that the relationship between gender and technology is no longer static among millennial women in the IT

profession. Instead, it alters with the changing nature of technological capabilities in the context of rapid socio-cultural and economic growth, which further propels an upsurge of women enrolled in computer-related courses and professions. It also alters the way individuals work and live-in everyday practices, which aligns with changes in rules and norms about technology enacted and performed. Therefore, the shift to having non-linear and multiple careers evidenced among these millennial women in IT reflects the change in meaning and experience of work, which is also manifested in the expansion of gendered work/life balance in order to seek meaningfulness in/at IT work.

I further move to discussions of meaningful work and meaningfulness, which arise from a person's own expectations and perceptions, including self-efficacy and self-esteem, authenticity, belongingness, cultural and interpersonal sense making, and purposes. Underlying such drifts is a depiction of a woman in IT work who's likely to experience meaning when she is inspired, personally enthusiastic, agentic, and living up to discovering her true desire and talents with care and ethics, yet beyond the self (see 5.2.2, for example). It is then perhaps not surprising that I conclude this chapter by proposing an alternative future by returning to the ethics of care approach, in alignment with the rapid growth of technology in the workplace. Constructs that a woman in the IT workplace tends to experience, such as intrinsic motivation, work involvement, and community engagement, are strongly related to her discovering meaningful work and finding the density of meaningfulness. This is also a move to transcend the traditional masculine concept of meaningful work. Such behavioral and emotional changes manifest among those millennial women who work as IT professionals, further contributing to creating a new ideology and a caring community. However, this is not an indication of the radical revolution of labor market power relations in the world of technology work. Rather, a more significant reflexive criticism is required to

rethink epistemological assumptions and problematize the discursive accounts of the role of technology in (re)producing gender (in)equality since it reflects paradoxical continuity and change.

6.2 Gender as a social construct and work-life experience remains the reality to cope with

Participants' stories and voices provide rich insights into millennial women's work-life experiences in IT and their coping strategies when they encounter challenges to progressing in their careers. In essence, participants described their careers as unplanned, non-linear, and serendipitous, resonating with recent findings from a study on the career experiences of ten women engineers in the US (Khilji and Pumroy, 2019). Life commitments and more experiences gained foster changes in their work-life priorities, such as career goals and expectations. Such changes manifested in their career patterns and different choices made at different life stages shape and reshape how individuals navigate their lives and livelihoods, and in the meantime, they learn and reflect on various situations they have constantly encountered. This study is positioned as a way of making visible the often invisible realities and work done by women in the IT profession, in particular, for those young ladies who have invested a lot of effort in learning and networking activities that continue to build new communities and foster career development. These new communities are established to provide job opportunities and IT-related career pathways for more girls in schools and universities, to equip them with relative knowledge, resources, and networks to enter the field without entrenched barriers that some women in the IT profession have experienced, e.g., technology 'jargon'; lack of power in a male-dominant workplace and remaining silent, etc. The hegemonic masculine mindset pervades the IT corporate culture, which has been described as gendered assumptions and expectations of women's behaviors in technology.

These women who participated in this study are skilled and successful IT professionals, yet some of their male colleagues and clients still consider that they lack technical competence or capabilities in mastering hard science and technology. The accounts of these women sampled reveal that they either assimilate themselves and behave accordingly by adhering to these gendered assumptions and expectations, or proactively resist these established and emerging scripts that portray them as 'outsiders' or 'aliens' rather than individuals who naturally belong to IT. This does not mean that these women have had to act exactly like men at work. Rather, they have had to learn and reflect the way they behave and construct, in response to the assumed level at which dominant male norms are embedded and to the degree of pressure imposed in a male-dominated environment, which subsequently pushes them to change their career patterns and behaviors. For example, although the women sampled recognize that non-technical skills are crucial in attaining leadership roles, e.g., project manager, their ability to garner respect from peers and subordinates - males rely on their technical expertise. This is, in part, due to women's level of fit and credibility related to technology expertise are often called into question by both colleagues they work with and by external parties such as clients they serve, manifested in their experience of IT gender structure in and outside of IT workplaces (Kenny and Donnelly, 2020).

There are also no signs of radical change in transforming the embedded hegemonic male norms; rather, it is the work experience as a reality to cope with. Male dominance constantly contributes to these women being excluded from events or networking activities that offer referent power and informal impact on decision-making. Surprisingly, such exclusion does not seem to burden these women who are engaging, as they indicate limited effort in transforming male-dominated social interactions and structures. Whilst they did acknowledge the entrenched structural inequalities and cultural discourse (see findings under 5.3.3, for

example) that may disadvantage women in technology (also see discrimination at work under 5.4.2), still, some of them denied they had experienced such exclusion as career barriers during their work-life experience in the IT profession. Instead, these women sampled chose to either frame scripts around 'female strengths' and seek alliance by proactively empowering young girls or voluntarily opt-out and start a new business with IT work. It is evident that these millennial women's career development in the IT profession is complicated, which resonates with prior research on how women engineers and scientists negotiate their professional identity, gender, and tokenism (e.g., Hatmaker, 2013; Haas, Koeszegi, and Zedlacher, 2016). The complexity means multiple factors intertwined have had an impact on these women's work-life experiences, either hindering or advancing their progression in the IT profession. Thus, when encountering unfavorable structural and cultural norms, these women are forced to navigate themselves in ways of rationalizing their 'doing' and reframe their reality. Consequently, so does their behavior change. Millennial women in the IT profession are more proactive in their approach and use a variety of methods to deal with a variety of difficult circumstances and gendered expectations. In their stories, three main navigation approaches emerge: acknowledging the 'rules of the game' and playing around to pursue freedom and autonomy; negotiating the rules to find a 'balancing' point and be resilient; and collective resistance and establishing their own set of values and terms. It is worth noting that women can adopt several strategies to navigate and manage their working lives at the same time, which also depends on the situation at hand and how they interpret it at that particular moment.

They accept the rules of the game and play around when some of them remain single, do not get married or romantically attached to a spouse, do not have children, and become assertive in objective measures of career success - climbing the ladder by frequently hopping firms

and, in return, providing for themselves financially, which, in part, equals to following the demands of capitalist regimes by lifting the negative impact on their careers and staying monetary-oriented, such as working extra hours or moonlighting as aforementioned (see 5.2.2 and 5.2.3, for example). It also happens when some working mothers, especially single parents, decide to step down from the IT firm they have worked for and accept their role as caregivers for kids (see later parts under 5.4.1, for example). Such an accepting strategy, to some extent, echoes the conforming strategy and impression management which have been commonly used and discussed in the existing literature (e.g., Herman, Lewis, and Humbert, 2013; Orser, Riding, and Stanley, 2012), an approach that demonstrates conformity to the entrenched organizational structures and portrays a certain image at work that is more inclined towards stereotypical gender norms (e.g., Buse, Bilimoria, and Perelli, 2013; Rhoton, 2011). For example, European women in science, engineering, and technology careers continue to conform to the 'ideal worker' which is male, and consequently, behave by adhering to entrenched patriarchal behaviors and norms to meet gendered assumptions and expected values, and in return, refrain from challenging but reproducing the conventional and dominant hegemonic image of the 'ideal worker' in their organizations (e.g., Herman, Lewis, and Humbert, 2013).

Women demonstrate their negotiating strategy and get around the rules when they seek family and spousal support. In essence, they gather up social capital to steer forward, either staying in the same organization to progress, or changing other professions to IT or organization to take on an alternative career trajectory. Examples extracted from this study include those women who make purposeful and active career paths to have jobs with more flexibility, more control over time, and greater self-confidence in general that would ultimately translate into career benefits. It also happens when it comes to negotiating towards

a ‘balancing’ point for themselves in which the boundary is individually defined, i.e., work-life balance and job-employee mobility, while ensuring their spouses have a career together and share household responsibilities, financial burdens, and remain romantically attached. This strategy allows those millennial women sampled to acknowledge male dominance in IT work and entrenched gender stereotypes with compassion rather than having to reconcile and adjust their ways of thinking and acting completely. A similar approach evidenced in Khilji and Pumroy’s (2019) research where a female interviewee, an engineer, revealed her negotiation with her husband on the decision to have one kid only, because “I wanted a career and he wanted a career. So I think it’s a lot harder … have more children. There is no question.” (p. 1046). Yet the concept of a ‘balancing’ point is an ambiguous and slippery notion that is almost subject to individual boundaries set based on their life status and human/career capital. In *The Rise of Neoliberal Feminism*, Catherine Rottenberg (2018) demonstrates how ideas of time and affect are central logics of balance discourses. To explain, Rottenberg (2014) proposes viewing women as entrepreneurial, neoliberal subjects, and thus investing in and treating themselves as an enterprise, prioritizing their careers in order to be happy and eventually become mothers and wives. Motherhood, on the other hand, could be postponed by approaches such as freezing eggs, and in doing so, to achieve the promise of happiness and secure themselves for future living and livelihoods, in the form of work-family balance (Rottenberg, 2018). Considering the norms of the intensive, emotional, and unpaid labor of childcare and parenting, the group of working mothers is also encouraged to prioritize their happiness and shine in their present life, which implies a tight quality calculation for childcare and companion relationships. Rottenberg’s influential work of neoliberal feminism, which focuses on the work-family balance discourse across time and space, further raises questions about how we could build the most memorable life moments with our kids, partners, and friends as a reward for the investment of our time, efforts and

emotions. As for the reality of working women, with or without caring duties, most of them are striving to make ends, to reach the fulfillment of aspirations towards a felicitous balance. Yet the process involves many struggles that these working women have had to cope with.

The most distinguished approach that millennial women in IT have demonstrated is that they do not follow a traditional, linear career path, instead believing and maneuvering that work should fit life rather than the other way around. They are proactively advocating collective resistance by establishing new communities to support more younger girls learning technology without prior education in related subjects - an effort to redistributing resources and gain the power to break gendered patterns in the field. Such a collective approach deployed by these millennial women in IT to 'acting up' echoes Petrucci's (2020) recent theorization of the concept 'postfeminist' community, in which the study draws upon how the gender-inclusive meetup groups outside of the workplace, where participants have access to training, mentorship, and support, can alleviate gender inequity in the US technology sector. To explain, these groups are found to provide a "supportive community rooted in professionalism and entrepreneurialism", a place that offers "skills development in a safe environment" and training on "how to take individual action against discrimination" (Petrucci, 2020, p. 546). While members of these communities may acknowledge the ingrained structural and patterned inequalities in a male-dominated workplace, their individual capability to seek empowerment has been highlighted, and as a collective, they reflect the desire for a future that supports the "postfeminist subtext in this mode of entrepreneurial femininity is that women are no longer oppressed" (Lewis, 2014, p. 1853). Yet, during the process of reconfiguration and consolidation of these 'postfeminist' strategies that aim to support women's empowerment, agency, and entrepreneurialism, and may further bolster social solidarity, I found what remains overlooked is the potential negative impact of

the fact that their social bonds are rooted in the logic of neoliberal capitalism. In other words, the most important reason that they relate to the other participants who joined the IT events/community/networks is that they are instrumental in the gendered job market. Further, despite the proactive engagement with activist responses performed by these millennial women in the IT workplace, in particular those women sampled in their 20s and early 30s, there is a risk of falling into the 'trap' of reproducing power relations, which means that others remain silent and invisible, and in this way, collection efforts and actions towards further organizational transformation would be more difficult to tame as well as an institutional change in the industry. Here, I come to resonate with Arruzza, Bhattacharya, and Fraser's (2019) argument. They write that:

> *"Sandberg and her ilk see feminism as a handmaiden of capitalism. They want a world in which the benefits of exploitation in the workplace and oppression in the social order are equally shared between ruling-class men and women - a form of equal opportunity domination"* (p. 11).

By rendering these women in IT's seemingly contradictory coping strategies, another surprising finding emerged, which lies in signs of a mass exodus from the workplace are present, which is predicted to happen in around ten years starting from when their career begins. Thoughts and preparations for being fully independent IT contractors while operating their own website or agency for IT work are expressed. Subjective evaluation of career success is also flagged up, which includes following passion, seeking meaningfulness from what they do, adding value, and being happy, instead of climbing the organizational ladder as an ultimate career goal. In the meantime, they tend to have a spouse who follows and cares much for their career development thus allowing them to grow and bloom with their work

(see later part under 5.3.1, for example). Findings of millennial women's changing lifestyles, and their fight for a 'healthy' work-life balance in IT (see 5.2.3 and 5.4.1, for example) point to their pursuit of meaningfulness from work and that 'work should fit life', along with a certain extent of financial stability. These findings broaden manifestations of what non-traditional and non-linear IT work-life experiences look like among female millennials, a burgeoning younger IT workforce, and consolidate and reconfigure the concept of 'careerism', as well as transform the narrative depicted by mainstream ideology. Much of the trends go beyond studies on a younger generation of women engineers that illustrate women's decisions on how to dress feminine and pretty, with some of them rejecting the traditional definition of 'balance' and redefining it, paving an alternative path to demonstrating strong defiance in the workplace (e.g., Khilji and Pumroy, 2019).

These coping mechanisms represent women's deliberate, reflective behavior in order to survive and succeed in a male-dominated world. To navigate their careers, women clearly understand how social roles and expectations signify organizational norms, which encompass boundaries from life to livelihoods, job to family, and vice versa. In essence, they demonstrate a high degree of understanding of the context, self-esteem, self-reflection through adopting various coping strategies, evidenced in the captured short stories and examples. These women face gender inequality and discrimination inside their organizations and with other professionals they interact with in the workplace. This marginalizes their identity as IT professionals and emphasizes their gender, ethnic, and age identities. Nonetheless, they have not always chosen to align with or conform to the mainstream gendered norms. Instead, they use constant learning and behavior change to combat structural inequalities and corporate cultural barriers. They learn to adapt, to engage with other 'allies' in the IT communities they established on their own and advocate themselves to shine. Their

agency is interpreted by their deliberateness, resistance, self-reflectiveness, and self-direction, which enables them to play a conscious and deliberate role in their professional development through skills enhancement, meaningful learning, and the ability to adapt. These women aspire to succeed in their profession and become an inspirational figure and/or role model for other young girls who want to enter the field. When the organization they work for no longer supports them, they carve out their own path to self-direction in their careers. They are proud of their profession and speak about the passion and meaningful work that led them to pursue information technology. These are not the symbolic representations of submissive or passive women that the older generation frequently depicts in science and engineering-related fields. Rather, their actions show confidence, courage, female strength, and resilience, not only in their distinguished approach to feminist solidarity and resistance, but also in their ability to self-reflect, make sense of the given difficult climate in the world of technology, adapt and learn with/from peers, mentors and challenging circumstances within. They also seek help when necessary, stand on their own when deemed appropriate, and are reshaping their own version of identity as female IT professionals/practitioners. Since work-life experiences are reflected in the eyes of individuals, it is a personal decision based on the individual's professional and private circumstances at that particular moment.

6.3 Revisiting and rethinking the meaning of work and meaningful work-life

Previous studies on the meaning of work highlight that meaningfulness can be generated and bolstered either *at work* or *in work* (e.g., Bailey *et al*., 2019a, 2019b; Pratt and Ashforth, 2003; Rosso, Dekas, and Wrzesniewski, 2010). To explain, the essence of the work being enacted and performed is the focus of meaningfulness at work, while the sense of the work being enacted and performed is the focus of meaningfulness in work (Antonacopoulou and

Georgiadou, 2020). The meaning of work has been fueled by increased autonomy, control, and mobility, etc (e.g., Bailey *et al.*, 2017), which aligns with beliefs and values perceived by individuals (Pratt and Ashforth, 2003). It is also acknowledged that work provides a sense of belonging in a society where respect interacts and intersects with confidence, which further supports personal learning and development, self-efficacy and self-esteem, and the fulfillment of a purposeful career (Bailey *et al*., 2017; Bailey *et al*., 2019a, 2019b). The analysis of those women's living experiences in the IT profession in the present study provides rich insights into their perceptions and expectations of meaningfulness and meaningful work as a new generation of female IT professionals/practitioners. These insights on meaningfulness stand against the mainstream conceptualization of meaningful work, which stems from discursive ideology manifested in its inherent masculine values and stereotypical assumptions about the organizational culture. Here, I call for a move beyond the dualistic representation of the meaning of work and meaningful work as either 'realization' or 'justification' – a dual concept of meaningful work proposed by Lepisto and Pratt (2017), implying distinct types of meaningfulness. To explain, the realization perspective denotes to view meaningfulness generated via self-actualization, which includes the fulfilling of needs, motives, and desires; while the justification perspective is recognized as another angle in perceiving meaningful work, that relies upon subjective accounts justifying worthiness and possessing positive value of one's work (ibid). Through highlighting new insights about why work matters and what matters to these female IT professionals from a younger generation, this study further contributes to exploring issues of embodiment, difference, gender, equality, and diversity that interweave in these lived experiences. Patterned yet distinctive individual and collective perceptions and expectations about what produces meaning of work to fulfill these women's various desires, motivations, and needs are demonstrated in a nuanced manner. This exploratory investigation in the present study further reveals women's

subjective experience of continuous self-reflection on the worthiness and value of IT work they have been doing, along with their uncertainties, anxieties, ambiguities, and changes that further propel personal learning, development, and collective resistance towards radical changes. It is concluded that meaningful work has taken on a new meaning among this new generation of female IT professionals/practitioners, entangled in bodies and minds, and the materiality that affects them in their working lives.

Meaningfulness originates from motivation, psychological desires, and other demands that overcome alienation and find a sense of belonging through work, which echo theories of self-determination and self-realization. Indeed, it is acknowledged that theories of self-determination focus on issues around autonomy, competence, and discussions of self-realization focus on subjective experiences, individual expressions, authenticity, and self-worth (Lepisto and Pratt, 2017). This perspective provides explanations for those female IT professionals who find job enrichment matters, that they can realize the self through work. It includes autonomy, job engagement at work, varieties of skills, and performance feedback, which are associated with job characteristics, motivation, work/lifestyle. This direction enables and further stimulates individuals to recognize and realize their self/ves through work which echoes the new postfeminist gender regime (Adamson, 2017), an attempt to claim feminist values i.e., freedom of choice, equal opportunities, and self-determination against the traditional patriarchal expectations around women, the feminine, sexuality, and motherhood (e.g., Lewis, Benschop, and Simpson, 2017). Examples of several recurring themes related to postfeminism are identified, such as

> *"An emphasis on individualism, choice, and empowerment, the revival and reappearance of 'natural' sexual difference; the shift from objectification to*

> *'voluntary' subjectification; the emphasis upon self-surveillance with constant monitoring and disciplining of women's bodies; the ascendancy of a make-over paradigm that not only acts on the body but also constitutes a remaking of subjectivity; the resexualisation of women's bodies and the retreat to home as a matter of choice not obligation"* (Lewis, Benschop, and Simpson, 2017, p. 214).

Individual differences and sometimes inequalities in career advancement are deeply anchored in neoliberal society, owing to the continued emphasis on postfeminist subjectivity. In other words, postfeminist recrafts individual values as a person or a professional in neoliberal terms: 'as an individualistic, entrepreneurial project that can be inculcated by the self' (Gill and Orgad, 2015, p. 334), while reducing the effect on individuals that complex power relations and collective responsibilities have placed upon in a system that is deeply entrenched in neoliberal capitalism. In organizational theorizing, gender fatigue in organizations has been flagged up (e.g., Kelan, 2009) by rendering visible gender inequality and discrimination across different industrial sectors. Part of the reason is that, under postfeminist thinking, the trending ideology of meritocracy sets the 'climate' that and discourses that promote individuals should be rewarded for their merits regardless of gender (Lewis, 2014), yet the power of the material reality constituted that constantly promotes women's exclusion within the IT profession has been overlooked (e.g., Tassabehji *et al*., 2020). With most of the time dedicated to coding, building software, things that make technology function effectively and meet clients' demands replace these women's human senses in their working lives, which is clearly in lockstep with neoliberalism. The working-life experiences of the new generation of female IT professionals in this study demonstrate signs of the ongoing transformation towards a new postfeminist gender regime that almost exclusively focuses on self-regulation and self-care (e.g., Rottenberg, 2014). This viewpoint

also underpins several top New York Times bestsellers in the business category, such as *Lean In*, *#GIRLBOSS*, and *The Confidence Code*, which reveal the constraints and challenges that most white, middle-class working women encounter, while collective resistance to radical change for equality and social justice is neglected. Instead, a new figure of 'feminist' is rising, which is attributed to market rationality, closely aligning with neoliberal materialism, that encourages all women to be autonomous and self-reliant, able to work around other attending duties and take full responsibility for their own lives.

The core issue of the contradictions exposed and discussed above may be more accounted for by the constraints, challenges, or suppressed subjectivities that prevent those women in IT from fulfilling their recognition of self at work, and thus they are unable to achieve self-realization and self-determination through work. Now, a rethinking of what meaningful work means by answering questions such as 'Why is my work worth doing?' 'Why is my work worthy?' Work has become the focal point of debate around its value or worthiness (e.g., Lepisto and Pratt, 2017). This view puts uncertainty, anxiety, and ambiguity of these working women's doing/un-doing on the table, which goes beyond recognizing the 'self', but by questioning the basic value and worth of what they are engaged in. Building upon the analysis of these millennial women's engagement in coding and technology communities, also sometimes referred to as 'postfeminist communities' (e.g., Petrucci, 2020), these accounts demonstrate that the worth or value of individuals' work is hard to be predetermined or acknowledged in advance. From an individual perspective, it is up for grabs, which means that its worth or value is not inherent or assessed by the nature of the tasks individually performed; but in the meantime, it is also for the 'collective convenience'. This is not to stand against meaningfulness or meaningful work which is predominantly constructed or shaped along with the term of purpose (e.g., Michaelson, 2005; Pratt and Ashforth, 2003), which

represents a sense of reasoning, ordering, or rationale. Rather, the new generation of female IT professionals is alternative meaning-makers as living bodies, as infrastructures, trying to build destructive force against underrepresentation in the field through collaborative transformation. Collective resistance is built upon care, generosity, trust, and solidarity (see for example, Ahonen *et al.,* 2020; Einola *et al*., 2020), and in ways of creating better meanings via account-making transformative activities and joint actions.

Through using the qualitative inquiry on individual and collective efforts the new generation of female IT professionals/practitioners performed reflecting upon their 'real-life' experience, there are various factors that hinder or facilitate their non-traditional and nonlinear career in the field. Those contradictions imposed on the new generation of IT workforce, from balancing at work and off work, physically and psychologically, that manifest throughout these accounts presented in Chapter 5 further provide valuable insights to unveil the multiple realities rupturing in/at work and everyday life of the new generation of female IT professionals. Karen Barad's agential realism provokes that all life forms, including passive objects, human and inhuman relations, *do* theory. She once wrote that:

> *"Theorizing, a form of experimenting is about being in touch. What keeps theories alive and lively is being responsible and responsive to the world's patternings and murmurings. Doing theory requires being open to the world's aliveness, allowing oneself to be lured by curiosity, surprise, and wonders…Theories are living and breathing re-configuring of the world. The world theorizes as well as experiments with itself."* (Barad, 2012, p. 207)

Likewise, this is also flagged up by Butler's (1993, 2015) insistence that embodied experiences not only happen within and through those discourses that are beyond humans but also within and through numerous moments of other materiality, such as interactions with time and space that would also cause-effect, which applies to organization settings, e.g., technology workplace. She wrote that:

> *"I am affected not just by this one other or a set of others, but by a world in which humans, institutions, and organic and inorganic processes all impress themselves upon this me... who is...as it were, in the 'hands' of institutions, discourses, environments, including technologies and life processes, handled by an organic and inorganic object field that exceeds the human."* (Butler, 2015, p. 7)

This is illuminated in the present study through rendering visible women's embodied experiences, struggles, and ambivalent emotions that affect their navigation towards a meaningful (work)-life in the IT profession, and the multiplicity of meanings and multiple realities are visualized and theorized in a processual, complex and fluid way. Lively bodies are recognized as holding agency, yet they recognize that agency is not for legitimizing the power of material relations between humans for sole competition, productivity, or functionality. Collaboratively, these women in IT have been learning and developing together with their peers and mentors, and through the process, they have demonstrated care for each other and for those who may want to enter the field but lack the materials or resources to get in. They care for those who do not have a relevant educational background in coding-related subjects, and thus, jointly prepare those women who have further needs to enter the field. This process also embodies slowness, through regular boot camps, coding marathons, and other interactive activities that enable women to learn, to practice, and to grow together.

Sharing, connecting, learning, and developing together with other women who code also creates effects that manifest in signs of care and trust. Care emerges among them at/in these moments, and when they reflect upon themselves, they recognize how they have been enriched technologically and emotionally by the others within the collective. Added to this, the discourse of 'balance' and 'healthy life' is flagged up, which further propels these female IT professionals' behaviors in fulfilling their beliefs, i.e., work should fit into life. During today's busy lifestyle in the fast-changing technology world, younger practitioners' ambivalent emotions and struggles experienced at/in work cannot be ignored, and neither does life outside of work - an important part that could be compromised for work matters, more importantly, for the sake of climbing the conventional career ladders. This view, in a sense, also resonates with the idea of 'slowness' rupturing in/at highly-skilled scholarly working life (e.g., Valtonen and Pullen, 2020), which provides a means through which care, and more specifically, feminist care, can stand a chance for radical changes, from small beginnings towards a better and different future.

6.4 An alternative future: An ethics of care approach

Given the above discussions, the significance of the power of neoliberal capitalism rooted in the fast-changing technology world has been recognized. From a human capital-based value perspective, the increasing demands of individual competitiveness, development, and resources are inevitably crucial when it comes to an employer's perceived evaluation of individual employees (e.g., Hooi, 2019). As 'products' of knowledge, skills, and 'pipelines', individual employees are attributed to increased or decreased stakeholder returns, benefits, market share, and operational cost to meet an organization's strategic goals. Such a measurement approach based on almost exclusively performance and resources overlooks

human experience and its worth attributed to the economy (Sambrook, 2012). Instead, this approach simply marks the pursuit of organizational goals which are entrenched in capitalist values. Thus, such resource-based views have been countered by scholars who hold feminist values and who advocate a more humanistic, employee/person-centered approach to further learning and development (e.g., McGuire, Germain, and Reynolds, 2020). These scholars give voices to those oppressed in the workplace by recognizing structural and reproductive labor inequalities in the career context and explaining how privileged values and power dynamics perpetuated in the workplace have further exaggerated the inequalities under the scientific positivist management approach (e.g., Bierema, 2010). For instance, Kormanik and Nwaoma (2015) argue that an inclusive organizational culture that builds upon shared values of equality and diversity reiterates the importance of an organization's efforts on attending to individual needs while respecting and valuing individual differences. Escaping such resource-based stances opens up alternative discussions of possibilities towards more democratic, humanistic, and ethical leadership and management in today's organizations, regardless of field. Instead of viewing individuals as autonomous, self-sufficient actors, feminist philosophers argue that caring for others begins with a view of "persons as relational and interdependent, morally and epistemologically" (Held, 2006, p. 13). To cultivate receptivity, which allows people to "feel with others" (Noddings, 2013, p. 30), we need a balance of interests between ourselves and others, genuine openness, and mutual engagement with otherness and intersectional differences. It also marks the establishment of space to further promote equality and social justice practice within mainstream human resources management and development in the IT workplace.

Upon revisiting the trends of feminist ethics of care, it is recognized that responding to individual needs through an inter-connected caring approach grabs the central spotlight. This

means that care ethics re-directs our attention to the need for responsiveness and relationships with a focus on connectedness between different individuals (e.g., McGuire, Germain, and Reynolds, 2020). Care is described as a sense of sympathetic concern for the good of others and the community around them (Baier, 1987). Mayeroff (1971) also perceives care as a cluster of activities that focus on healing, growth, empowerment, and self-actualization. Given the outcomes of the data analysis presented in Chapter Five, the learning and development processes of those women could be viewed as intentional activities that aim to assist individuals (and each other within the tech community) to achieve subjective learning outcomes in alignment with organizational goals. It is argued that the development process is an ongoing responsibility, along with liabilities imposed towards both recipients and givers (e.g., Kuchinke, 2010). As a result, an ethics of care approach questions and challenges the long-standing free-market capitalism and excessive individualism that have induced many employers to enhance their employees' learning and development to achieve strategic goals. In this regard, Armitage (2018) further argues the importance of an ethics of care approach, which is located around human life, marking the interaction of receiving and giving care between different individuals as a fundamental part of the human experience. Likewise, Nicholson and Kurucz (2019) also recognize the fundamental importance of care for future learning and human development in organizational settings for sustainable leadership purposes.

As a researcher, I am also provoked by the claim that care is rooted in an understanding that professionals/persons are featured in distinctive identity/ies, which are situated in specific contexts and dynamic relations they are involved with (Noddings, 2013). Similarly, Bauman (2011) once argued that productive relationships in the workplace demand care being exhibited, taking both employees' and stakeholders' wellbeing into consideration. Thus, it

could be asserted that an ethics of care approach is contextual, processual, and proximate in nature. In a career context, this interactive process involves caring for others, including those marginalized, vulnerable, and female bodies, while recognizing complex individual situations. Employing the ethics of care approach in IT firms makes visible the need for employers to provide sufficient support for their employees, both physically and psychologically, rather than simply ending with a series of 'inclusive' policies and strategies for symbolic reasons. Instead, they recognize the individual differences of those female professionals in the IT construct through a contextual and embodied approach that embraces alternative dialogues among individuals. As such, an ethics of care approach opens up the possibilities and opportunities for shaping and reshaping the core values of the strategic organizational climate and subsequent assessment of employees, which in turn further creates an 'inclusive' learning and human development environment for 'others' in IT work - those who have been marginalized and discriminated against by their intersectional differences, including women.

6.5 Conclusion

The present research further contributes to advancing contemporary feminist understandings of gendering technology in the career context and the changing nature of the gender-technology relationship, manifested in the new generation of female IT professionals. It suggests that such a critique has implications for the fragility of analytical categories associated with the 'hard-soft dichotomy'. Gender is still predominantly essentialist and monolithic in its representations, and technology is presented as an undifferentiated umbrella term. However, pieces of the literature suggest that ingrained epistemological gendered biases persist, which portray women as less competent in computing, with women having

limited career prospects in the information technology, electronics, and communication sectors. This leads to the marginalization of women in computing and IT workplace interactions. Broadly, the rapid growth of information technology and the widespread use of digital media have been marked by an enormous growth of contingent workers, with women making up many part-time and temporary workers. Such changes towards work flexibility and work organization (e.g., autonomy, mobility, control, etc.) can not happen without the proliferation of information and communications technology. The rapid growth in economic and capital inequality between women with different educational backgrounds, skill levels, and accessibility to labor market resources makes it difficult to generalize women's living experiences with computers and technology. New technologies may be epistemologically open, which manifested in millennial women's shift towards having non-linear and multiple careers, and the upsurging number of women who enrolled in coding courses and computer-related subjects in preparing to enter the field. Yet, many of their current forms under different social orders may be gendered in their affective material relations to existing techniques and within networks.

Therefore, I move to an in-depth discussion on the embodied experience of these women in IT work e.g., how they perceive their living experience in the IT workplace and changing livelihoods, which also manifests in their expansion of gendering work/life balance in order to seek meaningfulness. These discussions are based on the complex individual situations that are extracted from those millennial women in IT who have participated in the present study, in a way of reflecting upon their own perceptions and expectations of their working, living, and being. Discussions include subjective views of self-efficacy, self-esteem, authenticity, belongingness, cultural and interpersonal sensemaking, and purposes. Soon, it becomes clear that there is an image of realization underneath, demonstrating how and when a woman, an

IT professional, is likely to experience meaningfulness. To summarize, a woman who works as an IT professional/practitioner tends to find meaningfulness and satisfaction at work when she is inspired, personally passionate, agentic, and/or lives up to her true desire of discovering and utilizing talents through an ethics of care approach which originated yet beyond the self. It is then perhaps not surprising that I conclude this chapter by initiating an alternative future - returning to an ethics of care approach, in alignment with the rapid growth of technology in the workplace. Constructs that the new generation of female IT professionals tends to experience motivation through work involvement and community engagement, intrinsically and extrinsically, are strongly interconnected to their discovering meaningful work and finding the density of meaningfulness. In so doing, it moves beyond the traditional essentialist values of meaningful work and meaningfulness. Such behavioral and emotional changes manifested in the new generation of female IT professionals further contribute to creating a new ideology and caring IT communities.

Chapter Seven Conclusion

7.1 Introduction

In this thesis, I have adopted the lens of individual differences theory of gender and IT to explore how millennial women in the IT profession navigate their working lives, as well as their coping strategies to counter challenges exacerbated by other forms of difference in a gendered construct, and individual behavior change and (re)construction in response to work-life changes. In addition to previous studies that argue that technology's predominately masculine culture legitimizes men's power of genitalia-speak that excludes women's voices (e.g., Harvey, 1997), these millennial women in IT exercise increased agency in empowering themselves to forge an alternative, non-linear path in the field. Indeed, misogynistic attitudes remain deeply embedded in technology's recruitment, practices, organizational structurers, language, images, and symbols (e.g., McGee, 2018; Tapia, 2006; Tassabehji *et al.*, 2020). Adopting this view, IT culture is hostile to women because it is individualistic, self-reinforcing, aggressive, isolating, dissimilatory, and misogynistic (e.g., Kiss, 2015; Tapia, 2006), and the few women who do enter the field leave quickly. The current study confirms that the IT culture is still oppressive to women (e.g., Von Hellens, Trauth, and Fisher, 2012); however, millennial women's efforts to reconfigure identity work in IT in order to self-lead and take control of their living and livelihoods show that they no longer align with those images of submissive or passive women, as primarily depicted by older generations such as generation X (e.g., Feyerherm and Vick, 2005). Such passive representations are common among middle-class working mothers who are romantically attached to their spouses or partners, and work-family conflicts have been shown to negatively affect women's advancement in IT careers (e.g., Armstrong, Riemenschneider, and Giddens, 2018).

However, the current study's findings differ in these aspects because these female millennials do not follow traditional linear career paths by climbing organizational ladders. Instead, they manifest in their constant search for meaning, autonomy, freedom, and community belonging in IT work, through which they are equipped with technological advancement, financial stability, control over their working and personal lives, to achieve a 'balance' and 'healthy life', which further propels their fulfilment of that work should fit life. This is also consistent with the increased accessibility of technological learning and the burgeoning digital platforms, as evidenced by some millennial women who enter the field without a comprehensive computer science higher education. Their actions demonstrate confidence, courage, female strength, and resilience, and lively bodies are recognized as having agency while also acknowledging that agency is not for legitimizing the power of human material relations for the sole purpose of competition, productivity, or functionality. Rather, these young women have been learning and developing as a collective, with their peers and mentors, and in the process, they have demonstrated caring thoughts for one another and for those who may want to enter the field but lack the materials or resources to do so. Adopting this viewpoint, the findings from this study contradict previous studies that claim the main barriers to women's persistence and advancement in IT careers are a lack of mentors, role models, and informal networks (e.g., Amon, 2017; Cho *et al*., 2016). In this regard, the empirical data from this research fills the void in understanding how women engage in and profit from mentoring activities, networking, and relationships, which the opposite has been presented by previous findings that the good-old-boy network leads to women's negative interactions and overshadows women's mentoring opportunities (e.g., Brownell, 1994; Davies-Netzley, 1998; Dougherty *et al*., 2013; Oakley, 2000; Roth, 2007). For instance, these female millennials in IT care for those who do not have a relevant educational background in coding-related subjects and, as a result, jointly prepare those women with additional needs to

enter the field; this process also embodies slowness, through regular boot camps, coding marathons, and other interactive activities that allow women to learn, practice, and grow together. Sharing, connecting, learning, and developing with other female coders has a ripple effect that manifests in signs of care and trust. Care emerges among them at/in these moments, and when they reflect upon themselves, they recognize how they have been enriched technologically and emotionally by the others within these IT communities, where they can seek mentoring support, learning, and networking resources. The results of this study back up Winderler and Riemenschneider's (2016) findings that ethnic minorities in IT benefit from psychosocial mentoring, but it is unclear whether ethnic minorities, black women and/or Asian women in this study, benefit more than ethnic majorities.

Instead of simplifying women's gender, race/ethnicity, age, place of residence, and education level as mutually exclusive categories of experience and analysis, this study brings multifaceted careers and the multiplicity of working life into the dialogue. In particular, the researcher investigates women's work-life experience in a more nuanced manner, unravelling the multiple realities of those women in IT work and how they cope across different situations, and in doing so, it explains the ambivalent nature of their ways to construct paradoxical discourses and practices in the workplace interactions, and its impact on their work-life navigation mediated by the technology changes. The individual differences theory of gender and IT has been employed as an analytical lens, and in doing so, it encompasses the complexities of the tensions between challenging norms and changing work-life experiences in IT, which have not been voiced and remain taboo in neoliberal society. In particular, gender is still predominantly essentialist and monolithic in its representations, and technology is presented as an undifferentiated umbrella term. However, literature suggests that ingrained

epistemological gendered biases persist, which portray women as less competent in computing, with women having limited career prospects in the information technology, electronics, and communication sectors. This leads to the marginalization of women in computing and workplace interactions. Broadly, the rapid growth of information technology and the widespread use of digital media have been marked by an enormous growth of contingent workers, with women making up most part-time and temporary workers. Such changes towards work flexibility and work organization (e.g., autonomy, mobility, control, etc.) can not happen without the proliferation of information and communications technology. The rapid growth in economic and capital inequality between women with different educational backgrounds, skill levels, and accessibility to labor market resources makes it difficult to generalize women's living experiences with computers. New technologies may be epistemologically open but many of their current forms may be gendered in their material relations to existing techniques.

The present study responds to prior work that calls for further research with emphasis on non-traditional and non-linear careers and in this way, it contributes to offering new perspectives and fostering alternative discussions behind women's underrepresentation in technology fields. The thematic analysis is presented in a way of traversing the traditional organizational and gendered boundaries and translating social constructivist philosophy and inequality regimes through empirical work. It adds to the existing debates on the gender-technology relationship and the in-between connotations of gender, work-life navigation, and attitudes to technologies. It argues that the relationship between gender and technology is no longer static among millennials. Instead, it alters with the changing nature of technological capabilities in the context of rapid socio-cultural and economic growth, further propelling an upsurge of women enrolled in computer-related courses and professions. It also alters the way

individuals work and live-in everyday practices, which aligns with changes in rules and norms about technology enacted and performed. In addition, the shift to having multiple careers and gendered work/life balance has occurred among millennial talents. However, this is not an indication of the radical revolution of labor market power relations in the world of technology work. Rather, a more significant reflexive criticism is required to rethink epistemological assumptions and problematize the discursive accounts of the role of technology in (re)producing gender (in)equality since it reflects paradoxical continuity and change.

7.2 Contribution to knowledge

This qualitative empirical study is based on in-depth interviews with twenty-five female millennials in the IT profession across several developed countries and regions – primarily the U.K., members of the European Union, the United States, and Australia, who work across web design, software development, user interface development, digital site operations, and codes between these business units in technology. Specifically, three principal research questions are addressed in the present study.

RQ1: What attracts millennial women into IT work?
RQ2: What are the barriers and challenges that women in IT face in their profession (and/or in balancing their professional and personal life?) and what are the underlying reasons?
RQ3: How do these IT-skilled women navigate and negotiate with these challenges encountered and why?

This timely inquiry, therefore, has investigated the living experiences of a group of millennial women who work as technology professionals to gain an in-depth understanding of this younger IT workforce. During the exploration process, I have unmasked the unique challenges these women in IT face and discovered the strategies they have used to stay motivated and persevere; as well as initiatives undertaken in an environment where male dominance is prevailing. The intensification of IT work, which necessitates continuous learning and keeping up with cutting-edge technological development, as well as the effort to succeed in a more autonomous, independent lifestyle, which appears to give them more control over attaining healthy and sustainable productivity and self-satisfaction in their professional and personal lives, are among the identified challenges. These millennial women, who often find themselves as the only woman and sometimes, the only minority in their teams, have reported feelings of isolation and loneliness at IT work. Further discriminatory acts against these young women in IT have been reported as manifested barriers at work due to various forms of difference, including their gendered body, women of color and/or ethnic minority, youth, and sometimes sexuality. It is also revealed that the accessibility to a non-traditional, non-linear career development but appealing IT career prospect available in this work domain is underappreciated, owing to these young women's equipped technological skills through collective learning praxis and social capital built outside of the workplace through (self)-organized IT communities. These behavioral changes and initiatives undertaken, both individually and collectively, are perceived as proactive responses and ways of resistance to improve women's agency and empower women in this field. In doing so, it makes theoretical and empirical contributions to the field of study.

First, my research extends the work of a small number of management and organizational scholars who have documented the trouble women encounter in the gender structure in IT

and how this affects the behaviors of women in computing and IT sectors (e.g., Hari, 2017; Kenny and Donnelly, 2020; Petrucci, 2020; Tassabehji *et al.*, 2020; Vitores and Gil-Juárez, 2016), by providing new landscapes behind the underrepresentation of women in IT fields. This also makes those emerging IT working sites visible where a higher proportion of women could be found. We know from the literature what makes women navigate gendered social and organizational norms and grow resilient careers in science, technology and engineering fields (e.g., Fernando, Cohen, and Duberley, 2018; Khilji and Pumroy, 2019; Petrucci, 2020; Reid *et al.*, 2008), and it has also been reported that millennial women in IT benefit from care and peer support, as well as input on job success (usually from male managers) and spousal support, in order to achieve a balanced work-life experience. However, only licensed women engineers from listed companies in the industry and student members pursuing degrees in the occupation were investigated, and this is where the findings of this study seek to expand by bringing those women who enter the IT field without prior comprehensive subject degree experiences. This means that increased access to coding and technological learning can be identified, allowing more younger women to participate and enter the IT workforce at those intersections of new media, technology, digital operations, virtual design, and so on, where traditional computing and IT work has not been accounted for in official statistics. It also extends the application of gendered theory on the perceived challenges, persistence and advancement of women in IT careers (e.g., Armstrong, Riemenschneider, and Giddens, 2018; McGee, 2018; Orser, Riding, and Stanley, 2012; Reid *et al*., 2010; Riemenschneider *et al.*, 2006), by mapping various responses and behavioral changes of these professional women, in relation to different social, environmental and structural factors that have helped and/or hindered women's entry into and further development in the IT profession. This includes those women and minorities who enjoy IT work and those who encounter various struggles and challenges along the IT career journey, in which to make the millennial generation of

professional women's multi-facet living experiences and livelihoods in IT visible. For example, it is evidenced that these women have been exposed to the rapid growth of digital media as well as expanded access to technical knowledge, which has facilitated the development of their childhood self-interest and excitement in technology, as well as their career entry into computing and information technology fields. In doing so, this research goes beyond the ingrained epistemological structural inequalities in the existing literature which portray women as less competent in computing and IT work (e.g., Crump, Logan, and Mcllroy, 2007; Panteli, 2012; Panteli and Pen, 2009; Reid *et al*., 2010), along with women having limited career prospects in the broader information technology, electronics, and communication sectors (e.g., Adikaram and Wijayawardena, 2015; Long, Segalo, and Laidlaw, 2016). Rather, it enlightens what helps to promote millennial women's career equality and equity for gender diversity and inclusion in the IT field.

Second, unveiling the living experiences and changing behaviors of female IT professionals from the younger IT workforce also extends the work of a few technofeminist and cyberfeminism scholars who have documented the changing women-machinery and gender-technology relationships in the past (e.g., Faludi, 2013; Wajcman, 2004, 2010, 2014). This is manifested in millennial women's pursuit of non-linear and non-traditional IT careers discovered in this study, which contributes to contemporary feminist understandings of gendering technology in the workplace, as well as the changing nature of IT work and the gender-technology relationship, which is no longer static. It supports the mindset of this group of typically millennial workers who seek meaningful work, independence, and community in the new economy, as evidenced by Woldoff and Litchfield's (2020) recent work, which recorded a group of younger professionals, a class of millennial workers relocated in Bali, Indonesia, who seek fulfilment in work and life. This finding echoes their

research findings to some extent, however they looked at a group of expatriates who had naturally developed a new work culture and community in their new host nation, and the findings and conclusions differ in this regard. In this study, it presents itself in those millennial women who move and work abroad and experience a difficult adjustment period, and who have and/or have not been supported by established local IT groups and other networking and contacts built throughout their technological learning and work interactions. The outcomes speak out of those hidden stories in this field, which reveal women's changing attitudes, ulterior motives, struggles, and coping strategies during their change of work-life experiences, which are embedded with their on-going mixed feelings, emotions, reflections, and in search of new meanings of IT work as a promising young IT workforce. In comparison to older generations (e.g., baby boomers and generation X), frequently represented among those conservative, middle-class working mothers, this study reveals an increasing number of female IT professionals/practitioners from the millennial generation who actively pursue a lifestyle of independence and meaning for their living and livelihoods, manifested in their use of IT skills and resources to craft their IT careers, and travelling far and wide, and moving as frequently as they want. They manifest in their constant search for the meaning of work, autonomy, creativity and community belonging in IT, through which they are equipped with technological advancement, financial stability, control over their working and personal lives, to achieve a 'balance' and 'healthy life', which further propels their fulfilment of that work should fit life. Joining the above-mentioned work, I have also included single, childfree women in IT into the dialogue. This means that the findings differ from previous studies that highlighted female role models who balance work and parental responsibilities to live up to, and this study illustrates that these millennials in IT benefit from female role models who demonstrate high-level skills in balancing multi-tasking and intense IT work with their personal lives. Yet they are not problem-free. I discuss the challenges that these young

women face as they move away from traditional, linear working lives to climb organizational ladders in IT, starting with their transitions into moonlighting, freelancing, entrepreneurship, and remote work, and then elucidating how they create fluid but intimate IT communities, both online and offline, outside of the workplace of like-minded others. This process also reveals that stress caused by the intensification of IT work, isolation, anxiety, and loneliness, as well as difficulties between balancing job mobility and individual/employee mobility, have all been identified as challenges for millennial women in IT. Further, discrimination against these professional women in IT because of their younger age, as well as various forms of their minority status at work, have also been identified as challenges to overcome. Thus, this research addresses what is typically left 'unspoken' behind their modern working lives and livelihoods in a more nuanced manner, and adds to the existing debates on the monolithic, static gender-technology relationship and the in-between connotations of gender, work-life navigation, and attitudes to technologies. However, this is not an indication of the radical change of power dynamics in the world of IT work and/or the broader labor market.

The myth that an ideal worker image can be protected, for example, through scaling the hierarchies of fame and fortune embodied by disparities of material and symbolic wealth, is fueled by the enlightened notion of an autonomous self (e.g., Knights and Clarke, 2017). This means that when we fall for this illusion of a truly autonomous self, we literally bring such an idealized self-image for granted as a true and achievable aim for establishing meaning and reality, obscuring how it is partly an effect of exercises of power that constitute us, as this or that kind of subject. This is built on existentialism, which theorizes the self as autonomous and distinctive yet entangled in a complicated world of meaningless uncertainty and unpredictability (ibid). It further implies that rather than living 'less' and insignificant lives, we, as human beings, *must* commit ourselves to meaningful endeavors that protect us from

the dread of meaningless existential emptiness. In other words, people are considered free because they can avoid a life filled with meaningless pursuits and instead devote their living bodies and minds to work that allows them to discover and realize their true and authentic selves, and where their full potential lies. In fact, humans are frequently forced to confront mortality in order to live consciously in an entangled world that is oppressively uncertain and potentially meaningless, and in which existence is nothing more than avoiding death. Unfortunately, more individuals may become blinded to the oppressive and dehumanizing facets of certain political and social movements as a result of this. Yet, as Foucault (2011) points out, the ethics and aesthetics of subjectivity stem from our (their) reluctance to be what we (they) have been traditionally represented as through so many activities of power plays. Arguably, an individual's agency to mediate, perceive, compromise, and resist the meanings and connections concerning their subjection is not diminished by power relations and/or knowledge effects on subjectivity. For example, amongst these professional women, they frequently face the dilemma of being the only woman on their team, which fuels their isolating emotions, which further fuels their advocacy for change due to the lack of visibility of exciting career opportunities in the IT workplace. An identified approach is their use of social media and networking sites in creating a space, virtually and locally, for providing mentorship and building up an 'allyship' – connecting with those girls and others alike to unite, learn, and grow in a collective way. This is, in return, to improve their subjective status at work. However, approaches such as Facebook's #LeanIn Circles, which engage in and promote such a change through numbers and visibility, have the potential to affect the wider IT environment by perpetuating the exclusion of certain groups or the silence of others in organizational settings. Nonetheless, it is the ethico-political praxis that renders gender, race, youth/age, education, equity, and power dynamics visible, when interrogating the extant white, male dominance working culture, and working life experiences of professional women

within, as well as their complex, sometimes paradoxical identities. As a result, this study calls for more significant reflexive criticism to rethink the epistemological assumptions underlying technology's role in reproducing gender inequity and inequality as it reflects continuity and change.

Third, building upon Trauth's (2011, 2013) influential work, this research further incorporates feminist thinking of doing/undoing gender and how gendered interactions are (re)constructed by women in the IT profession genre under contemporary postfeminist and neoliberal cultural norms and organizations (e.g., Gill, Kelan, and Scharff, 2016; Gill and Orgad, 2017; Lewis, 2014; Lewis *et al*., 2019) to understand the site of multiplicity and behaviors of female IT professionals within different IT constructs while recognizing individual (intersectional) differences. In doing so, this study moves beyond the traditional opposite-binary and essentialist categorization of gender and technology, which are perceived as fixed variables (Adam, Howcroft, and Richardson, 2004; Trauth, 2014; Venkatesh, Thong, and Xu, 2012). Instead of complying with the exclusion paradigm underpinned by the field of study and the prevailing narrative, my research project explores what makes IT work attractive for millennial women as well as the potential for individual resilience and collective resistance against the male-dominated discourse in the IT field. Furthering insights into the promotion of women to take personal responsibilities, that women can 'have it all' in the IT workplace (e.g., Grinberg, 2012; Sandberg, 2013), the maneuvering behaviors of these women in the IT profession are seen as strategic responses to the existing essentialist and observable evaluation centered on value creation and success in IT. Taking into account the inherent male-dominated nature of IT firms and their essentialist-like rhetoric, I argue that addressing the underrepresentation of women in IT necessitates a feminist approach that interrogates the gendered symbolic of an ideal worker image in traditional jobs, career

trajectory, and HR development in this domain. There is also a lack of connectedness and relationality in this domain. We know from Petrucci's (2020) theory of postfeminist communities, which is used to identify how community organizing can take a postfeminist turn to address workplace gender inequities. However, she did not study private IT communities formed by millennials in IT; rather, the gender-inclusive meetups she has studied are mostly public, often free groups. This study's findings confirm the postfeminist values and support that community can provide outside of the working environment in the tech world. For example, as a group of digital natives who grew up on the internet and a group of very enthusiastic young women breaking it in technology, it is shown that these women in the IT profession are active IT community builders, seeking support and 'paying it forward' to help other young girls land a career in the IT field, and find growth in their own career paths to see those they have helped thrive and succeed. Hence, this study's result differs in this aspect by looking into those (self)-organized IT communities established in collaboration with and/or accredited by local IT companies, where these millennial women have been actively engaged and developed. These spaces have fused increased individual agency and improved women's status and influence in their respective workplaces. Thus, I argue that IT community building outside of the workplace can serve as a mediator in addressing structural/organizational inequality across the field while improving individuals' capability to act against it. This could also be a proactive way to foster gender equality and programs to encourage more young girls to participate and flourish in traditionally male-dominated IT fields. It means that, empirically, this could further provide IT practitioners with important mechanisms which could be incorporated to develop workable strategies in promoting gender equality, diversity and inclusion to ensure the success and sustainability of the co-existence of different genders and other minorities in this field, without dominance or discrimination. In doing so, it also elicits an interpretation of the evolving women-technology

relationship based on women's engagements across intersectional differences such as educational, race/ethnicity, age, social, and cultural distinctions that would otherwise separate women, and it promotes feminist solidarity across boundaries and individual differences. On the other hand, those joint engagements are undeniably also monolithically for the purpose of obtaining more capital-based human resources and career impact for individual advancement in the IT field, which is manifested in current types of in-house community-based activities in IT, as well as those developed outside of the workplace.

Methodologically, despite qualitative methods being acknowledged for their research values in the broader field of management and organization studies, certain disciplines and fields such as mainstream international business and global human resources management/development are traditionally quantitatively oriented, guided by the positivist paradigm and exerting a clear preference towards quantitative methodologies and methods (Bell, Kothiyal, and Willmott, 2017). The combination of an interpretive approach and critical lens in this present study could be employed in future research exploring the complexity, employees' feelings and mixed emotions, and their perceptions towards daily interactions in a longitudinal period in the IT field. In this regard, future research can also fill the research gap located in intra-gender leadership interactions among male employees (e.g., resistance or prejudice) and in comparison to women's perspectives. Any comparable or (in)compatible themes which emerged from future studies could be employed here to logically flow to this area, pinning the importance of understanding women's oppressed situations during career entry and further success in IT, along with changing actions required from examining those different perspectives.

7.3 Practical implications and limitations

The proliferation of information technology and the increased opportunities generated from the emerging digital sites and environments have been marked by an enormous growth of women's participation. Women account for a prominent portion of the workforce and occupy a substantially remarkable position in the digital economy, and thus, women in the IT profession need their ranks to genuinely represent the work that they are carrying out. Such change towards accessing more opportunities and work flexibility contributes to women's increased autonomy, mobility and control in the IT profession. The change is, however, intermeshed with the continuity of gender inequity and inequality, which is manifested in the fact that women make up the majority of part-time and temporary workers in this field. The reasons include deeply ingrained gender norms in IT firms, as well as the promotion of almost exclusively individualism and technical competencies that align with corporate goals. This also relates to the employment protocols and role expectations for women in IT, which are manifested in how IT companies organize their human and capital resources, where female IT professionals behave in a way that advances their agency to address gendered power relations. On the other hand, it reveals the essential patriarchal and hegemonic male power perpetuated in the IT workplace. Thus, it becomes clear that new technologies may be epistemologically open, but many of their current forms may be gendered in their material relations to existing techniques.

Adopting this viewpoint, the present study seeks to advance the current understanding of practices and behaviors of a new generation of female IT professionals, which would further contribute to the practices of managing intersectional differences and feminist organizing for equality and diversity in the IT workforce. Specifically, this study focuses on a few

overlooked IT sites, those interdisciplinary aspects of computing and IT work settings where a higher proportion of young women learn, work, and practice could be located. Practically, it suggests that employers, recruiters, and managers in the IT field should recognize the change in the growing number of skilled IT specialists working across various emerging IT sites, where a higher proportion of women's participation is found. However, these sites and professionals involved have not been 'officially' accounted for under the narrowed categorization of computing and IT in general. These alternative IT opportunities for the new generation of women are emerging in the intersection of information technologies and areas such as art and design, cognitive sciences, biomedical science, new media, etc., and embrace the individual differences of those professional women. The shaping and reshaping process may also involve intersectional differences and could be viewed as fluid and performative with the potential and possibility to transform power dynamics, gender relations, and women's empowerment in today's digital society. Instead of portraying women as victims of machinery and technological development, it is also worth focusing on exploring the possibilities and prospects that new technologies could offer to advance women's careers in technology, and the changing gender-technology relationships.

Discrimination against women entering, progressing, and remaining in IT careers based on biological sex differences, as well as their associated assumptions about gender role expectations, are recognized and evidenced barriers that women in the IT profession face. Assumptions about gender role expectations further push women out of progressing and career advancement. In addition, the culture of male dominance in the IT field and the lack of mentors and other forms of social capital, e.g., informal networks, contribute to the underrepresentation and exclusion of women in the IT profession. Embodied masculinity helps to understand what it looks like to be an 'ideal IT professional' as having a body to

"meld with and de-merge from the machine" (Tassabehji *et al.*, 2020, p. 20). Reasons documented for causing this disparity include but are not limited to the negative influences of prevailing male norms and gender discrimination in the IT workforce and a lack of adequate explanations and sufficient mechanisms or strategies to address the negative consequences of gender inequalities at work. Most statistics indicate that there is a 'leaky pipeline' (e.g., Scott *et al*., 2018), manifested in women's underrepresentation in the IT profession and a slower rising trajectory in the IT employment proportion compared to their male counterparts (e.g., WISE, 2018, 2019). Accordingly, concern is raised for the new generation of women and their future in IT, due to the low proportion of women entering the IT field and the seemingly high dropout rate during their IT career paths. Further, work-life conflicts are perceived as having negatively affected women's persistence and advancement in the IT workplace, where workers are usually required to work long hours to meet clients' demands while keeping up with the fast-changing technologies and coping with the extensive work stress. For individual IT professionals, it seems inevitable to consider what approaches they can take and in what kind of way in which their human agency could be increased, to make a change and improve their status at work. For example, the findings of this study demonstrate that those professional women in IT are expected to be capable of speaking both human and computing/coding languages and exert both machine-like brains and social-communicative skills. It is worth noting that there are a burgeoning number of varied forms of self-organized, community-based associations that enable women in IT to seek a site of training, collaboration, advice, mentorship, and support outside of their workplace. Proactive actions to empower women in the IT workforce have emerged over time in response to movements such as the #Metoo movement and Black Lives Matter. These collective activities and community-based initiatives among IT professionals further illuminate how these millennial women resist the entrenched stereotypical assumptions of women's inabilities to code and

counter the toxic masculine culture in the IT workplace. These practices are also initiated to challenge the entrenched system of patriarchy, hierarchy, and white supremacy. Further, this present study calls for future collective resistance for women's empowerment in the IT profession, through embracing intersectional differences and emphasizing the need to promote those overlooked and/or marginalized female IT professionals because of their gender, race/ethnicity, nationality, sexuality, marital status, and age, etc., for diversity and inclusion in the IT workforce.

Similarly, it is also suggested that the internal networks for diversity and inclusion created in-company among the marginalized employees in IT also become a popular site with a collective attempt to address the structural oppression and other forms of inequalities that women in IT encounter. Along with the changing nature of IT work and IT workers, it is also required for tech companies and employers to invest in attracting and retaining enough skilled IT professionals to maintain their attractiveness to these skilled workers. In other words, employers and managers of IT firms should not view their female IT workers as a unitary group sharing the same identity. Rather, these women should be understood in terms of being released from traditional norms and cultural expectations. Embracing those younger professional women who constantly seek meaningfulness and meaningful work, in which during the shaping process, new and multiple identities have been reconstructed. Thus, tech companies and employers must keep in pace with the changing nature of the new generation's IT workforce. This includes understanding what the younger IT workers' needs and demands are, and further establishing a workable mechanism for them to maintain their attractiveness to those skilled workers, and to maintain their technological competitiveness.

This qualitative research has epistemological and methodological weaknesses that must be recognized. The first is concerned with the empirical generalizability of the findings on the evolving nature of the gender-technology relationship in the workplace, which are presented in this thesis. In qualitative analysis, the word "generalization" is often omitted or used cautiously (Parker and Northcott, 2016). Scandura and Williams (2000), for example, claim that interpretive studies appear to make generalizing conclusions about their results without dwelling on the grounds for such generalizations or how they could be justified. It is crucial to distinguish between empirical and statistical generalization in order to understand the essence of such constraints, which usually occur in qualitative inquiries (Rapley, 2013). Empirical generalization is concerned with producing localized discourses about contexts or phenomena and then generalizing the findings beyond the reach of the settings (Parker and Northcott, 2016), while statistical generalization is concerned with statistical power against the general public (Rapley, 2013). In this qualitative research, the empirical generalization is concerned with the arguments about the changing nature of the gender-technology relationship in the IT workplace, which, based on the findings from millennial women working as IT professionals/practitioners, could potentially be generalized to other technology sectors, where male dominance prevails. While these claims are based on the premise that these professional women have similar attitudes toward technology in terms of having more autonomy, belonging to the IT community, and in search of meaningful work, findings from a promising group of millennial IT workers may not be enough to endorse a generalization of theory. More research is needed to explore the issue of empirical generalizability by investigating a range of empirical settings, such as the living experiences of many other groups of IT workers in those other types of tech organizations, in order to assess empirical generalizability in the evolving nature of women-technology relationships. Further, despite qualitative methods being acknowledged for their research values in the

broader field of management and organization studies, certain disciplines and fields such as mainstream international business and global human resources management/development are traditionally quantitatively oriented, guided by the positivist paradigm and exerting a clear preference towards quantitative methodologies and methods (Bell, Kothiyal, and Willmott, 2017). The combination of an interpretive and critical approach in this present study could be employed in future research exploring the complexity, employees' feelings and mixed emotions, and their perceptions towards daily interactions in a longitudinal period in the IT field. In this regard, future research can also fill the research gap located in intra-gender leadership interactions among male employees (e.g., resistance or prejudice) and in comparison to women's perspectives. Any comparable or (in)compatible themes which emerged from future studies could be employed here to logically flow to this area, pinning the importance of understanding women's oppressed situations during career entry and further success in IT, along with changing actions required from examining those different perspectives.

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Appendix Interview Guide

Personal and professional work-life history section for the interview

What prompted the participant to pursue a career in information technology?

What were their school experiences like, and when and where did their interest in computing and IT begin?

How did they land a career entry in the IT profession, and what do they do now?

Working environment

Could you provide an example of a regular working day, daily and weekly working routine?

What does an IT professional's common workplace look like?

What is the style of your workstation or office? Equipment, software, and so forth. With whom do you share it?

What would you say your workplace's culture is like?

The IT role

What characteristics distinguish an individual who does so well at tech (e.g., software, digital architect, cloud, UI/UX design, coding etc)?

Do you possess such attributes? Or do you find yourself sharing some similarities to any of these characteristics?

Can you recall any other male coworkers/colleagues with whom you have had a pleasurable interaction and describe why do you think they are good? Elaborate reasons.

Can you recall any other female coworkers/colleagues with whom you have had a pleasurable interaction and describe why you think they are good? Elaborate reasons.

Change and development

What are your thoughts on the lack of women in technology and the drive from authorities and the industry to bring more women into the field?

Do you think the IT field has a gender bias? Can you elaborate on your views on this?

Do you feel anything should be done and/or initiated in the IT field and/or IT firms to encourage more women to work on the development and design of new technology? If so, could you think of any plausible way? If not, then why not?

What advice would you give to women interested in pursuing a career in IT?