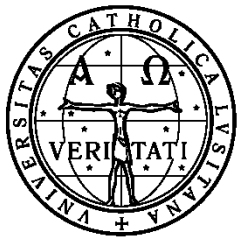

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THE DIGITAL GENDER DIVIDE:

A NARRATIVE STUDY ON WOMEN WORKING IN TECH IN PORTUGAL

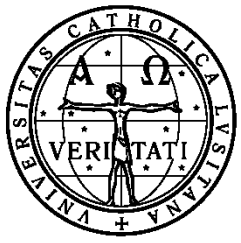
Dissertation submitted to Universidade Católica Portuguesa to obtain a Master's Degree in Communication Studies, with the specialty in Communication, Organization and Leadership

By

Daniela Badaraco Basto da Silva

Faculty of Human Sciences

December 2019



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Under the supervision of Professor Carla Ganito

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Abstract

The purpose of this research is to explore how women in tech in Portugal perceive of the male-dominated industry. Following a social constructionist epistemology and drawing on the life-story narratives of four women currently working in the field, this research aims to contribute to a better understanding of the digital gender divide by analysing how women experience the industry. While the topic on the under-representation of women in tech has been internationally researched, the same has not taken similar precedent in Portugal. Data was collected using semi-structured interviews and narratives were created with the intention that each narrative stand as a text on its own. Through their life-story trajectory, these narratives provide insight as to how the subjects navigated through their academic and professional careers. The results indicate that, contrary to the dominant discourse of women in tech industries, for those who have overcome any perceived barrier or obstacles, the subjects display high levels of job satisfaction within their line of work. It is anticipated that by examining these women's perspectives, using a bottom-up approach, more strategies and recommendations will emerge towards the efforts of bridging the gap in tech related disciplines and fields.

Keywords: women in tech, social constructionism, narrative, life-story interview, gender gap, organizational communication, Portugal

Acknowledgements

My sincerest gratitude to the women who participated in this study, for lending me their time and sharing their experiences with me. Without their contributions this project would not have been possible.

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The narrative approach ended up being the most satisfying part of this process and I am touched by everyone's stories. I admire each and every one of the perspectives that have unduly shaped this project. This includes not only those of the participants, but to all those who have entered my life in some form or another. Your stories have impact me in ways unimaginable, fueled my passions and inspired me to do better. This project is only the beginning.

To my late dog, Peachee. My faithful and loyal companion who always kept me company during those sleepless nights of writing, I still felt your presence during these times.

Lastly, I am reminded that academia is a privilege that is not afforded to many. I thank my father for giving me this opportunity.

p.s.m.a.s.

para a minha mãe,

Henrieta "Neca" Filomena
da Luz Badaraco
(1949-2016)

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Introduction

Less than 7% of tech positions in Europe are filled by women (Next Generation, 2018). Although 57% of tertiary graduates in the European Union (EU) are women, only 24.9% of them graduate in ICT-related fields and of these graduates, very few enter the sector (European Commission, 2018). Globally, it is indicated that women's participation in the digital sector is not improving, and according to the European Commission report (2018), the gender gap in tech is growing.

The term *digital divide* was first coined in 1995 by Lloyd Morrisett and refers to the access to information technology (Jackson et al., 2008: 437). Access in this context meant the opportunity to own or use a computer and was based on socioeconomic factors such as income and education, as well as race and gender (ibid.). Affordability remains a challenge for many, but the pervasiveness of personal computers has evolved all over the Western world. The digital gender divide goes beyond the mere usage of a computer, rather it pertains not only to access to technology, but as well to the gaps in digital-related educations and labour markets.

Over the last several years, discussions on how to increase women's participation in tech have been mainstreamed. In 2018 alone, the Organisation for Economic Co-operation and Development (OECD), European Parliament's committee on Women's Rights and Gender Equality (FEMM), and the European Commission (EC) all published reports to bridge this digital gender divide, aiming to strengthen policy directives, support women's equitable participation in the digital economy and focus on the structural causes of the gap. Apart from the international recognition, organizations and seminars on national and local levels have directed their attention to the gender inclusion and diversity in tech.

Interest in this topic continues to be significant. However, this attention has focused mainly on a few western countries upon which we base much of our academic research. Therefore, in an effort to produce research based outside that context, I give voice to the women working in the

field in Portugal. Portugal has a booming start-up scene; is has even been suggested that Portugal might one day become "Europe's Silicon Valley" (Farmbrough, 2018). A recent study by Honeypot titled "2018 Women in Tech Index" placed Portugal at the top of their list for countries that offer the best opportunities for women in tech. This study was conducted "by comparing the differences between the overall gender pay gap and the pay gap in the technology industry" (Honeypot, 2018). Despite these favourable statistics for women in tech in Portugal, explorations on the topic have been limited.

Ferreira & Silva (2016) claimed that there is a "deserted landscape" of Portuguese research on gender and ICT. In their study, the authors explored the portal of Scientific Open Access Repository of Portugal (RCAAP). This portal collects documents deposited from 97 institutional repositories in Portugal and is a single-entry point for the search and discovery of thousands of scientific and scholarly publications, from journal articles to conference papers and dissertations distributed by the Portuguese repositories (Ferreira & Silva, 2016: 398). Although the RCAAP does not include the entire scientific production in Portugal, out of the 97 Portuguese institutional repositories with 307,853 publications (at the time of the search, April 2016) only 23 publications are on issues related to gender and ICT/technologies (ibid.: 399). Related to Master and PhD thesis, out of the 101,770 Master theses and 15,454 PhD theses, there are only 11 (7 Master and 4 PhD) about gender and ICT/Technologies (ibid.). Since the Portuguese word for "género" can mean both "gender" and "genre," some of the theses were related to the latter, decreasing the mere 11 to 4.

As such, the authors noted that while the topics of the digital gender divide has been internationally recognized and researched since the 1990's, it has not taken the same precedent in Portugal. Out of the 11 theses found, they did not pertain to the direst topics that are being studied in international scientific production (ibid.: 400). It is therefore my aim in this study to produce research that has rarely been engaged here in Portugal in comparison to the Western world.

This research will explore the digital gender divide in two ways: the theoretical framework provides a background as to the *causes* of the digital gender divide using several perspectives. In order to narrow the digital gender gap, we need to first acknowledge the structures and

environments that create a barrier to female participation. Additionally, from an organizational perspective, what are the benefits of a gender-diverse workforce for a given company generally, and what sorts of outcomes a homogenized workforce produces. Through these chapters, I want to take you on a journey on what I have labeled as the tech "lifecycle." Starting from the beginning stages of one's life, how structural powers affect the interests of girls, thus accounting for the lack of women with relevant skills. Chapter 1 focuses on the underrepresentation of women in STEM, in particular, technology and engineering. As the foundation of knowledge of social constructionism, the theories and perspectives focus on the cultural and structural barriers that keep girls and women out of these disciplines and fields. Socialization, pedagogical theories and media representations are brought in to explain why society does not see girls and women as suitable subjects to acquiring the interest and skills. As part of this chapter, I give homage to the forgotten women who have paved the path in technology. By challenging the contemporary images of what we deem as male-dominated, this historical materialist approach shows how tech became known as a masculine industry, further defending the claims of social constructionism.

Moving forward into chapter 2, "It is not enough to possess technical skills," these theories claim that even if one were to have the necessary skills for the job, the structural inequalities of labour markets create further impediments to women's participation. These perspectives emphasize the difficulties women face with the work/life balance and how organizations maintain gender ideologies that do not support women. Also included in this chapter is how social policies and welfare systems, at a macro level, enable or hinder women's equitable participation in labor markets.

For the final section of part one, chapter 3 elaborates on the organizational culture and practices of organizations. Some space is dedicated here to the implications and repercussions a company may experience when there is a lack of diversity in the company.

For the empirical portion, this research will focus on the digital gender divide within the national context of Portugal. Using an informal, conversational interview methodology and life-story narrative approach, this study will explore the discourses of women who are currently working in the field of tech. Since the theoretical framework is defined in the context of girls and women

displaying a lack of interest, not entering the fields or leaving the fields, the discourse of those currently working in the field may diverge from these theories. What could we learn from those working in the field as they seem to have overcome the barriers?

Gender equality issues and gender-diversity has and continues to be urgent issues to address. Especially in the field of technology, when the injustices against women in the field are discussed, often it is framed in a way that portray women as the "problem" rather than focusing on the larger social factors that shape both societal perceptions and social opportunities (Ferreira & Silva, 2016: 401). On June 3, 2019, an *Observador* article states that "Portugal still has 'some delay" with the question of gender equality" stated by the Minister of Higher Education Manuel Heitor (Agência Lusa, 2019). Several other news articles and publications state that there is an overall need to address gender inequality, but also the concept of gender within Portugal.[1]

In organizational contexts that largely excludes or disadvantages groups, ethical considerations should be at the forefront of discussions – especially within organizational and communication studies. The narrative approach has been used particularly within organizational sciences (Mitchell & Egudo, 2003: 8). Narratives have been used to gain insight into organisational change, can help lead the way to cultural change, and to transfer complex tacit knowledge or serve as a source of implicit communication (Ambrosini & Bownman, 2001; Linde, 2001; as cited in Mitchell & Egudo, 2003: 1)

There is often a privileging of a systematic or structural perspective stressing how the organization and society directs individuals' learning and development (Antony, 2002, as cited in McAlpine, 2016: 46). The narrative approach allows for the individual efforts to be self-motivated and agentive that are otherwise underplayed when using other forms of methodological research (McAlpine, 2016: 46).

[1] See for example, Isabel Nery's article - although Portuguese women have solved the problem of inequality in educational pursuits, women have yet to find parity in wages and higher-positions "Portuguese women – poorly rewarded for good education" retrieved from: https://voxeurop.eu/en/content/article/2816671-portuguese-women-poorly-rewarded-good-education; and Diogo Camilo's "Portugal continua abaixo da média da UE na igualdade de géneros" [Portugal continues to be under the EU average for gender equality] retrieved from: https://www.sabado.pt/portugal/detalhe/igualdade-de-genero-portugal-continua-abaixo-da-media-da-ue

This research seeks to contribute to the knowledge production revolving the underrepresentation of women in STEM and the tech related industries and to spark the much-needed discussions on gender and technology in Portugal.

The problem

The preponderance of results from several authors studying the digital divide in certain geographical areas and time frames has suggested that a digital gender divide has persisted across time and international boundaries (Cooper, 2006: 322). The digital gender divide in computing mostly concerns professionals in the field as well as educators concerned about the composition of their classrooms (Misa, 2010: 7). Globally, women account for just 27% of employment in the software and IT services industry and account for fewer than 20% of leadership roles, according to a recent analysis based on LinkedIn data (WEF, 2017 as seen in OECD, 2018). These statistics remain unclear in Portugal. The lack of formal data in this area hinders the researcher's ability to have accuracy and specificity when conducting research on the subject.

The lack of diversity in both educational pursuits within IT and in IT workforces are of themselves a concern for women's social and economic reasons, and the effect of a homogenous workforce has a ripple effect for the future. That is, the bias in technology, such as in product development, may have dire consequences for certain groups of people. We are already experiencing negative social consequences with products.

The purposes & research questions

Taking into consideration the narrative approach of this study, my goal was to understand how those who are working in the field perceived their progress through academia and their career. What can we know from those who are currently working in the field in Portugal? By exploring how women experience the tech industry, I am interested to understand how these women navigate through the male-dominated industry. Therefore, my research questions aim to answer the following:

(1) What is the discourse of women working within tech industries in Portugal?

(2) Can we find any cultural differences in Portugal regarding the digital gender divide in comparison to other countries and contexts?

Following a life-story narrative, the recreation of their stories, given in the 3rd person narrative, will showcase their initial interests in the disciplines and how they negotiate sometimes being, the only women present in their class, team or workplace. My goal with the narratives was not only to give voice to women but also to have them stand as a story on their own, so that readers will be able to engage in the creative and informative process

Ethical considerations & positionality

Prior to beginning the theoretical framework, I would like to dedicate this space to a critical concern which I believe needs to be addressed. While I will mostly label and term groups as 'women' or 'men,' this has fallen into the binary cycle that I want to steer away from. Women and men as groups of study are never homogenous and throughout this study should not be considered representative to include different experiences and histories of women and men. Studying humans and societies and writing within the discipline of social sciences always comes with its pitfalls of classifying a group and its inability to accurately interpret the lives of all.

This study has chosen to study only the gender division in a vast array of other groups of people, including, most importantly, ethnicity and class. Further divisions include sexual orientation and other socioeconomic factors - and the intersections of all these together, privileging some groups while excluding others. Intersectionality as an analytical tool and critical approach understands multiple forms of oppression and how it may affect different groups of people in different ways. The use of the binary terms of gender does not adequately address the experiences of all at the intersections.

Furthermore, the lack of studies and data (or perhaps a lack of access to) respective to specific nation-states regarding the digital gender divide has resulted in an overall dependency in academia to use literature mostly from the west. Accordingly, the following literature review uses much of its information based on the findings from the USA and the UK. This research therefore can not be directly correlated to the demographics of the study and should be taken to

make cautious generalizations when it comes to the problem at focus. This will further be elaborated in chapter 5.

As is often the case with research endeavours, this project is fueled by my personal experiences. I have noticed, since a young age, the power dynamics that are so deeply embedded in our institutions, such as those present within the family structure. Our understandings of human relationships and interactions have undertones of oppressive structures. It is due to traditions and culture that have normalized these systems. Throughout my life, I have witnessed the constant undervaluation of women's labour within the public and private sphere and for that I will forever hold a soft spot for this subject. I want to disrupt the status quo. My aim is to reflect and critically analyze the social conditions of just one industry, however many of the theories and perspectives can be applied to most industries. Therefore, the following theoretical framework reflects my aims as a researcher.

Part I: Theoretical Framework

The focus of the following literature from feminist, sociological and economist perspectives is most relevant to this study. To understand women's participation patterns and to tackle the underrepresentation, one must understand why the gap exists in the first place. From this theoretical framework, I want to present the readers a background to the following questions:

- How can we describe the factors behind the current digital gender divide?
- What are the barriers to entry which would explain the digital gender divide?
- What are the structural and environmental practices of tech-industries that cause women to leave/switch careers?

1. Tech's "LifeCycle" – the digital gender divide

When you think about certain concepts, such as "tech" or "IT," what are some images that come to mind? It is most likely that you are picturing a male worker and a male-dominated field. There are probably even other generalizations of what a typical "tech" or "IT" worker may look like. That is because we tend to use systems of classifications, in which we almost unconsciously picture a generalized or stereotypical image of what it means to occupy said space. One of our first classifications is almost always about gender. Gender is a salient identifying feature in our social environment and our brains are attuned to gender in order to place them in the social hierarchy (Payne et al., 2018: 11).

It is important to bring gender stereotypes into this discussion. As Hayes (2017) points out one's internal and external (public) identity reflects how people see themselves and how public perception reflects how people outside a discipline view it and the people who work within it (38). This can affect the lack of women interested in choosing a particular field of study, and this is how we start to understand the lack of women in certain places - our unconscious beliefs have real-world consequences (Freeman & Johnson, 2016 as cited in Payne et al., 2018: 11).

This is how we begin to understand what I labelled as tech's "lifecycle" – why women are underrepresented first in technical areas of studies, such as STEM fields and secondly, why women are underrepresented in tech companies. What follows are theories to understand the social construction of how these stereotypes emerged and how they are further reinforced.

Chapter 1: Women's underrepresentation in S(TE)M[2]

Science, technology, engineering and mathematics (STEM) are academic disciplines most associated with those working in tech industries. It is usually within these degrees where the necessary skills and knowledge are required in order to enter technical positions. Interest in these subjects evolve throughout all stages of one's academic curriculum, starting as early as primary school. The gender gap in STEM begins early; young girls report less interest and self-efficacy in technology as early as elementary school (Master et al., 2017: 92). In their study, Master et al. (2017) found that 6-year-old children already have stereotypes regarding STEM (ibid.). In another study done by Microsoft, young girls show interest around the age of 11 but that they quickly lose interest at around the age of 15 (Petroff, 2017). This decline in interest often occurs just at the time when girls begin to decide what to pursue in post-secondary education.

The metaphor of the "leaky pipeline" is used regarding women in STEM as career progression, falling out at certain stages of their educational tenure (Sadler et al., 2012: 412). The "leaky pipelines" also extends further past academia into career pathways, where we see women "leaking out" in higher positions and leadership roles.

Women have very favourable statistics in terms of participation when it comes to education and university degrees, although they do not enter all professions at the same rate. Girls are more likely to graduate high school (Applerouth, 2017), women are more likely to enroll in higher education and they earn more university degrees than men (Naplitano, 2018). A 2015 article from *The Independent* states that there are more than 100 countries in the world where women outnumber men in tertiary education (Martin, 2015). Over the last forty years, there has been a

[2] I have used a bracket in this acronym since this study is based on technology and engineering disciplines.

general increase of women in traditionally male-dominated professions; women have also achieved higher representations within fields such as law, medicine, psychology and biological sciences much more than computer science (Hays, 2010: 26). Despite these figures, women continue to be underrepresented in STEM and the gender gap is significantly larger in technological fields such as computer science and engineering than in math and science (Sadler et al., 2012: 412). Rates are falling steadily in the past twenty years in computer science in the US, yet is rising in some STEM disciplines (Hayes, 2010: 26). Figure 1 in Appendix A shows the rates of women graduates in STEM among 35 countries.

Bear in mind that women participating in STEM disciplines does not fully encompass the large discrepancy of women in technology and engineering disciplines. The positive data on women graduating in STEM is due to their participation in sciences, especially health and natural sciences and in math. Therefore, moving forward in this study, the usage of STEM should be understood mostly in terms of technology and engineering (S[TE]M). In addition to this, the lack of women in technology and engineering does not necessarily translate into women in the workforce, as this workforce can consist of people from various educational backgrounds (or vice versa, many people who study computer science may not go into technical positions).

It is a common assumption that women's low participation rates in STEM disciplines is due to a lack of interest and a lack of relevant skills. There is a widely perpetuated narrative that entails notions that women are essentially lacking the skills and abilities due to a biological deterministic view of women. However, as research on this topic has shown, it is not that women's inherent abilities that influence their choices and preferences but that the gap is caused by much deeper macro-cultural inequalities.

Therefore, in this section, we will explore studies and theories as to why women are underrepresented in technology and engineering fields. Disciplines under the umbrella of computer science (CS), information technology (IT) and information and communication technology (ICT), as well as all branches of engineering are incorporated in this review. Here I focus especially on the barriers to education and the suggested reasons for the lack of women pursuing technical skills.

1.1: The social construction of technology (SCOT): socio-cultural gender constructions and the discourses of technology

> Gender is best understood as pervasive patterns of difference, in advantage and disadvantage, work and reward, emotion and sexuality, image and identity, between female and male, created through practical activities and representations that justify these patterns that result in *social* categories of women and men. Gender may include more than these two categories. Gender is a basic principle of social organizations, almost always involving unequal economic and social power in which men dominate. Gender is social constructed and diverse, and varies historically and cross culturally (Acker, 2006: 5-6).

In 2017, Google fired a software engineer for writing an internal memo arguing that the low number of women in technical positions was a result of biological differences rather than discriminatory practices (Wakabayashi, 2017). A Harvard doctorate dropout with an impressive academic background, James Damore questioned Google's diversity efforts stating that it would only harm the productivity of the company. Similarly, in 2005, the then president of Harvard University, Lawrence Summers, also argued that men outperform women in maths and sciences because of biological difference (Goldenberg, 2005). Statements such as these are not uncommon. The conceptualization that men and women are essentially different, have different interests, aptitudes and skills are all created and recreated in the hegemonic discourse. The masculine associations of computing and technology can affect women's participation.

There remains a common belief that gender differences in behaviour are natural, evolutionarily inherited, biological and deterministic (Payne et al., 2018). Science and technology are structured be gender, pervaded and constituted by it (Hearn & Husu, 2011: 103 as cited in Palmen, 2016: 2). Scientific and technological realities construct, and sometimes re-form and even subvert, dominant gender relations (ibid.). A historical examination on the exclusion and representation of women in tech is elaborated in chapter 3 and contributes to explanations of current gender imbalances.

The social construction of technology (SCOT) can be understood in a variety of ways. Two of the leading adherents of SCOT, Pinch and Bijker (1987) proposed that there is an interpretative

flexibility when it comes to the knowledge of and usage of technological artifacts (as cited in Klein & Kleinman, 2002: 29). This will differ depending on time and space and within social group. The relevancy of how a social group attaches meaning to specific technologies as both the users and producers of it; and, since technology is determined by social influences, the construction of technology can have many possible outcomes.

Interestingly so, one of the earliest historical examples to depict how gender was diffused in society and technology was with the early bicycle design. Victorian women with their long skirts were unable to partake in the usage of the early bicycles and the posture necessary to ride a bicycle was regarded as 'indecent' (Woodford, 1970, as cited in Klein & Kleinman, 2002: 44). The bicycle taboo was a socially constructed product of a taken-for-granted social norm of the Victorian era. But, as women's demands as consumers grew, perception that only men could ride bicycles changed. However, even with its growing demands, producers did not have to change their products to fit the needs of all consumers, since Victorian manufacturers were also socialized in this society (Klein & Kleinman, 2002: 44).

As popularity rose and cycling became liberating for women both physically and symbolically, Victorian men protested women's freedom, creating numerous myths such as the potential for cycling to cause depression and the inability for women to reproduce children (Pilcrow, 2015). The bicycle is a classic example of how technology is constructed and how it has potential to transform society despite social efforts to keep it from doing so (ibid.).

Keep this example in mind when thinking of how SCOT can be applied to other facets of modern society. How are institutions, activities, mannerisms and objects constructed and gendered? This theory of knowledge, social constructionism, extinguishes the common myths that women are less suitable, interested, or competent in certain academic fields and workplaces and is the foundation for understanding this digital gender gap.

1.2 Socialization & pedagogical perspectives

Gender socialization in homes and schools may have an impact on girls' trajectories in displaying interests in computers or technical areas of studies, and staying interested in the field,

as well as how they perceive themselves within the field. As this section will show, the developmental years of a child's life can bring insight as to the gender gaps in university majors as well as underrepresentation in workplaces.

Deconstructing the view that boys or men have either more of an innate attraction or talent towards computing is one way of understanding the underrepresentation of women in computing education. In their book *Unlocking the Clubhouse: Women in Computing*, authors Margolis and Fisher (2003) trace back to the earliest roots of socialization to understand why there is a male claim on the field and the erosion of girls' and women's interest in computer (5). Beginning from as early as preschool, children will start showing gender appropriated interests. By age 5 or 6, children are already aware if something is a 'boy' or 'girl' thing to do (28). Children learn by imitation, mostly in-home environments and media outlets, while parents and teachers also develop expectations about who will succeed in computer science. The assumptions of role models in a child's life also influences the choices of children (31).

As part of their longitudinal study, Margolis and Fisher (2003) also participated in an Educational Testing Service to create interdisciplinary changes in pedagogy with computer science high school teachers across the US. This included revising the assignments to incorporate a wider view of computers aside from technicality (that computer programming can create good in society, for example, rather than just computer games) and making teachers aware of their own behaviours and biases. Their program was deemed to be successful, with percentage of girls in computer science classrooms rising (110-126).

Studies of middle and high school have found that school curriculum, computer games geared towards the interests of boys, and adolescent culture impact the interest and confidence with computers between boys and girls. The most striking impact for adolescent girls is a drop in their self-confidence and competence. Girls in formal education appear to be less confident in ICTs, math or science. Another report from the OECD ABC of Gender Equality in Education (2015a) shows that there is no innate difference in aptitudes, but rather, girls and boys demonstrate different attitudes and confidence in their abilities (OECD, 2018: 23).

The corrosive effect of lack of confidence can also explain women and girls' interest in computer and computer related activities. In one study done by Henwood (2000), she studied how women fared in computer courses in UK higher education. The first was a traditional computer science (CS) course, employing very liberal notions of equal opportunities, and the other, an interdisciplinary information technology (IT) course, which she perceives as embodying some aspects of constructivism in its approach to the gender-technology relation. According to her research, the formal outcomes to these specific courses in which she studied, 60% of women passed while only 55% of their male counterparts passed in the CS course. In the IT course, 100% of women passed, compared with just 50% of men.

Although the sample size in this study was very small, the author's aim was to understand why, given the excellent formal outcomes for women in these courses did women continue to underestimate competence in technical skills. Following a series of interviews as well as other ethnographic approaches, Henwood (2000) found that women tended to underestimate their competence, despite accounting for four of the top five grades. For Henwood (2000), a critical discourse is deemed necessary to understand the lack of confidence women had with their technical skills. The binary gendered language about women and men in technical fields is at times blatantly expressed. Henwood (2000) concludes her research by suggesting that a deconstructionist approach is necessary to understand the latent ways in which gendered appropriations are created, maintained and ultimately essentialized. Through this study, whilst it had a small sample, it is a valid representation to the bigger picture. Henwood (2000) concluded that many of these gendered assumptions are empirically incorrect and have been normalized. In order to understand the lack of women's participation in tech or to encourage greater participation of women in tech, a fuller critique of gendered relations of technology and the challenge to dominant construction of these relations must be conducted.

What Henwood (2000) found to be particularly interesting was the contradiction between women's competence and the judgement with an outsider observer as their own experience was undermined by the dominant discourse that continues to assert women's technical incompetence.

1.3 Social constructionism

The theoretical perspective on the social construction of IT as a male domain explains the fundamental incompatibility between the social construction of the female identity and the social construction of information technology and IT as a male domain (Trauth, 2006: 1155). This view finds that the causes of the gender underrepresentation can be attributed to the generalized societal influences – the workings of gender constructions in the fields are also represented in the wider society.

According to Wajcman (2009), gender power relations are embedded in technology (144). Feminist analyses of technology examine the very processes by which technology is developed and used, the social factors that shape different technology and are the product of historical and cultural constructions which keep women out. Technical competence is associated with men, technical incompetence with women, and who better fits roles in society is all historically and culturally constructed.

Widely held stereotypes about the roles of men and women are as strong today as they were thirty years ago (Payne et. al, 2018: 7). According to a study by Haines, Deaux, & Lofaro (2016), when comparing gender stereotypes today to a set of data collected in the early 1980s, little has changed; people still regard men as dominant, competitive breadwinners while women are viewed as caring, nurturing homemakers (as cited in Payne et al., 2018: 7). These sorts of views are also shared between both genders, and although there has been what is seen as a progressive shift in society, the prescriptions of genders persist (ibid.).

Gender Ideology supports a system of inequality that justifies differential rewards and opportunities (Padavic & Reskin 2002: 40). It is a set of widely shared assumptions about the way genders are and what the relations between them ought to be (ibid.). Part of this ideology promotes gender stereotypes which are socially shared beliefs that men and women have different skills and attributes from one another. For example, it is a universally held belief that women are naturally better suited to care for children than men. While many of these generalizations may hold some truth, it is important to differentiate between the usage of

language with essentializing. Women may be better suited for care work because they have been socialized to do so, and not due to some innate quality.

As stated in the beginning of this chapter, when one is asked to conjure tech or IT an image of a male worker usually appears. Stereotypes are learned and become unconscious, and we do so to process a flood of complex information the world presents to us (Padavic & Reskin 2002: 43). However, these stereotypes may negatively affect individuals and groups of people in society, such as in organization when it comes to prospective workers, jobs and pay.

Gender-role socializations is the process by which social institutions such as family, peers, schools, workplaces and the media all inculcate a society's expectations of acceptable behaviours, attributes and aspirations for each gender (Padavic & Resikin, 2002: 53). Evaluation bias is the tendency to judge people's talents more positivity if they match the stereotype for the given discipline, which can differentially impact the rates at which men and women are hired, retained, or promoted in male-dominated fields (Hayes, 2017: 28).

1.4 Male-dominated? Challenging contemporary images

Computers and technological endeavours were not always dominated by men. A historical timeline of women in computing shows it to be a rather feminized field, tracing its roots back to the 1800s. Computers only started to become male dominated in the 1990's. According to historian of technology, Marie Hick (2017), computer operation and programming was viewed as women's work but when it became clear that it was going to become a lucrative occupation, men displaced the thousands of women who had been pioneers in a feminized field and eventually acquired a masculine image (1). Following a historical account of computers in Britain, Hicks explains how women were essentially the backbone in many wartime efforts, such as codebreaking, programming, repairing and even building computers (ibid.). Historical recounts show that women's agency and their presence were removed from the narratives, either diminishing their contributions or by outright removing identities. Current public perceptions indicate that most people are unaware of the original feminization of computer work.

Shortly after the end of World War II, women were forced out of certain labour fields, some through legal measures, yet women's participation in the labour market exponentially grew. At this time, the British government refused to acknowledge equal pay wages and jobs were starting to become highly gender segregated. Women's work continued to be devalued yet they were in high demand since it meant increased production power and lower labour costs. As technology's newness became more attractive and therefore attained a higher status, this shaped staffing decisions and the perceived lower status of women meant they were not given the most promising jobs. For Hicks (2017) meritocracy was a myth and the goal of effective industrial and government organization meant hiring the most promising candidates (read: men) who are given opportunities to succeed and assumed that reproducing this hierarchy would ensure maximum efficiency (89). Even today, men are more likely to get hired than women with the same qualifications, this illustrates that this created professional identity of computer workers is tied to a history of structural discrimination that has nothing to do with skill (Hicks, 2017: 235). The historical materialist approach shows how sex segregation evolved and its relevance for understanding gender discrepancies in computing today (Haigh, 2010: 51).

A group of six women in the early 1940s assisted with the development and operation of the ENIAC (Electronic Numerical Integrator and Computer), one of the first and most famous, early electronic computers (Ensmenger, 2010: 121). These women are sometimes celebrated as the world's first programmers (although many argue that Ada Lovelace was the first back in the mid 1800s) (ibid.). At that time and during the US "software crisis" of 1960, programming was considered a low status job partly due to its newness and lack of formalization requirements (ibid.). The professionalization of programming, or in other words, the masculinization of programming began with the imposition of formal educational requirements, certification programs or licensing requirements (many of which were barriers for women) and the overall professional image of a worker (ibid.). As Ensmenger (2010) and other sources note, computing in its early years was unusually open to women and had unique advantages, such as working from home (136). It was only in 1997 that all six women – Kathleen McNulty, Mauchly Antonelli, Jean Jennings Bartik, Frances Snyder Holberton, Marlyn Wescoff Meltzer, Frances Bilac Spence, and Ruth Lichterman Teitelbaum were inducted into the Women in Technology

International's Hall of Fame (Misa, 2010). Popular media accounts of women's roles in computing are extremely narrow and are believed to account for the present-day computing dilemma.

1.5 Media representations

"You cannot be what you cannot see"
- Marian Wright Edelmen

The Committees of Advertising Practice (CAP) is responsible for writing advertising codes for the UK. In partnership with The Advertising Standards Authority (ASA) who administers the Code, on June 14, 2019, the CPA declared that the ban on harmful gender stereotypes in ads has come into force (CAP, 2019). Following a review from the ASA, evidence suggests that "harmful stereotypes can restrict the choices, aspirations and opportunities of children, young people and adults and these stereotypes can be reinforced by some advertising, which plays a part in unequal gender outcomes (ibid.)

Britain joins countries like Belgium, France, Finland, Greece, Norway, South Africa, Spain and India, which have laws or codes of varying degrees and age that prevent gender discrimination in ads (Safronova, 2019). The content in the media is constantly shaping our lives and is perhaps the most pervasive and powerful influence on how we view men and women (Wood, 1994: 31). In her publication, Julia Wood (1994) presented three themes in regard to gendered media: (1) the underrepresentation of women, which heavily distorts the actual proportion of sexes, implies that men are the cultural standard and women are unimportant or merely secondary; (2) men and women are portrayed in stereotypical ways, reproducing already ingrained gender normative views; and, (3) depictions of relationships between men and women which also emphasize traditional roles and normalize violence against women (31). While the effects of gendered media can influence many facets of social life, the traditional roles and stereotypes have also been found to negatively affect women's interest in computer sciences (Cheryan et al., 2013). In their study, Cheryan et. al (2013) manipulated the depiction of computer science majors in a print newspaper article, finding that diversifying the field and shifting away from stereotypical representations may be a step towards more inclusivity (68). The researchers did

so by changing a newspaper article, claiming that computer science majors no longer fit the stereotypes and circulated alternate media images of computer science that portrays more diversity (ibid.). Women reported to be more likely to consider majoring in computer science and the researchers concluded that media outlets may be particularly powerful agents of change as they have the potential to reach large audiences of different ages (ibid.).

Social and cultural biases incorporate the internal view that women have of themselves (self-expectations) and the external view of women (stereotypes) are influenced by the media and may be one factor in explaining women's career path choice (Ahuja, 2002). With the recent adoption of rules regarding harmful stereotypes in the UK following suit of other nations, the issue of negative stereotypes is being taken up more actively. Other organizations, such as the Unstereotype Alliance convened by UN women and with a growing membership of companies such as Facebook, Microsoft and Google, have championed addressing gender bias in businesses and organization, thus contributing to changing the narrative in the work environment ("United Nations Women: Unstereotype Alliance," n.d.)

Chapter 2: "It is not enough to possess technical skills" – Structural factors of labour markets

> *"…their eyes were opened to the realization that the playing field is not level after all and that they had a high price both personally and professionally…"*
>
> - Massachusetts Institute of Technology, 1999
>
> -

As previous research has shown, it is usually not due to women's lack of interest or skill in tech, but rather the structural properties of labour markets that imypede women's participation. Women's career trajectories are more complex; they are often conflicted between work and family and have different patterns such as intervals away from full time employment. Acker (2006) labels corporations as claiming total "non-responsibility" when it comes to ways of functioning. For Acker (2004), non-responsibility is actively constructed through organizational interventions and state actions that create the rights of corporations to act in their own interests

(26). Anything that was not seen as a source of profit, such as providing flexibility in locations and hours so that workers maintain some control and autonomy, job sharing, childcare and parental support, are all seen as unimportant (Acker, 2006: 176). Structural factors such as these are dependent on the welfare state and social policies – how much can be state-controlled or market-controlled? The push for social protection is rising in many organizing unions and movements. Why is this an important topic with regard to the digital divide? Social structures can either facilitate or create a barrier into entrance or maintenance of certain jobs. In the following section, I will highlight some perspectives on the public and private sphere, also known as paid and unpaid labour market, respectively, and how the gendering of these create gaps in women's economic power.

2.1 The public & private sphere: the gendered division of labour

The narrative that the tech field, amongst other industries, requires long working hours, is often used as an explanation as to why women are 'unfit' or 'unattracted' to the field. This also influences the hiring and promoting of women, since they are usually regarded as having incompatible work schedules to fully commit to their work. As Acker (2006) points out, work is generally assumed to mean that reproduction is left at home, or in other words, the worker does not have other responsibilities that interfere with work (93). According to the arguments of Acker (2006), feminist economist Heidi Hartmann (1979), and critical theorist Nancy Fraser (2016), work organizations continuously perpetuate gendered divisions of labour by first ignoring the responsibilities of human reproduction and secondly by privileging capitalist notions over all other facets of life. This section will focus on the gendered divisions of labour, the private, unpaid sphere and the paid, public sphere. To understand more about women's lack of involvement in certain spheres of the paid labour market, I will briefly go over some theories as to how these divisions began and how they are maintained. This feminist historical materialist approach is a perspective in understanding contemporary material forces – with a specific focus on the history and workings of labour, we can focus on the gendered dimensions of work with technology (Hicks, 2017: 20).

Sociologist Joan Acker, commonly credited as one of the first to theorize how gender gets institutionalized in organizations and workplaces (Bridges & Messerschmidt, 2007), states that since doing unpaid caring work is the major reason that women do not work for pay, caring work has a negative impact on earning ability in the paid labor market (Acker, 2006: 61). There is even a double standard when it comes to marriage; organization view the married man as an asset, with a stable support network at home allowing him to give his undivided attention to his work, yet they view the married woman as a liability, likely to neglect her career at the expense of her family at every opportunity (Vinnicombe & Sturges, 1995, as cited in Cross & Linehan, 2006: 38).

Using a rather historical materialist approach[3], Acker (2006) explains how the rise of industrial capitalism, which was first developed in Britain, then in Europe and to the United States had from its birth a deeply segregated and stratified capitalist labour force (80).[4] Organizations were both racialized and gendered for the purposes of maintaining divisions, paying less for certain skills and protecting the wages of white men (ibid.).[5] Gendered divisions usually kept women in lower paying jobs and within jobs that were seen as essentially more "feminine." Often hidden under these processes in the production, monetary sphere of the economic system, is the unpaid, reproductive sphere. The sexual division of labour, in its most basic conception

[3] Referencing Marxism and using it as a method of social analysis, as put forward by Heidi Hartmann in *The Unhappy Marriage of Marxism and Feminism: Towards a more progressive union* (1979). While traditional Marxist [Marxism] focused on the how social structures and development of social institutions as dependent on the economic system of their time, human consciousness was enmeshed in relations of productions and reproduction. Marxist [Marxism] feminists focused more on how the division of labour (specifically the reproduction and labour within the private sphere) served the interests of the capitalist market.

[4] Differences in earnings and wages were already present prior to the development of the capitalist wage as argued by Padavic & Reskin *Women and Men at Work* (2002).

[5] This is a classification that Acker (2006) uses throughout her book, claiming that industrial capitalism is historically and continues to be a "white male project." As the innovators, owners and holders of power, the capitalism that grew out of Britain, Europe and the United States were dominated by white men (78). Therefore, when she uses this category, it is to indicate a general pattern of domination that exists, but not as a homogenous category. As she states, "getting a living wage was not easy for white men, or that most white men achieved it" (80). Rather, by using this category, she is claiming that a small group of powerful white men are the ones who hold the power.

is that women are primarily responsible for housework and men primarily for wage work (Hartmann, 1979: 19-20).

In a similar fashion, authors Padavic and Reskin (2002) state it was the shift from agricultural labour and pre-industrial Europe to the Industrial Revolution in which the gendered labour force emerged (20). For the past 200 years since the start of the Revolution, the gender divisions persist. This has created the assumption and the image of the working man and the stay-at-home wife and further reinforced the naturalization of these distinct spheres. This also generalized the belief that women do not do 'real work' since the Industrial Revolution considered labour to be monetarily paid, it also assumed that women are temporary or part-time workers, since they would quit when they are needed at home, and assumes that women are not committed to their careers (Padavic & Reskin, 2002: 41).

Due to the necessity of care labour, or the caring market, the view that this responsibility falls only on women has created a barrier to certain types of work and fields. The gendered separation between the production and reproduction, the public and private, determined many other facets of social life. It shaped the overall organization of daily life and the ways in which groups and individuals constructed meaning and identities (Acker, 2006: 92).

Furthermore, it also implicitly assumed that these spheres were to be distinct and separated, with either party being fully responsible for the tasks at hand. Because women are representative of the reproduction arena, the structures in which a nation-state runs its state policies greatly impacts the ways in which women and men participate in the labour market. For Acker (2006), these organizational structures obscure underlying arrangements based on gendered assumptions (107). Therefore, it is through many legal policies as well as organizational structures that women's agency and choice regarding labour markets are affected.

This is what Hochschild (1989) labels the "stalled revolution." The vast entrance of women into the working economy has not been accompanied by a cultural understanding of

partnerships, work and child-rearing (12).[6] The workforce has changed, and the image of the working women has evolved, however, most workplaces remain inflexible with regard to family demands of their workers (ibid.). Rather than seeking for structural and social changes, some prominent women have instead advised women to accommodate this stalled revolution. The "superwomen syndrome" first coined by Marjorie Hansen Shaevitz in 1984, urges women to do it all without a change in men (Hochschild, 1989: 29). A more contemporary example, Sheryl Sandberg's "lean in" is also seen as a disservice to women. "Doing it all" means internalizing workplace discrimination and maintaining hierarchies which to some women might be their way of overcoming adversity.

Hochschild's book, *The Second Shift* (1989) was a term coined to describe the demands at home after a paid labour shift. Similar to the 'double burden,' this refers to all unpaid domestic duties, usually in a two-job couple household, this can also extend to other living situations. In a series of interviews and observational research of families in their homes between the 1970s and the 1980s, her research found that despite women drastically entering the paid labour market, they still do the lion's share of responsibility in the home. Her story-telling narrative between different sets of couples show that 'the second shift' can cause strain between couples and families. Women often felt overworked and unappreciated for their efforts – there was an overall disappointment between one's desire and one's reality. Through her methodology, Hochschild incorporated how a person's upbringings molded the way they perceived their place in the family, in the household, and in society. While Hochschild's (1989) book dealt more sociologically about the idea of gender, marriage and the second shift, it is important to understand the everyday life of women outside the paid labour market to better understand how this shapes their careers.

One of the key findings of the OECD (2018) report states that a better redistribution of unpaid childcare and housework would help foster women's participation in the (digital) labour market

[6] This was changed from the authors original sentence of "cultural understanding of marriage and work." While Hochschild´s (1989) book revolved mostly around the union of marriage, I wanted to incorporate different unions, as well as accounting for say, single-parent households. In any case, the work/life balance doesn´t always have to concern heterosexual married couples, but tof several different unions, to even single households, all of which concern a work/life balance.

(14). According to their research, women spend 2.6 times more than men on unpaid care and domestic work which restricts the time they can spend in paid work or to upskill themselves. Actions are needed to raise awareness to challenge this stereotype alongside fostering gender-neutral parental leave-taking and childcare services. This has more to do at the structural, macro level, where many times companies have the power to enable flexibility but subsequently do not. On a macro level of government institutions and welfare, it is also important to take into consideration how different nations provide for parental leave and childcare services.

2.2 Nation context of private and public sphere divides – how do nation-states allow for the work-life balance?

In recent decades researchers have begun studying the role played by the state in affecting women's economic activities and labor market positions (Mandel & Semyonov, 2006: 1910). The role of the state as legislator and implementer of social and family services operates under the premise that the state strongly affects women's participation rates and economic opportunities (ibid.). These authors found that welfare states contribute to increased women's labor force participation, enhances the economic independence of women and mothers and strengthens their power within the household and in society at large (Sorensen & McLanahan, 1987; Hobson, 1990; Bianchi et al., 1999; as cited in Mandel & Semyonov, 2006: 1911).

Social services can be divided into a few categories – in terms of family policies, how much responsibility does the state support for the care of young children and provide the necessary conditions to combine work and family (ibid.).

For example in Sweden, many policies facilitate the combination of parenting and paid work. Parents are guaranteed a certain number of months of paid leave – with the guarantee that they will not lose their jobs – upon the birth or adoption of a child (Acker, 2006; 93). This may be one reason as to why Sweden is a nation with the least male overrepresentation with computer work and salaries (Tympas et al., 2010). Although paid maternity leave protects women's employment, a long absence from paid employment may discourage employers from hiring women to positions of authority and power (Mandel & Semyonov, 2006: 1914).

The Nordic countries have the highest percentage of women in work in the world (Slaughter. Anne Marie-Slaughter compared the United States to the welfare systems of Norway, Denmark, Sweden and the Netherlands (Slaughter, 2013). These Northern European countries all provide universal childcare, support for caregivers at home, school and early childhood education, protections for pregnant women and care for the elderly and the disabled (ibid.). These governments invest in welfare policies in the same way they invest in, for example, transportation infrastructure (ibid.). These societies show that breadwinning and caregiving reinforce each other. They routinely rank among the top 15 countries of the most globally competitive economies, but at the same time, they rank very high on the OECD Better Life Index. In fact, they rank higher than the U.S. or Switzerland who have higher average levels of income but lower rankings on work-life balance.

In their study, Mandel & Semyonov (2006) compared women's employment opportunities in 22 countries. They captured state interventions using paid maternity leave, childcare policies and public sector employment. It was found that while women's integration into the labor market is higher in countries with progressive welfare states, within the occupational hierarchy women are still not able to compete successfully with men for powerful and lucrative positions (1911).

Portugal

How does the Portuguese state impact women's employment opportunities, and what sorts of social services do they provide? Portugal is seen as an example of the 'social model of the South' and has conservative regimes characterized by late industrialization, a right-wing dictatorship in the 20th century and a strong role played by the church in promoting traditional family-orientated values (Tavora, 2012: 63). State provisions of care and policies that help women reconcile employment with the family have traditionally been limited and is still described as lagging behind most western European countries (Esping-Anderson, 2009; Kastrougalos & Lazaridis, 2003; as cited in Tavora, 2012: 64).

There is a gradual divergence of Portugal with other southern European countries. Portugal has high rates of employment of Portuguese women, rooted in the 1960 and 1970s when emigration and military recruitment to colonial wars created severe labour shortages in the period of strong industrial development (Barreto, 2004; as cited in Tavora, 2012: 65). Women continue to have patterns of full-time continuous employment and limited the extent to which families can be expected to provide care and other home-based services (ibid.). However, Portugal has the distinctive feature of pronounced familialism (a system which the family, rather than the state, is expected to take the main responsibility for the welfare of its members), fragmented and polarized social protection with persistent gaps in coverage and particularism in the distribution of benefits (ibid.).

Formal childcare is largely provided by the non-profit private sector and highly subsidized by the state and research from the OECD indicates that childcare has become relatively affordable (ibid.: 70). An OECD study from 2007 shows that the net cost of formal childcare for children under 3 years old was the lowest in Portugal, Greece and Belgium among OECD countries (ibid.). Fees for full-time daycare for a child aged 1 year in Portugal is at 10-15 percent of a dual earner's family income and at 2-10 percent earnings of a single parent's income (OECD, 2004, as cited in Tavora, 2016: 70).

With regards to parental leave, Portugal has significantly improved in the last two years with the new *Lei da Paternalidade* [Paternal Law] with gender-neutral language (ibid.: 71). Under this new law, there is a post-birth leave of five months paid at 100 percent replacement rate or six months paid at an 83 percent replacement rate if the father takes at least one month (ibid.) The post-birth leave can be extended for six more months to be equally shared between parents and paid at a 25 percent rate. The new regime includes 10 days fully paid paternity leave.

CITE stands for the commission for equality in work and employment and forms part of the Ministry of Work, Solidarity and Social Security. In 2016, they published a 181-page report on the uses of time between men and women in Portugal. In association with several other international organization such as the International Labor Organization (ILO), OECD and the Eurofund, the uses of time have been a particular area of interest concerning policies to promote equality and balance between women and men in terms of work and family life (Perista et al.,

2016: 5-6). As stated by the authors, the feeling of injustice is mostly felt by women with regards to sharing domestic responsibility, and even more accentuated when the care of children is involved (ibid.: 95). More than 1 in 3 (33%) women respondents reported difficulties in concentrating on their paid work due to family responsibilities, while for men it was 25.8% (ibid.: 116).

Interestingly, there was a divide with the respondents between the reasoning behind the work/life balance. Some accepted or defended the difference between the role of the mother and the father. The belief stemming from mostly the structural differences between what is offered for mothers and fathers and biological reasons (breastfeeding mother or the mother/child has a privileged emotion bond (ibid.: 122). Others are unsatisfied with the unequal balance, claiming the need for full gender equality in the field of paid work and family (ibid.).

On average, across the entire country of respondents and across all age groups, women spend approximately 4 hours and 17 minutes on unpaid work, and 8 hours and 35 minutes on paid work per day, while men spend 2 hours and 37 minutes on unpaid work and 9 hours and 2 minutes on paid work per day (ibid.: 140). If we were to estimate the time spent on unpaid work on the weekend and estimate the time spent in a 7-day period, women spend on average 12 hours and 22 minutes more than men (ibid.: 162). That means that in a month, women on average spend approximately 49 hours and 28 minutes more than men (Figure 4).

Taking into consideration different family dynamics such as divorced, single-person households, and single parents and age frames, the use of time changes. For those who only focus on their professional life, the hours of unpaid work are reduced and more even between the genders (ibid.: 163). This reduction during the week is marginal, as it is usually compensated during the weekend, indicating that professional activities does not usually influences unpaid working hours in the same sense (ibid.).

In the realm of paid work, work done by women is seen as less valuable in workplace market, women face precarious conditions and unstable work, there are more women that are paid less than the national minimum salary, there are more women with timed or without contract and there are more women when looking at the unemployment rate (ibid.: 165).

One of the policy's conclusions states that gender stereotypes persists in the social organization of Portugal, where unpaid work, domestic or care/familial duties constitute the primary responsibility of women (ibid.: 171). Because this stereotype leads to a systematic violation of applicable law and since this injustice is hardly perceived as such, it must be met with political determination through measures capable of changing a harmful paradigm that is incompatible with the Democratic rule of law (ibid.). Some of their recommendations include: valuing the social need for the caring and support for family and for paternity to be considered with the same relevance as maternity, the explicit inclusion of the concept of unpaid family care in the Portuguese judicial system, deconstruct the language that highlight the predominance of men in social organizations which reinforces stereotypes and increasing investments to fight gender stereotypes (ibid.).

In a recent *Diário das Notícias* 2019 article titled "Portuguese Women, tired, unhappy and badly paid" (*as mulheres portuguesas: cansadas, infelizes e mais mal pagas*) an investigation put forward by the Francisco Manual dos Santos Foundation, involved 2428 women (which according to the study, should be representative of the 2.7 million women residing in Portugal), all of them between 18 to 64 years old stating that they perform 74% of the household chores, compared to the 23% that their partner does (Reis, 2019). Upon further inquiry, the report also stated that if the same pattern is to continue from the last generation, it would take 5 or 6 generations to achieve parity for domestic duties between men and women, in couple who both have paid work (Sagnier et al, 2019: 37).

2.3 Flexibility & structure

Workplace flexibility is perceived as a necessity in contemporary workplaces (Halpern, 2004, as cited in Hill et al., 2008: 149). From an organizational perspective, workplace flexibility is the degree to which organizational features incorporate a level of flexibility that allows them to adapt to changes in their environment (Dasmalchian & Blyton, 2001: 1, as cited in Hill et al., 2008: 150). From a micro, worker perspective, workplace flexibility entails individual agency in the context of organizational culture and structure and is the degree to which workers are able to make choices to arrange core aspects of their professional lives, regarding where, when and

for how long work is performed (Hill et al., 2008: 151). With both of these perspectives, it is assumed that both parties will indirectly benefit with increased productivity.

Costs of workplace flexibility varies greatly across careers, companies and positions. The cost of workplace flexibility includes penalties to labor supply and include job interruptions, short hours, part-time working during part of the working life, and work flexibility during the day (Goldin & Katz, 2011: 46). Career choices are deliberated at various stages of one's life cycles with imperfect knowledge about the workplace flexibility penalties and uncertainty about their family responsibilities (ibid.). Goldin and Katz (2011) view the structure of organizational workplaces as having the ability to provide flexibility but that organizations are not willing to pay for this flexibility (46).

In a qualitative study focusing on how organizations can increase diversity and retain workers, researchers examined how women in the IT field balance work and family issues (Armstrong et al., 2007: 143). It was found that women perceive the interaction between work and family as directly and indirectly impacting both advancement opportunities and voluntary turnover (ibid.: 149). Although flexible work schedules are associated with high job satisfaction and organizational commitment it has drawbacks with promotion opportunities (ibid.).

Research has found that other colleagues perceive women with flexible or reduced work schedules as less dedicated, have less advancement motivation and have a higher likelihood of turnover (Cohen & Single, 2001, as cited in Armstrong et al., 2007: 149]. Women have also felt that they are less likely to be offered promotions or other opportunities when they take advantage of the benefits of flexibility. This can be seen as another vicious 'damned if you do, damned if you don't' cycle. While flexibility allows women to balance between family responsibilities, their personal lives and their job requirements, others perceive their behaviour as a detriment rather than a benefit.

With regard to wages and the gender pay gap, Claudia Goldin (2014) believes that alterations to the structure of the labor market such as remunerating enhanced temporal flexibility would reduce the gender pay gap. Many fields and companies have an incentive to disproportionately reward individuals who worked long hours and who worked particular hours (Goldin, 2014: 2).

The "residual" is often termed "wage discrimination" and has been explained by such theories as women's lower ability to bargain, their lesser desire to compete, and gender differences in the probability of leaving (ibid.: 4). Interestingly, Goldin (2014) found that technology occupations have some of the lowest residual gaps because it appears that tech enables women to work part-time or to work more flexibly (14). Her results showed that technology occupations and not tech industries are more associated with greater gender equality in earnings (ibid.).

Chapter 3: Organizational practices & outcomes

3.1 Recruitment and hiring

Figure 1: Hiring biases depicted in The New Yorker cartoon. (Source: Danny Shanahan in The New Yorker, Oct. 14, 1996)

According to Acker (2006), inequality regimes are further reproduced through hiring and recruitment processes (115). Perceptions are built upon existing gender compositions of jobs and often assumes that a certain skill or quality is needed for the right fit (ibid.). Jobs and fields are created and recreated through the knowledge of workers and identities that fill these particular jobs. Despite legal protections and laws prohibiting gender discrimination or exclusion of groups into the labour market, there remains legitimated practices that are largely invisible in the recruitment and hiring processes. Some women have reported that they were asked 'illegal' questions during their job interviews (Hatmaker, 2012: 380). For example,

questions about whether they had arranged for childcare or about what their husband's thought about their doing or accepting of a engineering job (ibid.).

In one example, a laboratory experiment simulated hiring processes which incentivized participant 'candidates' to be hired and participant 'employers' to select the better performing candidate (Reuben, Sapienza, & Zingales, 2014 as cited in Payne et al., 2018: 6). The experiment showed that both male and female employers were twice as likely to select a male candidate to complete an arithmetic task when they were provided no information about the candidate other than a photo (the ability to identify gender) (ibid.).

Occupational segregation in the tech industry also remains similar to other traditional industries where women remain concentrated in junior, lower level positions and are rarely seen in upper management, leadership or technical positions. In their study on barriers to advancing female careers in the high-tech sector in Ireland, Cross and Linehan (2006) found that there are hardly any organizational policies and procedures that are derived from senior management decisions (32). This means that since there are no clear selection criteria for promotions, as is the case in many organizations, there is considerable scope for discretion by senior managers that is likely influenced by their personal views and attitudes towards woman (ibid.). This goes back to the preconceived stereotypes of who should perform the role rather than the qualifications required (ibid.).

There is a general feeling on the lack of perceived procedural fairness when it comes to promotion decision and that even when family-friendly policies are in place, organizational culture does not always avail to these policies (ibid.: 33). Family-friendly policies are usually taken up by women and men rarely use such policies, they are regarded more as "women's issue" and companies simply pay lip service to these policies (ibid.: 34). From a bureaucratic perspective, it is extremely difficult to take advantage of certain policies, since their male counterparts do not typically take these, it reinforces the stereotype that women don't devote themselves, or care as much to reach higher positions (ibid.: 37). Women have reported that they 'battle' with their managers to convince them that they will return after maternity leave and in extreme cases, some have also reported how they were not given the same position upon returning (Hatmaker, 2012: 391).

3.2 Working environments

Ensmenger (2010) states that the culture of computing is the most significant barrier to female participation, as it is perceived to be inherently and excessively masculine (121). Through his analysis of how programming came to be known as a masculine field, he shows that the social construction of the computer programmer and the institutionalization of gender, creates circular reasoning as to who should fit the stereotype and who should be hired. Etzkowitz et al. (2000) found that women face a series of gender-related barriers to success in male-dominated careers (as cited in Powell et al., 2009: 412)

Sexist humor and macho work culture, which is by no mean unique to computing, are identified as key factor to why women leave computing (Misa, 2010: 256). An interview with 2500 men and women in the STEM professions present evidence of a "macho culture where women are very much outsiders, and where those who do enter are likely to eventually leave," with nearly two-thirds of women reporting harassment on the job (ibid.).

Ensmenger's (2010) example of the development of the "nocturnal" culture of computing represented a structural barrier for women (137). Several decades ago, when the computer was a large, expensive machine, computer programmers often had access to them during off-hours and some corporations specifically prohibited women from remaining on premise after business hours (ibid.). Even after the personal computer was accessible, the culture of staying up all night persisted and is even celebrated within certain computing communities (ibid.). These practices can serve to be both unappealing and impractical for women, considering other responsibilities women tend to face. This is one interaction between structure and culture in its replication of gender norms and identity (ibid.).

Alongside representing a relatively low share of the workforce of IT companies, women also feel as if they need to work harder than their male-counterparts to have their efforts recognized. In an article by the Wall Street Journal, it is reported that women software engineers at Facebook were 35% more likely to have their code rejected by the company's internal peer review system (Seetheraman, 2017, as seen in OCED, 2018: 29). Women have described instances in which others have doubted their technical abilities either overtly or indirectly (Hatmaker, 2012: 388).

Women went to lengths to prove themselves to their colleagues to counter interactions that amplified their gender, rather than working harder for career progression, this determination was done in an effort to be taken seriously (ibid.: 389).

Within organizations, mentors and peer relationships can facilitate career and personal development (Cross & Linehan, 2006: 34). Burke and and Mckeen (1994) found that managerial women are less integrated with important organizational networks and that it is through these networks that influence critical human resource decisions such as promotion and acceptance (as cited in Cross & Linehan, 2006: 34). Sometimes understood as networking, this informal network can determine the access to certain opportunities. In their study, the participants felt that organizational decisions are made based on access one has to information which is gained through formal networks, such as meetings as well as through informal networks (Cross & Linehan, 2006: 34). But because many decisions and promotions are made through this informal network, access is a vital route to reach higher positions (ibid.). Regarded also as the "men's club" or the "old boys' network," exclusion from these informal networks are also perceived as barriers – lack of access to contacts, exclusion, isolation and frustration (ibid.).

Garavan et al. (2003) state that networking forms an essential dimension in organizational life and individuals who excel at networking generally excel in organizations (Cross & Linehan, 2006: 34). However, since informal networking usually takes place socially and often outside working hours, women are less keen and have less time to commit to such gatherings (ibid.: 35). Burke et al. (1995) also proposed that in an effort to maintain dominance within an organization, women are excluded from informal networking through the use and maintenance of the "old boys' network" (as cited in Cross & Linehan, 2006: 35).

Aside from networking, mentoring is widely acknowledged as a critical step to career progression (Cross & Linehan, 2006: 35). A mentor provides information, training, advice, direction, achievement of social and professional integration in organization and psychosocial support for a junior person in a relationship, however, finding a mentor is difficult for women (ibid.: 36). Since there is already a lack of female mentors and women find it difficult to reach higher positions, this creates yet another cycle of disadvantages.

In several studies concerning how women cope with discrimination in the workplace, it was found that women accept discrimination and consider it as part of the industry. Kanter (1977) calls this idea of 'role entrapment' and represents a response to what Kanter (2002) calls 'boundary heightening,' whereby challenging discriminatory behavior is rejected due to the risk of exclusion or isolation (as cited in Powell et al., 2008: 419). In their study of how women 'do' gender, Powell, Bagilhole and Dainty (2009) reported that female engineering students have adopted strategies to gain male acceptance in the workplace by having to 'act like one of the boys' (418). Schmitt et al. (2003) argue that conforming to organizational norms and displaying masculine behaviour may be necessary to avoid stereotypical performance based on one's sex, but that this strategy often backfires, and women are penalized for not being 'womanly enough' (as cited in Powell et al., 2009: 418). Miller (2002) found that even if women's occupational and organizational values, beliefs and behaviour were consistent with traditionally masculine norms, they still said they felt like outsiders (as cited in Powell et al., 2009: 423).

Similarly, in Hatmaker (2012) on her study of women engineers, it was found that their interactions were mainly based first on their gender rather than as an engineer. To avoid being downplayed on being a woman, they tried to be less feminine in appearance and affects, using minimal or no makeup, wearing trousers instead of skirts, and generally trying to not appear too feminine or discuss feminine topics (Hatmaker, 2012: 368). It was also found that men expected women to handle certain tasks around the office (e.g. buying gifts), were ignored or tuned out their inputs in meetings, with some of her participants claiming they would be talked over by speaking at the same time (ibid.: 388). The participants described instances where a response seemed to be directed 'past her' rather than looking at her, and that at times when responding to a question or comment, the person would address the response to a colleague who was a man instead (Hatmaker, 2012: 388). The most common scenario related to participants was that while the women's statements were ignored, it would then be followed by a man restating the same idea and being recognized for it (ibid.).

In addition to this, women often feel 'pigeon-holed' by their colleagues into stereotypically feminine identities' such as signalling that their identities as wives and mothers take precedence over their professional identity (ibid.: 390). The female engineers in Hatmaker (2013) related

stories about how they were asked to take notes in a meeting, collect money for gifts, lead charitable contribution campaigns, plan birthday parties and bring doughnuts to meetings (390).

As a way to negotiate these negative interactions, there are certain tactics that woman employ in the workplace. Following what Miller (2004) uses, coping mechanisms can include blocking and rationalization (as cited in Hatmaker, 2012: 393). For example, sometimes a sarcastic or witty response to a question or remark may set the tone that what is being asked was not appropriate, this is a form of blocking. Women also rationalize and make sense of the situation by convincing themselves that they are 'okay' with it in order to persist in future interactions, however this also suggests that the interaction in itself is perceived as 'okay' or just part of the culture (Hatmaker, 2012: 390). Other ways of coping may be tactics such as 'proving oneself' and 'image projection' to install positive images of one's technical abilities (ibid.).

However, a male-centric culture does not entirely explain why women either leave the industry or why the proportion of women in computer sciences is decreasing. Since there are other male-dominated industries and cultures, such as physics and engineering where the proportion of women continue to increase (Hayes, 2010: 267).

3.3 (Lack of) diversity outcomes for company productivity

In 2015, McKinsey & Co. published their business case titled *Why Diversity Matters* which has been widely cited and influenced inclusion and diversity efforts within corporations, the public sector and the third-sector organizations worldwide (1). Using a quantitative study approach, the 2015 report (using 2014 data) established a statistically significant correlation between executive team diversity and financial performance (8). In their expanded and updated version of 2017, they found that companies in the top quartile for gender diversity on their executive teams were 15% more likely to experience above-average profitability than in the fourth quartile (ibid.). Also featured in their studies, McKinsey & Co. found that telecom, media and technology companies in their sample, with the majority of tech firms being disproportionately represented in the fourth quartile for gender (17).

Further to their findings, McKinsey & Co. (2018) found that gender diversity on executive teams to be consistently positively correlated with high profitability across geographies in their data set of 12 countries and over 1000 companies. The role of executive teams are important determinants in the financial performance of a company considering the bulk of strategic and operational decisions are made within it.

The term "groupthink" was first coined in 1971 by the psychologist Irving Janis who found that when people come together in a group, they all want to belong (Smith, 2018: 4). Group members are more likely to agree with each other, want to minimize conflict and reach consensus and individuals stifle their doubts and while this seems to be harmless, the consequences can be dire (ibid.).[7] One solution to groupthink is diversity. A 2009 study found that racial and gender diversity correlate with greater sales revenue, more customers, and higher profit (Smith, 2018: 5). Regarding a decision-making influence, the mere presence of someone perceived as an outsider changes the behaviour of the group, improving the thinking of those in the majority even when divergent viewpoints aren't expressed (ibid.).

In another study, researchers partnered with an entrepreneurship program to asses how gender diversity would affect business performance (Smith, 2018: 6). The study found that gender-diverse teams had more sales, higher profits, and higher earnings per share than male-dominated teams (ibid.). It wasn't that men or women were better at business, but rather that performance peaked when the proportion of women hovered around 55 percent (ibid.). Gender diverse teams monitor each other more closely. The hypothesis initially proposed by Janis stated that since consensus feels pleasurable it puts pressure for individuals to "just get along and to not rock the boat" (Smith, 2018: 7). Paradoxically, adding an outsider to homogenous groups upsets the balance but this exact discomfort is the reason groups won't conform (ibid.).

In another study on diversity and leadership styles and company performance, Zenger (2017) found that the overall mix and diversity of skills that both men and women can contribute to a

[7] Groupthink as a concept has been used in various disciplines and psychologists have blamed groupthink as a factor for many war efforts such as the Bay of Pigs invasion, the Vietnam War and even to business collapses from Lehmon Brothers to Enron to Worldcom, the global financial crisis (Smith, 2018).

company's success and women were found to outperform men in 12 out of 16 general leadership skills (as cited in Payne et al., 2018: 6).

3.4 (Lack of) diversity outcomes for consumers

An OECD report mentions that aside from the greater economic and personal benefits from the inclusion of women in the digital economy, the inventions arising out of diverse teams are more economically valuable and have a higher impact than those in which only men are involved (OECD, 2018: 5).

By scrutinizing two kinds of diversity, inherent and acquired, a study by Harvard Business Review (2013) found that companies with 2-D diversity out-innovate and out-perform others. Inherent diversity involves traits you were born with, such as gender, ethnicity and sexual orientation while acquired diversity involves traits you gain from experience, such as working in another country. Employees at these companies are 45% likelier to report that their firm's market share grew and 70% likelier to report that the firm captured a new market. 2-D diversity creates an environment where "outside the box" ideas are heard. They found that when at least one member of a team has traits in common with the end user, the entire team better understood that user. A team with a member who shares a client's ethnicity is 152% likelier than another team to understand that client.

A homogenous team will most likely build a product that serves that team (Forbes Technology Council, 2018). Innovation happens when teams challenge the status quo and homogenous teams have a challenge when it comes to tapping into empathy for customers. Research from the Hamilton Project (2018) found that in cities with the historically high skilled immigration have an increase in the level of innovation.

As will be mentioned in the next section, the lack of diversity in the composition of innovation teams across the globe reflect socio-cultural biases.

3.5 Discrimination in emerging technologies

Why is women's participation in innovation important? Sexism, racism and other forms of discrimination are being built into machine-learning algorithms. In this section, I will provide some examples of the discrimination that has been noticed.

Joy Buolamwini (2017), an African American MIT doctorate student found that facial analysis software programs did not code algorithms to identify a broad range of skin tones and facial structures. What we may have thought to be neutral technique of problem solving, algorithms have also been found to be biased. She created an organization called "The Algorithmic Justice League" which counters what she terms the "coded gaze" – the "embedded views that are propagated by those who have the power to code systems" (Buolamwini, 2016).

Carnegie Mellon University studied Google ads and found that significantly fewer women than men were shown online ads promising them help getting higher paid jobs (Spice, 2015). In this study, researchers used the platform AdFisher and created 1,000 simulated users, half designated male and half female and had them visit top 100 employment sites. It was later revealed that male users were more likely to be shown high-paying job ads. Researcher's hope that other organizations will monitor the behaviour of ad targeting software.

Why should we care about algorithmic bias? As machines learn algorithms that are used everyday by people around the world, society is increasingly relying on them in many different institutions and organizations. For example, in the criminal justice system, algorithms determine if someone is guilty of a crime and how much jail time someone should serve, workplaces decide who to hire for a job through algorithms, and advertisements are chosen to promote to specific users (Bermudez-Silverman, 2018). So far, much of machine-learning algorithms are left unregulated and non-diverse training data is skewed towards creator's bias (ibid). The bias in technology can be exclusionary, prejudice, and discriminatory. Some recent examples include Amazon's AI hiring mechanism which was found to be biased against women, inadvertently favoring male candidates (Gonzalez, 2018); risk assessment algorithms used by the American criminal justice system disproportionately targeted low-income and minority communities (Hao, 2019).

Female participation in patenting activities has increased, however at a relatively slow pace. The OECD (2018) calculated that it will be 2080 before women are involved in half of all patented inventions within the largest IP offices (Intellectual Property)(15).

Part II: Empirical Study

The empirical portion of this study uses the knowledge gained through its participants and is analyzed using qualitative methods. Qualitative research is an interpretive approach that attempts to make sense of or interpret phenomena in terms of the meanings that people bring to them (Jones, 1995). However, it should be noted that, qualitative and quantitative methods are not necessarily separate and distinct forms of analysis, but can complement each other (Silverman, 2013). For example, conducting secondary analysis is a part of a mixed methods approach and the analyzed secondary data sets and can be found in the appendix section (Dale et. al, 2008: 11). According to Bryman (1988), secondary analysis can provide evidence to help plan a qualitative study and provide a nationally representative context for a small-scale study (as cited in Dale et. al, 2008: 12). As stated in the introduction, some of the beginning interests for this study came from the favourable studies regarding women in tech in Portugal, yet on an international scale, women's participation in tech workplaces reflected very different outcomes. This discrepancy-initiated part of the research design as well as an attempt to understand data sets more in-depth as a critical approach to not wholly accept primary data collections (ibid.).

Nonetheless, this study is heavily based on qualitative practices and shouldn't be considered a mixed-method approach since there was no collection of quantitative data and the evaluation of its secondary data is limited. The methodology section provides a more thorough elaboration on the purpose of qualitative methodology, followed by the qualitative approach used - the life-story narrative. The epistemological standpoint will follow to justify the reasonings of using this type of methodology, and the section will end with an explanation of the data collection, data analysis and ethical reflection.

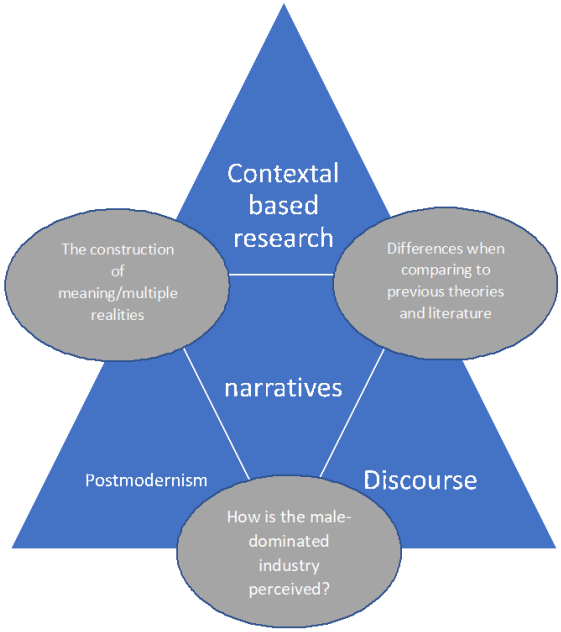
Chapter 6: Methodology

This study is conducted within a qualitative methodology since its purpose is to explore the perceptions of women working in tech in Portugal – it is their reality that constitutes the

objective. It is important to keep in mind that the theoretical framework is based on theories of *why* women have little interests in these academic fields and the barriers keeping them from these careers. In addition to this, the theoretical framework relies on the narratives of those who have mostly been unsatisfied with the field, either in their academic career or within the workplace, have been discouraged to enter or have entered and left. Because of the choice of participants in this study, that is, women working in tech in Portugal, the empirical data explores a different side to this story.

A conceptual framework provides an approach that is missing in a theoretical framework. It is an interplay between theory and practices, and it is an attempt to bring knowledge together. In other words, the presented theoretical framework and what has been chosen to be presented in such, can either have gaps in the theories where it is partial or misleading (Maxwell, 2005: 35). This is not to devalue the written literature and theories on this topic, but rather that from these theories, this study wanted to perceive the problem in a different light – that is, through the eyes of women who have overcome these barriers.

Figure 2: Conceptual framework - understanding the experiences of women working in the field.



6.1 Postmodernism

As a paradigm to this study and as a basis for justifying the small number of participants interviewed, this section will briefly elaborate this critical approach. As a field of social science, it can be argued that since an objective truth is unattainable and that there are rather, several truths according to the reality of the person, positivist or more traditional forms of research do not capture the essence of human life.

Often difficult to define, postmodernism is characterized by the centrality of discourse, fragmented identities, a critique of representation, a discrediting of grand narratives and acknowledgement of the connection between power and knowledge (Alvesson, 2002, as cited in Sands & Krumer-Nevo, 2006: 951). Postmodernism argues for socially contingent forms of knowledge and shifts away from other methodological approaches that are designed to establish the "truth" (Gorman, 1993: 249).

As such, postmodernism guides the narrative inquiry by recognizing the subjective nature of knowledge, it encourages the exploration of the unique, rather than the general.

6.2 The importance of 'situated knowledge'

In her 1988 article "Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspective" prominent scholar Donna Haraway argued for a new perspective of knowledge, one that steers away from the hunt for objective truth. Because this totalized, generalizable truth is impossible to attain and privileges certain narratives over others, the feminist objectivity, that is, situated knowledge and limited location allows for the multidimensionality of subjectivity (586). For Haraway, "the moral is simple: only partial perspective promises objective vision" (583). What she means by this is that since everything is understood by the subjective experience, all knowledge claims should come from knowing subjects, as this is how they make meaning – it is through their accounts how one understands the "real" world (579).

Putting this into the context of the paper, it is very likely that one woman will perceive the same event differently from one another. While one woman may find it disheartening to be in an

overly male working environment, another woman might find it empowering. This is one of the main reasons I have chosen to use the narrative methodology. Through storytelling, researchers understand life-experiences and how people make meaning in their lives.

Donna Haraway's idea of the situated knowledge was offered as a reply to Sandra Harding's standpoint theory. Haraway focused more on criticizing the field of science, claiming that it is contestable and that we should insist on a better account of the world (Haraway, 1988: 579). Since science also requires some form of interpretation and meaning and has been largely been historically male-dominated, then science is not value-free. According to this postmodern approach, we can find ourselves stuck in a socially structured system which we are bound to and therefore reproduce a hierarchy. An example of this would be questioning the positivist notions of science, such as the sometimes-claimed fact of biological differences between men and women, thus attributing to the gap in certain fields or interests. This has now been proven a myth by neuroscientists, implicating that there can be social and political influences in scientific inquiry[8]. Recall above how certain biases and gaps are said to be caused by natural differences.

Standpoint theory accounts for the social positioning of the agent, since it is the subject that has privileged access to truth (Stoetzler & Yuval-Davis, 2002: 317). Situated knowledge can reflect on differing contexts depending on the time and location of the inquiry and acknowledges the differences between individual's belief systems and intersections of their identity. Beginning with the national context of Portugal, we will begin to explore how the digital gender divide is understood, privileging the narrative accounts of the women interviewed.

Anglophone Hegemony describes the hegemonic position the Western world takes in the "international" space and the limited acknowledgement of its own locatedness (Ramon et. al, 2006: 3). This is a power/knowledge system in which the production of knowledge, and how we attain it comes from limited perspectives yet dominate our worldviews. A significant factor is language, with what Spivak (1993) calls 'monolinguistic superiority' (as cited in Ramon et. al, 2006: 3). Language in both the creation of academic publishing, how we consume these texts

[8] See for example Gina Rippon's *The Gendered Brain: The New Neuroscience that Shatters the Myth of the Female Brain*.

and the loss of meaning through translations, have created other locally produced publications and non-English ones to be ignored. Consider the concept of gender and how it may cause problems when translated. Many non-English languages do not have the sex/gender distinction as seen in the English language (ibid.). In Portuguese, the term *género* is synonymous for both 'genre' and 'gender.'

Anglophone hegemony is mostly used within the field of human geography; however, it affects any of the knowledge productions within social science inquiry. In their Guest Editorial "Does Anglophone hegemony permeate *Gender, Place and Culture?*" authors Ramon, Simonsen and Vaiou state the importance of contextuality and argue that the uneven development of gender issues could be due this bias within the field. The uniqueness of a country's context and its historical trajectory account for the differences amongst groups of people.

6.3 The life story narrative as a qualitative approach

The life-story narrative, as described by Robert Atkinson (2006), is a researching perspective and an approach that helps to understand a social reality and explains an individual's understanding of social events (227). The life story interview is a methodology, a narrative inquiry, and is an appreciation of the actual experience of an individual person (ibid.: 230). The narrative approach as discussed by Lynn McAlpine (2016) has the purpose of inviting the reader into the text (33). McAlpine (2016) presents three methodological stances: sociocultural, naturalist and literary (35). The sociocultural stance focuses on the broad cultural narratives that influence individual experience and answer questions such as, how stories are cultural resources (ibid.). In the naturalist stance, the focus is on how people make meaning of their experiences, and the literary stance is on the discourse individuals use to describe their experiences (such as images and metaphors) (ibid.). Seeing as the three approaches are not separate and distinct, this research incorporates all stances. When looking for any cultural and historical signs and to answer the second research question, the sociocultural stance would be more prominent, however, the naturalist method would best represent the narrative methodology generally.

The narrative is an extension of the interpretive approaches in social sciences and captures the richness of data within the stories (Mitchell & Egudo, 2003: 8). The narrative analysis takes the story itself as the object of study (ibid.). It may also be of interest to the readers to notice the alternating interpretations between the conceptual use of "life-story narrative," as described by Robert Atkinson, and "narrative" where McAlpine has been referenced. After some careful considerations, these concepts can be argued to be used interchangeably in this study.

The life story narrative is broadly interdisciplinary and varies according to the approach of the researcher, therefore the final forms of life stories can vary greatly (Atkinson et. al: 2006: 4). A life story can read as mostly the researcher's own description of what was said, done, or imitated, or it can be full a first-person narrative in the words of the person interviewed (ibid.).

6.4 Life-story interviews

"The life story interview can be *approached* scientifically,
but it is best *carried out* as an art"
– Robert Atkinson (1998)

The life story interview is what the participant chooses to tell about the life she has lived, what she remembers of it and what she wants others to know of it (Atkinson et. al., 2006: 6). As a researcher, my task is to engage in dialogue and actively contribute to the knowledge production. Due to the conversational aspect of this life-story approach, the interview structure was more closely related to informal, unstructured interview, rather than the initial plan of using a semi-structured interview. That is because after the first interview was conducted, I quickly realized that if I wanted to build up as much rapport with my participants and allow them to be comfortable enough to open themselves up, following an interview guide was disruptive to the flow of the conversation. Although an interview guide was formulated (Appendix A), it was sparingly used. Instead, it was used as a general guideline to cover certain topics.

For this study, answering all or parts of the questions prepared was not as important, since it was more up to what the participant wanted to share about her experiences. When the interview began, I would always start with a short life story about myself, what I was studying and how my interests evolved, thus resulting in my topic of interest. As a researcher, I figured that this

was the most appropriate to feel connected with the participants. After my short life-story, the interviews usually went chronologically, with the participants starting off with their beginning memories of their interests with technology.

As each participant was speaking, I quickly took note of how I would follow up with certain questions and remarks. What I mostly did was incorporate studies and events that pertained to what the participant said. This proved to be both challenging and satisfying, as a researcher, being quick enough on your feet to be able to follow-up with an example, concept or statistic and maintain the flow of the conversation. At many points of the interaction, I would also answer with my own narratives about my experiences. As stated by Atkinson (2006) the life-story interview demands many spontaneous, individual judgements on the part of the interviewer while the interview is in progress (14). At times our interaction seemed to fall of the track with sometimes random conversations however I found that to be all part of the process of the life-story narrative. As Rubin and Rubin (1995) describe interviews as "wonderfully unpredictable," part of the skill of a qualitative research is being able to adapt quickly to a situation that did not go as expected (as cited in Sands & Krumer-Nevo, 2006: 950).

6.5 Selection of participants

For the purposes of this study, four women were selected in total. As there are no closely defined rules for sample size in qualitative research, sampling usually relies on small numbers with the aim of studying in depth and in detail (Miles & Huberman 1994; Patton 1990, as cited in Tuckett, 2004: 2). Research participants were selected according to the research aims and objectives (Ezzy 2002; Reet et al. 1996) and the sample decisions were guided by reference to the research interpretative framework and what was practical within the frame of the study (Miles & Huberman, 1994, as cited in Tuckett, 2004: 3). In this study, the research objective and aims were broad, the selection criteria were as follow: all participants should be (1) women, (2) currently working in tech (3) in Portugal. This also, somewhat lead to women being Portuguese, although this wasn't a strict requirement. Furthermore, according to Tuckett (2004), the process of the sampling criteria may change as the study unfolds. Although the initial requirement with finding participants was only on women working in tech in Portugal to mainly focus solely on

workplace culture, it came as a coincidence that all my participants also studied and graduated from STEM related fields. This enabled the research to truly expand into a life-story narrative, focusing in some instances on some of the earliest memories and experiences the women had.

The first task was to contact prominent women in tech organizations in the country. Women in Tech, and its many variants of similar organizations, such as Women Who Tech, Girls Who Tech amongst many others. Some are internationally based while several have opened in countries as well as in cities. In Portugal, some of the main organizations include Portuguese Women in Tech (PWIT), GeekGirls, and R-Ladies. An ad was posted on the Facebook pages for the following three organizations: PWIT, R-Ladies Lisboa, and Women in Tech Lisboa. The ad introduced myself, my research aims and objectives, how long each interview would approximately last, and that a consent form would be provided as well as anonymity. Interviews were also offered to be in either English or Portuguese.

Unfortunately, only one woman had contacted me out of all three of the Facebook group ads. After realizing the need to quickly search for new participants, a network selection process was used (deMarrais & Lapan, 2003: 60). A network selection is when one locates one participant who fits in the selection criteria (ibid.). One participant was contacted personally. And was found on an article that showcased a conference in Portugal on empowering women in tech. As part of this network selection strategy, the researcher can also use personal contacts to locate other potential participants for the study (ibid.). Asking around my network of friends and family in Portugal, I was able to locate the third participant for this study. This participant referred me to other colleagues within the company, as well as past colleagues and this yielded my fifth participant. Snowball sampling can also be referred to as a network selection (Goetz & Lecompte, 1984) and involves use of referral, "word of mouth" and other methods of potential respondents through previously identified participants (as cited in deMarrais & Lapan, 2003: 292).

6.6 Interview proceedings

Shortly after every interview I wrote a narrative summary of what I noted as salient issues. Narrative summaries, according to some qualitative research books (see Joseph Maxwell, 1996) are an attempt to keep the participants stories as fresh as possible. All the interviews lasted from approximately 90 minutes to 150 minutes and were conducted over the course of the summer of 2019. Interviews were all done via the Skype application and were recorded using a built-in phone application and transcribed verbatim. This amounted to a total of 71 pages of transcriptions (12 times new roman & 1.5 spaced).

All the interviews were mostly conducted in English, with some casual mixing of languages between English and Portuguese. Although I offered the option to interview in either language, all my participants were proficient in English. This worked highly in my favour, as it avoided the extra step of translating and any other misinterpretations that may come from it. English can be labeled the tech language, or also sometimes considered the *lingua franca* of computing, the internet and engineering (Mares, 2016; Björkman 2008). In other words, English is considered as the working language in tech and all my participants were able to express themselves in English.

I kept in contact with many of my participants and emailed them follow-up questions when clarifications were necessary, usually after or during the recreation of their stories.

6.7 Analytical process

The narrative approach differs from the more frequently used thematic analysis where findings are analysed and organized first by theme rather by individual (McAlpine, 2016: 36). Data reporting in narrative-based studies usually invoke literary elements in constructing low inference accounts that represent participant experience (Holley & Colyar, 2009, as cited in McAlpine, 2006: 36). In this case, data is conceived by participant narratives followed by a narrative interpretation.

Readers will notice that the presentation of the narrative included certain events and experiences of the participants as well as added statistics and studies where able to support the flow of the

stories. What is meant by the study being contextually based in Portugal was to show the discourses of women's experiences as well as how structural and cultural differences can be applied. The goal of each narrative was to have it stand as a *text of its own*. Encompassing both a creative and academic aspect, the intention was to build a narrative that was both enjoyable for readers as well as informative. Elliot (2005) suggests researchers seek out large pertinent databases as a means to contextualise the accounts (as cited in McAlpine, 2016: 46)

The challenge in how to preserve the fullness and complexity of individuals' lives when reports are often limited to 5000-7000 words (McAlpine, 2016: 44). In this study, each narrative was limited to approximately 2500 words each, further limiting the scope of what would be shared. Quotes should not be taken outside of context when reproduced in this study. A further analysis on all four narratives were also drawn in order to answer the research questions. This proved to be difficult, how was I supposed to answer broad research questions on complex life-stories, considering the foundation of postmodernism which claim that all realities are contingent on the person? I organize my findings to be

6.8 Ethical considerations

In common with other qualitative researchers, there are many steps taken to ensure participant anonymity (Appendix C). This includes not only changing their names, but also not revealing their exact position, company, or schools attended, and geographical location was kept to larger regional areas (e.g. Northern Portugal). The removal of biographical information can raise challenges in doing justice to the actual accounts while preserving anonymity (McAlpine, 2016: 45).

Testimonial validity poses the question if participants indicate that the interpretation accurately described their experiences (Stills, 1999: 100). After each narrative was recreated, each participant was emailed their individual chapter to verify that they were satisfied with the interpretations of their story and offered the opportunity change or omit anything they deemed not fit with their perspective. This was a further step in ensuring anonymity as well, so that certain life events were not easily traceable back to the participant.

Sample frame bias entails choosing participants according to the purpose of the study (Tuckett, 2004: 9). The women who were interviewed overcame barriers that existed, such as the ones presented in the theoretical framework. These are success stories. Finding the hidden population of women who might have gone into STEM but were discouraged at some point of their journey, or women who started a career in tech and left due to personal reasons would be difficult to track down and are outside the scope of this study.

Practical and logistical issues also biased the sampling outcome (Tuckett, 2004: 10). Such issues as timing due to competing demands can interfere with recruiting and analysis efforts of the study (Groger & Mayberry, 1999, as cited in Tuckett, 2004: 10).

It should be noted that with the construction of these narratives, I made the decision on which data to include and exclude. My positionality, research interest and knowledge I have acquired have inevitably shaped the analysis.

Considering these measures, I will now present the narratives.

Chapter 7: Women's narratives

The math whiz

It was 16h on the dot when I received an email "Hello, I am on Skype." I had found myself extremely nervous for my first interview, waiting anxiously as that all too familiar Skype ringtone went on. Punctual and well-presented, Luisa appeared on the other end of the screen with the company logo in the background. Luisa is the director of mobile development at a small-sized tech company, a position typically held by men. According to a study by Informa D&B, women only hold 28.5% of leadership positions in Portugal (Fidalgo, 2017). When taking into account the representation of women in leadership positions within tech, the numbers are considerably lower (Kvochko, 2016).[9]

[9]A McKinsey & Co. article from 2018 The number of women in Portugal on the Board of Directors is a mere 22% when compared to the 27% EU-28 average, and women only hold 10% of the executive committee with

Considering the representation of numbers both in leadership positions held by women in Portugal and adding the extra layer of the male-dominated industry, Luisa can be seen as the exception. "Since I can remember, my favourite subject in school was math, that has always been my favourite" Luisa recalls. At a young age, Luisa had already broken some common misconceptions about the gender differences in aptitudes and interests in mathematics. While the assumption that "girls aren't as good at math as boys" has become a myth (Park, 2008)[10], there are still some firm believers on brain differences between the sexes. Take for example a study published in 2005 by the Laboratory of Neuropsychology and Investigation from the Institute of Intelligence in Portugal. They found that boys and girls have differing abilities and behaviours because their brains function in different ways (DN, 2005). This article, published by the *Diário de Notícias*, considered as one of the three main newspapers in Portugal continued to be used as a form of reasoning for pedagogical changes (Sanches, 2016).

During her childhood, Luisa and her sister played with LEGO's and a remote-control car and thinks back on how her other female friends probably did not get the same toys from their parents - "maybe my father just wanted the toys that he wanted for us and I was OK with that." At times worried that her story would not contribute to the research, I briefly explained the socialization aspect to this research. After realizing that some of my participants had similar childhood experiences, I searched the correlations between childhood toys and interests and found that childhood exposure to certain toys, while seemingly trivial, may contribute to certain intellectual developments (Oksman, 2016).[11] Toys that are usually targeted to boys, such as building blocks and LEGOs help kids develop spatial skills. Research has also correlated higher numbers of men in engineering fields due to their exposure to spatial toys as children (Inman & Cardella, n.d.). Luisa's parents, an engineer father and a mother who studied geography, may

17% of the EU-28 average (Mckinsey & Co., 2019). This study was taken from the main companies in Portugal as of 2018. Further information regarding these statistics: 13% of management positions are held by women, 2% on board of directors (Matos & Jerónimo, 2017);

[10] See also, the Time's article on how "Girls beat Boys in Every Subject, and They have for a Century"

[11] For those with further interest in cognitive and social developments amongst gendered toys: S.B. Ehrlich, S. C. Levin & S. Goldin-Meadow, "The Importance of Gesture in Children's Spatial Reasoning," *Development Psychology,* Vol. 42, no. 6 [2006], pp 1259 – 1268.

have never considered the implications of these small acts, but little did they know this would have contributed to Luisa's success and interest in math. Thinking back on her childhood, she states that her parents were never the kind of parents that would associate gender to certain things, "I didn't grow up in that kind of environment so, maybe that also helped."

Fast forward to high school, it was only during grade 12 where Luisa realized she had chosen a field that most girls were not choosing. Knowing she wanted to go to engineering college, she chose physics and was in a class of two girls and over twenty boys. In her mind, she knew that most people in engineering college would be men, but that did not stop her from pursuing exactly what she wanted to study, "I have really good friends that are boys, so I never thought that this would be a nightmare or that it would be more difficult because of gender."

Luisa studied applied mathematics and computer science and her thirty-person class consisted of approximately ten women and twenty men. If we consider the numbers in STEM majors, women are more present in subjects like math and life sciences, such as biology. It is in certain branches of engineering, such as mechanical and electrical, as well as computer science, where the numbers are heavily skewed. During her masters degree at one of the top computer science universities in Europe, she was one of three women in a class of over a hundred men. I asked about her experiences throughout her academic career, if she had ever felt like leaving or switching her major. It was rather the level of demand and intellectual challenge that at times made thoughts of changing degrees cross her mind. However, it was never because of the overtly masculine environment – "that didn't affect me in a positive or negative way, it was something that, *it is what it is.*"

Between graduating her bachelors and starting her masters degree, Luisa worked for two years at an IT company. There were two female engineers and the rest of the company of approximately forty people, besides the other women working in the HR department. At her second job, there were two women in the company of about fifteen people. One of the reasons I had decided to take this as my subject of interest was due to the buzz around tech in Portugal. By 2019, three web summits had been held in Lisbon, and Portugal was frequently ranked as a top country for women to work in tech (Honeypot, 2018) (Appendix A). Alongside this, the start-up and entrepreneurial scene in Portugal were also booming (Farmbrough, 2018).

However, all my participants were shocked to hear these reports and stated that they were usually the only female on the team. Upon further investigation of these studies, I realized that all workers under ICT and people working under "tech" companies were included in these studies. Many outsourced companies had made their way to Portugal, attracted by the country's cheap eurozone base and low salaries, the studies included all workers under the label of a tech company (Frayer, 2014). When it came to women who held vital technical positions, usually with a background in STEM, the numbers are much lower, and unclear.

In the last ten years of her career, Luisa explains that it was completely normal for her to be the only women present in a meeting. During these meetings, she says that she feels that the men aren't as comfortable with saying certain jokes or comments, that sometimes they stop in the middle of certain sentences because of her presence, "they feel less comfortable talking about some kind of particular subjects when there is a women around, however I feel that they do so before I arrive."

Luisa doesn't recall working with other women on her team, perhaps in her department but never on her team. She explains one instance when an opportunity arose to be promoted to a better position but that it was given to another male colleague, "since the beginning I thought that it would fail. She was right. Promotions or pay wages based on seniority or meritocracy is often debated. In Portugal, seniority is highly valued. In their study of poor management performance, Cunha, Vieira, Rego and Clegg (2018) found that the lack of meritocratic logic is lacking in Portugal, and that the lack of transparency was the most damaging legitimacy issue – "lack of trust in performance assessment was due to a sense of favoritism or nepotism that, in their words, is prevalent to Portugal's particularistic culture" (Brewster, 2007, as seen in Cunha et al., 2018: 681). Whether or not gender can be seen as an impediment and as aware as Luisa may be, she states it would be difficult to really know or prove otherwise. The perceptions of whenever one feels discriminated based on gender, race, ethnicity, age and other social factors are hard to prove when not overtly said, and again why it is important to take into consideration storytelling methods.

We continued talking about the changing family dynamics in Portugal and how this could affect women's labour patterns and their work-life balance. Many of the participants witnessed both

parents working as women across the globe were increasingly entering the labor workforce since the 1970s. In Portugal this started earlier – between 1960 and 1974 when the mobilization of young men to the colonial wars and high levels of emigration cause sever labor shortages, women entered employment (Tavora & Rubery, 2013: 224). Stories of mothers "doing it all," and working the double shift were the undisputed norm. Luisa recounted her own observations between her friends and society in general, finding that although within her group of friends a more egalitarian household was present, the broader population continues the same patterns from her parent's generation – "I think women have a part of the guilt in this problem…if women keep doing what the other one is not doing, things will stay that way forever." Women need to reclaim more power, in their decisions and in their choices, rather than internalizing certain cultural and gender norms, a stance I also believe in. It also become a common observation that all the women in this study had similar views regarding the work-life balance and shared household responsibilities – *mulheres ponderosas*, as I like to call them.

Regarding parental leave, Portugal doesn't separate maternal or paternal leave, and groups both under simply parental leave (European Parliament, 2016). It is mandatory for women to take six weeks off postnatal, and a parental leave of 150 days can be shared between the mother and the father, 120 if only the mother assumes it, four months fully compensated (ibid.). There is also a possibility of an extension up to a year, and unsurprisingly so, even with a generous welfare system, it is uncommon for fathers to take the leave. In an article by *Público*, only 32% of Portuguese men took paternal leave, stating that that it was *mal vista pelos colegas* (badly viewed amongst work colleges) (Lusa, 2018). Luisa tells me a story between her and a male colleague on her team:

> you know one really sad conversation I once had, I was on a team, and I was leading a product inside that team and I was working with a guy and we were discussing parental leave and so we were working on the same product and I have more responsibility than him. He said that there is no way that I can take the parental leave, how can I be away from here for more than a month? And I said, I am a woman, if I get pregnant, I would stay out of here for at least 4 months, how can you say this will not survive without you, but the project can survive without me, right?

Gender equality and work-life balance are not explicitly present in organisational documents and policies, nor do employers have specific protocols on it (Sümer et al., 2008: 369). It can be

seen as a risk that women take, asking for the full year of maternal leave, as they are not completely protected under the law when they return. Although Luisa has no children of her own, she tells me a story about taking time off work to tend to her grandfather. Flexibility is another factor to consider within the work-life balance and is linked to job satisfaction and happiness. A study done by *Polar Insight* found that Portuguese workers have little flexibility and lags behind the rest of Europe (Polar Insight, 2018).

Luisa gained flexibility by proving herself, working on weekends and after normal working hours because she enjoys her line of work. She doesn't believe that she would have been given the same sort of freedom had she asked in the beginning of her career. Alongside this, she comes into the office at half past nine so to fit in her morning workouts. Flexibility and work-life balance is almost always contextually based, depending on the profile of the worker, company and type of work. Considering the level of responsibility Luisa has and the structural arrangements of her current workplace, I felt that Luisa was satisfied within her line of work and her company. Despite being one of the only women present in both her academic and working careers, Luisa is an example of how one woman navigates through what is often seen as a "masculine culture."

When studying the under-representation of women in tech we are often overly focused on the bad. We hear of the stories of women being discouraged from entering STEM fields and those who have left their careers. We sometimes gloss over the positive stories, of women who have satisfying careers and have not been dismayed by the male-dominated profession.

"I want to be an engineer"

"Do you want to be pretty? Or do you want to be an engineer?" (*Quer ser bonita? Ou quer ser engenheira?*) Beatriz tells me about hearing this running joke as a little girl between her father's male engineering colleagues around the dinner table. The joke went something like this: When God put women on this Earth, he asked her: do you want to be pretty or do you want to be an engineer? To which Beatriz answers, I want to be an engineer. "These kinds of jokes, touched me at that time, so for me gender, and gender issues, since a young age, *vieram comigo*" (stuck with me).

Having done some of her own research with a small team of passionate women in Northern Portugal, their focus has mostly been on women in engineering. She shows me infographics and explains to me the distribution of gender between the different engineering majors, as well as the number of applicants and drop-outs in all the engineering schools across Portugal. With some universities witnessing a decrease in the number of women entering engineering in recent years, Beatriz states how the very low numbers scare her. She tells me about a recent article by the International Monetary Fund (IMF) *Gender, Technology, and the Future of Work* which predicted that 180 million women's jobs worldwide would be replaced by automation in the next twenty years (Brussevich et al., 2018). If women are already underrepresented in fields experiencing growth, such an engineering and IT, the digital gender gap needs to address the technical and hard skill gap – "we need to be more successful in bringing in younger generations to engineering and technology, and by technology I mean computer science, new innovations and disruptive skills you need for the future."

Beatriz has spoken in various conferences and events around the country, hoping that she can, at the very least, be the face adolescent girls see, that yes, women really do exist in engineering. And not only do they exist, they also lead very satisfying lives as professionals in the field.

Like Luisa, Beatriz also recalls playing with LEGO's and laughs about how her barbies were at the top of her shelves collecting dust. Her mother is an accountant and a professor who ran her own business, leading Beatriz to spend most of her time with her father. Her "playground" as she would say, was with her father, often accompanying him to his workplace and playing with more gender typical boy toys. As a teenager, Beatriz had the opportunity to study at the Glubenkian Orchestra which forms part of the Calouste Gulbenkian Foundation, a philanthropy institution located in Lisbon, hosting some of the most promising talents in arts, science and education. She recalls a story during a history of music class, her professor informs the students how the orchestra and the theatre were all dominated by men and that only when men went to war that women took their places – "I will never forget…it gave me the early impression that we just go to the jobs when men don't want it anymore, like in the early years of computation." As the previous section mentioned the history of computing and how programming began as a

feminine field, women's accomplishments are easily forgotten, and their visibility, often unrecognized.

For five years during her integrated master's degree, Beatriz had just one other female colleague in a program of around ninety male students. Beatriz studied electrical engineering which is considered the most difficult engineering major with the lowest number of women present. As Beatriz and other participants informed me, some branches of engineering attract more women than others, and that statistics merely show the number of women admitted into engineering programs, as many of them drop, some as early as their first year, with official statistics not recognizing the actual number of graduates. This largely undocumented statistic of women dropping from their program is what sometimes makes it difficult to research or find this specific population. However, Beatriz remembers all the women who have entered or transferred from the program throughout her five years, "I can recall all their faces, there were so few of us."

Animated stories and frequent bouts of laughter during our conversation, Beatriz is light-hearted and well humored. All her experiences, albeit always in a male-dominated environment, from academia to work, were always jovially expressed. Prior to starting her PhD, she started a company with her now husband and father and stated how she was always considered as either the secretary or an administrative staff and never the engineer. When she explained she was an engineer, they always thought she was either a management or production engineer, the fields more associated to women, "they never matched my face with engineering!" she exclaims while laughing. In another instance when I asked her about the talked about "bro clubs" in tech and if she has ever felt excluded in her workplace, she tells me, again after regaining her composure from laughter, "well, I have a funny way to react to these things, when I see it, I normally do this, say they are talking about going out, just like the bros together, I just go there and I say, 'I will go too!' Even if I don't like it, or if I don't want to go, I just go, 'I will go too!'"

It was both refreshing and heartwarming hearing her stories and understanding more of Beatriz's optimistic and bold nature. When I first started researching my subject matter, I was constantly reading about women giving up and their complaints about the unwelcoming environment which led many to either switch programs or change fields. Emily Chang's *Brotopia: Breaking up the Boys' Club of Silicon Valley* was just released in 2018 and became a US bestseller. The

book gained international recognition, was frequently referenced in news articles and was a hot topic all over the internet. This "toxic environment" and the masculine culture of tech was essentially being referenced in almost everything I was reading. Some of the behaviours from "humour," which may not be meant to intentionally offend women, to being outright hostile, the underlying question to this was, "how can we change tech's 'bro culture?'"

For Beatriz it all seemed a bit more simple, she tackled it her own active way, "you just have to break these kinds of things in some ways, so I just do this…It's not easy to see things are wrong and we have to change the way we react, but when I identify the issue I just come up with a strategy...I think people just don't notice these things, I don't think they notice I was being excluded so, you know, if I don't speak up how will they know I'm excluded?" I hear her dog bark, "*Ivy, como é*?" Perhaps it's a sign that Ivy also agrees with her mother.

She tells me how her male colleagues react, that at first, taken by surprise, is later followed up by an "okay yes, come with us, come with us." I replied by saying her strategy seems successful and that they don't react in negative ways to which she answers, "yes of course, I feel lucky in that case, but maybe I would try another strategy to solve the problem, in other ways." *Luck*, the narrative women often use to attribute to their success,[12] or perhaps Beatriz's strategy does work, at least for her and in her workplace. However, she got me thinking about something that we seldom hear, that is, how one reacts or perceives of certain actions and behaviours. What could we learn from Beatriz's reactions? Do women have the potential to claim more power in male-dominated environments by their own will without waiting for structural and cultural changes within tech?

Faced with plenty of adversities throughout her studies, Beatriz recounts some other experiences, like the time her supervisor in *praxes* told the other students behind her back how he saw her breasts, "imagine, five years, ninety male students, I was with them all day, imagine myself *nas praxes* and he said to everyone he saw my breasts…what a ridiculous thing to say! I was every time with a t shirt up until my neck." *Praxes* is a Portuguese student tradition, having

[12]Women are more likely to attribute their successes to external factors and their failure to their own lack of skill, while men attribute failure to bad luck. See Bradshaw's *Why Luck Has Nothing to do with it* https://www.forbes.com/sites/lesliebradshaw/2011/11/08/why-luck-has-nothing-to-do-with-it/#8e3d3e24f982

been passed down for several centuries and practiced around the country, it usually involves different types of jokes and rituals. It can be considered as university initiations or ceremonies to welcome groups of students, and in this specific instance, Beatriz was talking about doing pushups while weary of other's looking down her shirt, "it was hard you know, but I was successful in managing it, but I know that some girls, it's more easy to give up."

Aside from the male gaze of objectification, Beatriz also heard her fair share of discouragement, such remarks like "why do you put yourself in that situation? Women are the victims in engineering, they get discriminated," from her school colleagues, "to us, you are like a man" and even from her own friends stating things like "are you crazy? Do you want to be in an all-male environment?" These sorts of remarks can be labeled as microaggressions, and they can be considered as everyday sexism or racism, are more elusive than overt discrimination, and they usually go unnoticed and many times are unintentional (Barratt, 2018). So, for example, if we believe someone doesn't fit into a certain setting, due to a social or physical factor or a combination of such, this is one form of microaggression. If we believe women aren't fit or suitable to overcome certain situations, this can also fall into the category. Microaggressions can fall under the umbrella term of discrimination and this again is all dependent on both parties of the dialogue and whether one perceives of it as such. As Beatriz states, "it is hard for me to say this but, the majority of women don't know what discrimination is."

Had Beatriz picked her first choice of career, we would have lost another great engineer. "My first choice was medicine in high school, I took Spanish classes to take medicine in Spain because all my girlfriends went to Spanish classes, all of them, and my last option was engineering." Beatriz explains how if she would have followed the crowd, that is, her girlfriends and what was more expected of her from friends and family, she would have made the wrong career choice, "I faint with blood! Sometimes society doesn't know what's best for you." This is exactly what we need, people from all different backgrounds breaking the mold, for if we were only to choose where we *seem* to fit in better, things would never change. As Beatriz said, *em vez de me dar força!* (rather than giving me strength)" as a reply to her friends' disbelief in her career choice in engineering, encouragement is just one starting point to attracting more women in STEM and in tech industries.

As our conversation was coming to an end, I wanted to ask Beatriz where she thought the first attraction to STEM subjects started, "it starts in the family, in the home and with teachers, our first role models." She explains how gendered toys can harm spatial reasoning and rationality within girls in the beginning stages of development and may be correlated to why boys are more prone to technical areas. Her second suggestion was reworking human resource departments within the companies themselves as they are biased with recruiting people, "when you don't know the gender of the person when you are recruiting, women are more likely to be hired." For example, a study by GitHub, a large open-source software community which allow for developers to write codes for someone else's project, found that out of approximately 3 million requests, women were approved at a higher rate than code written by men when their gender was unidentifiable (Wong, 2016).

Beatriz's third recommendation was – apply! According to a study by Hewlett-Packard, women only apply to jobs or positions if they meet 100% of the qualifications while men apply when they meet only 60% of them (Mohr, 2014). Also known as the confidence gap, the outcome is inaction on the women's part and when women do act, it is because they're being forced to (Clark, 2014). Earlier during the course of the week we had spoken, Beatriz overheard two interns at her workplace talk about applying to data analytics jobs. When Beatriz encouraged the interns to apply, their responses were "we don't have all the requirements and I'm not good at this type of programing language." Beatriz told me that she purposely stayed by the interns' side while they applied to the job, "I was like, you are going to apply, now! Don't be part of the statistics, please!" In the same study, when women do act and apply, they perform just as well as men do (ibid.). In addition to this confidence gap, women are also hesitant when it comes to negotiating their salary offers (Bowles, 2019).

At times unsure as to where my dissertation would lead me, the usual demise of every master's student, Beatriz assures me that reading about strong personalities about women in tech is both good and helpful. After thinking about what she said, I realized that every woman I interviewed had this very same energy of confidence and vigor and perhaps these are the stories we need to hear more of. She thanks me for conducting this research and insists that gender issues need to be spoken more of in Portugal.

The class delegate

During her recess breaks in high school, Claudia would have the habit of going to the library in the search and hope of finding news about women's soccer in the local newspapers. One day, she did find an article, excited and happy upon her encounter, she realized that it was an opinion column criticizing women's soccer. The author of the opinion piece basically stated things such as, women's soccer sucks, and that women should be at home and taking care of the family. "At that time, I was so angry, I wrote back to them and they published what I wrote as a reply and I started to see that there are some tools, if we use them in the correct way, we can try and diminish a bit of this eternal gap."

Women's soccer and the media and news coverage surrounding it are some of the beginning forces behind Claudia's interest in gender and technology. After realizing that there was essentially no coverage on this topic, Claudia decided to join the internet club at her high school, creating amateur websites for every team she played in, eventually evolving her web development skills over time. She now has a PhD in electronic engineering and is a team leader of over twenty software developers. Claudia presently works at a company with a strong focus on diversity and a large international presence where there are several female group leaders – "when I look around and I see the group leaders, I see several women, this is inspiring for me and I hope I will also inspire all the girls in the organization to reach this level of leadership in the tech world."

For Claudia, she saw her participation in soccer and a sports team, with its competitive edge and routine practices, as a later advantage during her studies and work environment. Claudia was my first participant who had mentioned sports as a hobby and as an influential factor in both her adolescent and adult life. Curious to see what sort of impact this has on women and girls, I found that the team environment of sports can be positively related to adolescent girl's self-esteem (Pedersen & Seidman, 2004). In another study by Steele (1997), he suggests that adolescent girls start to disidentify with sports the same way as they do with math and sciences during their adolescent years, mainly due to the pressure to conform to traditional gender stereotypes (as cited in Pedersen & Seidman, 2004). The findings from the previous study argued that girls who can resist the pressure to conform to traditional gender stereotypes, like

team athletics and excel in this domain, portray more positive self-esteem developments than girls who are not offered or participate when given the opportunity (419) - “I feel that I could apply that [soccer] to everything.”

Claudia followed the advice of her older brother who also pursued an electronic engineering degree. Studies have shown that parents and/or older sibling in STEM related fields are considered a significant influence amongst those who pursued STEM (Tan & Yun, n.d.). Being the only woman present in a class of sixty men, Claudia finished her master’s degree in five years, a feat only achievable by approximately 20% of the class at her university. She was also elected as the class delegate and tells me about her research interests explaining how she “crosses technology with the human part.” Commonly known as “compassionate technology,” this is an area of focus in which technology is developed for the intentions to alleviate social problems. In many instances, compassionate tech is linked to such areas as healthcare technology, as only one example of the many other growing ideas that solve real life problems. Engineer and consultant Lindsay Tabas wrote an article about how women are more focused on human problems and how negativity often overshadows the success of women entrepreneurs in tech (Tabas, 2019). We should instead focus on the strengths, the ethical, moral and passionate side that women bring. I remember speaking to a colleague about this, how many younger girls don’t know what engineering could produce and if they better understood this social aspect to it, they could perhaps be keener on entering the field.

Claudia tells me a story about a boy who liked ballet but his teacher was treating him differently which made the boy feel he didn’t belong and eventually gave up on it, “and that is what happens with most girls, they feel they don’t belong and they give up.” I asked her if she had ever felt the same way and after letting out a deep sigh she goes “there was for sure the feeling of not belonging several times, it’s tension from the teachers, because I was the first to get questioned, well, I was sitting in the first row, but the feeling is there, I just fought it, as much as I could.” She tells me that her extroverted personality served as somewhat of a protective shield during these discomforting times.

Having the international experience of working with colleagues of different countries, Claudia recounts her experiences within the different working cultures. When I asked her if she recalls

any specific situations or dialogues where she feels her gender has been brought up, she answers "I would say that is *quite obvious* already." She gave me the impression that my question was self-evident and that these narratives have become rather normalized. Although the company where Claudia works has a strong focus on diversity, the gender balance is much more apparent in the German office, in comparison with the Portuguese office, where she leads three teams at the moment. She notes the conversations between each of the settings, and while she explicitly stated how she doesn't like to generalize, she notices that Germans are more reserved about speaking on private matters, while an older colleague at the Portuguese office, at their first encounter asked her something along the lines of "aren't you thinking of having children, or a family?"

It is much more expected from Portuguese culture the narratives surrounding marriage and family formations during the latter ages of one's 20s. However, Portugal has seen drastic changes in regard to traditional family forms and fertility rates. Aside from women's labour force participation in Portugal being above the EU-25 average for the past two decades (Dominguez-Folgueras & Castro-Martin, 2008: 1521), and its portrayal of "traditional" family patterns, Southern Europe has, since the 1990's, seen some of the lowest fertility rates (Kohler et al., 2002, as cited in Dominguez-Folgueras & Castro-Martin, 2008: 1515). According to the independence hypothesis, women's advancement in education and employment has some effect on the rate of entry into marriage, with many preferring cohabitations and are open to having children outside marriage (ibid.: 1538). In addition to this, prior studies have also shown that societies with inconsistent levels of gender equity in both public and private domain are where overall fertility is lowest (ibid.). Another study by Gonazález et al. (2006) found that since consensual unions do not entail significantly more egalitarian relationships and higher male involvement in caring activities in Southern Europe, cohabitations is not attractive enough to "compete" with remaining single among highly educated women (as cited in Dominguez-Folgueras & Castro-Martin, 2008: 1538). Overall, women in Portugal are experiencing higher levels of social and economic autonomy in comparison to its older generations. The changes we are witnessing, and considering the demographics of women opting out of or postponing marriage and childrearing, have greatly impacted their labour patterns. In my opinion, it is only

a matter of time until we will see material changes to this dialogue, and for the taboo to be lifted when women do not get questioned with their life choices.

Aside from speaking on her perceptions on the differences between Germany and Portugal, Claudia spoke on her observations within the company's India office. She tells me that it is much more common and acceptable for women to pursue a technical degree as it protects women since they can work indoors, saving themselves from the usual street harassment in the country (Madgavkar et al, 2018). I found that in India, 35% of technical specialists are women, in comparison to the UK (17%) and the US (20%) (Vigo, 2019), and that classrooms in India consists of more than 50% women (Clarke, 2018). What is paradoxical about this situation is that, the more gender equal a society is, the fewer women there are in STEM (Khazan, 2018). In a recent study, Stoet and Geary (2018) found that women choose these fields as it is the best path to financial freedom (as cited in Khazan, 2018). What this means is that in places we deem the most progressive in gender equality standards, such as those in the Nordics, there is a bigger gap with the amount of women present in STEM because these women have the liberty to pursue other passions and worry less about their wage (ibid.) (Appendix A, Figure 7).

Although this comes from a labour economist perspective, this may weaken some of the theories that strong welfare systems and state policies allow women more opportunities within the labour market. In other words, the push for more gender equal societies in a structuralist viewpoint may not always be the solution for more women to participate in tech workplaces. Looking back to some of the theories I had elaborated on in my theoretical framework, the study on this 'gender-paradox' could undermine some structural criticisms in which some women do not have the same opportunities based on how much of their time they are able to spend on academic or financial pursuits (that is, when we focus more on private/public spheres and daycares, etc).

As a team leader, Claudia states that when she notices or hears something that she believes is not valid nor compliant with the company's values concerning diversity, she instinctively shuts it down as a way to be fair to all her associates. However, prior to earning her leadership position she was not "always comfortable fighting all the time, say for example, you cannot say that, or basically, blocking these kinds of conversations." Although only one woman is present in her twenty-something team, a discrepancy she finds unfortunate, she tells me it is extremely difficult

to hire in the domain of embedded software development. When I asked if it was due to a lack of skill, she made it very clear to me that it isn't about the lack of skill but rather the lack of women pursuing this specific university degree. Notice the difference here? If technical skills are acquired through formal education and training programs and there is a lack of women pursuing university degrees, that does not entail that women have a lack of skill, but rather, choose not to develop these abilities.

In Claudia's perspective, children are conditioned very early in their lives and learn that certain things are not for their gender:

> we don't give kitchen sets to boys, and we don't give *futebol* balls to girls, we are telling them those things are not right for them…it is seen as 'special' when a boy chooses ballet, or when a girl chooses robotics. When you grow up learning this you choose different paths, go in other directions, the fault is from adults and society, framing and shaping children… the lack of women pursuing this university degree is because they don't choose it and because they were raised like that.

Therefore, the narrative on the lack of skill should shift its focus rather on women not pursuing the technical skill and why that is. The way it is sometimes framed makes it seems as something *naturally lacking*.

When we talked about the work/life balance amongst women in this field, Claudia mentions an observation from the owner and founder of InoCrowd, an open innovation platform. This technological platform connects businesses to researchers, where many of these researchers usually take on a project on top of their regular line of work. It was found that there aren't many women willing to take on extra projects due to the balancing of time dedicated to their children, their family and the household. Accepting extra projects could potentially lead women to a jump in their career and take on leadership positions. This leads to a 'vicious cycle' - women do not accept more responsibility and leadership roles because they think they won't have time for their private life, prevents them from moving up in their career and creates less role models, or visibility.

For Claudia, if there were more structural ways for women to organize their lives accordingly, women could take on more responsibility and this has to be organized and supported by the company. As part of her leadership position, she needs to be aware of how long her associates

are working as a way of ensuring that employees are taking care of their health. The new era of diseases such as the 'burn out' or work-related stress is often the result of overworking oneself. Claudia explains that at her current company, assuring a sustainable work/life balance is a paradigm to their values, however, it is not always the case with other employers.

Claudia was the only woman who had replied to my Facebook posts when I first started looking for participants. It was apparent, both in this act and during our conversation that she held strong views and beliefs not just on the underrepresentation of women in tech but also regarding the role women have in society – "her voice is heard, she is part of the vision, she is at the table giving facts and giving arguments, being part of the discussion and being seen as equal." There is a much bigger picture to be understood here that goes far beyond women's career choices.

"This is my art"

> …the considered civilized world, because, maybe it's everywhere. It's mainly a patriarchal society, since forever, so the world was, even in stories right, it's always the male hero, it's always the male accomplisher, it's always the men that do the action, and the women are saved by them. It's really deep down in our roots, in our history, it's been there since forever, I can't even think of a time where the balance was even. It will probably be the same amount of time to balance it out, so we are doing some progress, women in general and also men, cause without them there's no way we can do it, it's not just IT…

Rita starts off our conversation with the above statements, setting the tone of how the rest of our conversation would go. Rita is a single mother and an IT developer at a small-sized tech company, having worked for almost twenty years in tech, switching companies every so often. "I caught the internet boom in Portugal, I was at the right place at the right time, so I put college on hold" referring to the time she was offered her first full-time position at a company located just in front of her university. This was during the 1990's when the world wide web was spreading across the globe and created a large demand for IT professionals – "I can tell you I was very fortunate."

"I have been working with male colleagues since forever" and it was only recently, when looking back at her experiences, that Rita took notice that she was at times, treated differently for being a woman in IT. She recalls instances of patronization, the dismissal of her ideas and

comments from other colleagues and describes to me how such "small inklings of patronizing" often goes unnoticed and that since it is so deeply rooted in culture and education, women either brush it off or it goes unnoticed. "I can tell there were times where, not at the time, because I didn't notice, but looking back I can tell you that for sure, people treated me differently because I was a woman and again it was something that I never talked or felt, until I looked back and because of that now, I am more sensitive to it, I can tell on the spot. It's very subtle…it's just something that happens." Despite this, Rita assures me that she loves what she does and that the satisfaction she gets from her work overshadows any sorts of issues that have been brought up in the workplace – "it's really important to like what you do, something that you created, this is my art."

A self-proclaimed 'science geek,' Rita recalls memories of her childhood, building things, solving puzzles, picking stuff apart and putting them back together and reminisces about the Spectrum 48K computer her parents bought for her older sister, an 80's classic – "you had to a connect a radio to the tape…it took about half an hour for the game to load and you would play it for ten minutes before the computer got too hot then you had to disconnect it." Rita's mother worked at a bank that had a syndicate offering workshops for families with computer science being one of them. Being too young for the workshop herself, Rita's older sister attended, learning how to draw circles and boxes using basic computer language while Rita watched in awe - "still at that time I was only interested in playing the games." According to a study by Blumberg & Sokol (2004), video games often provide the first opportunity for children to interact with computer technology and might influence information processing skills, such as those pertinent to spatial ability, and in turn, have implications for more complex computer use (Goldstein, 1994: 151). However, Rita states that she didn't have much of a skillset for computers in high school, admitting that she even flunked once in computer science – "it was because I didn't have a computer of my own to practice on" and only concretized her interest and skills during the first few years of college – "I knew computers were the future, and after a couple years in college I just knew that was what I wanted to do…"

When Rita put her graduation on hold to pursue a full-time job, she explains to me that in her area of expertise, it is acceptable to do so since developers are constantly learning in IT and

since technology is frequently changing. To be a successful developer, one must keep up with the dynamically changing field so, in some ways, not *everything* needs to be learned simply during your university years; anyone can learn how to pick up a new skill – "it's something that, I believe anyone can do." Often times, people may get discouraged when realizing that they weren't as talented or as skillful in a certain technical area as initially hoped. Sometimes considered as "the talent myth," this issue was raised by Jacob Kaplan-Moss, the co-creator of Django. In his presentation at a PyCon 2015 event, he stated how the myth of the "genius programmer" is extremely dangerous because it sets the entry threshold excessively high, scaring a lot of would-be-programmers away (You, 2016). Jacob labels himself as a "mediocre programmer" to steer away the misconceptions of all programmers being naturally talented. His argument goes something like this - using the bell curve which can be distributed to any skill or activity that can be measured, the overwhelming majority of people are average, occupying the middle area of the curve. The thin line on either side of the curve represents a tiny minority of people who are either very good or bad (or what Jacob calls, "sucks or rock stars") and is the area where we heavily focus our attention when it comes to programming. He asks and compares this bell curve with that of marathon running, why do people not use the same narratives of naturally gifted and extremely skillful with all the participants who run a marathon? In addition to this, why does no one picture a typical marathon runner the same way they do for programmers?

This "talent myth" in programming, according to Jacob, haunts people from entering and even those already in tech and contributes to some of the problems within the industry. As a final remark, he states that the narratives around programming and being a programmer should include all those who are, simply average – as Rita told me "you don't have to be good at everything, but if you manage to do the job and be proud of it, that's good enough for me." When she was asked to do a job interview with a potential employee, she also applied the same line of reasoning, "I think the most important thing you can ask is, if you like what you do, it doesn't matter if you're good or not."

Speaking on the generational differences between women's labour patterns, Rita, who thinks back and admires her mother for sticking to the same job for almost 40 years, gave me a heartfelt

talk about how limited women's career possibilities were just several decades ago – "she didn't like what she did, but she had to do it…fortunately because of her choices, me and my sister had the ability to choose what we could do with our lives." Recognizing these efforts and differences between eras, women have much more autonomy and control over their lives.

Taking me on a journey to the past and telling me stories about her mother, who, having grown up in Mozambique during the time of the Portuguese dictatorship, was educated differently and offered more freedom than those on the mainland. Her father was from a small village next to Aveiro and, like the rest of the Portuguese male population at that time, had to serve the regime's mandatory military conscription. The two met while he was on his way to the war and when he went to pick her up during one of their dates, she wore lipstick and caused a bit of a stir.

Wearing lipstick may have historically been one of the most powerful symbols for women (Idacavage, 2018). It had a tumultuous past and the lipstick taboo was often associated with having questionable morals. As one way for women to oppose the cultural stigmas of their time, the simple act of wearing lipstick was seen as a rebellion. "My father said something like, 'I'm not going out with you, you have to take that off' and my mother goes, 'then I'll go out with my friends,' she dismissed it right away." This simple story illustrates how people, across different timeframes and contexts perceive of the gender ideology – what is deemed appropriate behaviour and what is not.

Studying women's labour patterns in Portugal is never complete without some historical analysis. In their article, Tavora and Rubery (2013) state that women's labour market integration is primarily shaped by the gender culture and its interplay with institutional conditions (222). Under an authoritarian political regime that persisted until 1974, the family economy in Portugal was dominated by agriculture and strong catholic traditions (ibid.: 223). In light of Salazar's right-wing dictatorship and idealized male-breadwinner model, Portuguese women have long been established in core labour market segments (ibid.). Integration preceded the development of supportive welfare policies and even after four decades of high full-time employment among women, there is still a strong support for traditional gender roles (ibid.: 225). The authors believe that the gender culture was inherited from the old regime and has been kept in a modernized arrangement (ibid.: 228). Debates and opinions on Salazar's legacy still remain, however, Rita

disagrees with this aspect – “we are not behind because of what happened during the dictatorship, we are conservative in our way of life, if something works, why change it? Society is changing, in Portugal it comes later, but it will come.”

As the only mother interviewed in this study, and on top of that, a single mother, I was curious to know more about how Rita maintained her work/life balance. She tells me about the criteria used when deciding on her most recent workplace– placement, working hours, location and the project itself. She chose a company that granted her some flexibility so to be able to drop off and pick up her daughter during the required hours and account for time with the commute, “I can have help from my parents, but I don’t want to put that responsibility on them, sometimes they help but it is the exception not the rule, she is my responsibility.” Due to the high demand for workers in IT, Rita had many options within the field, stating that “maybe in other industries there isn’t as much, but here I can choose.”

Until very recently, she never thought about how people may experience tech differently and seemed, at times, hesitant on the discussion about diversity of women in tech. I introduced the issue of biases in technology and how it is believed that diversity may combat them alongside other reasons in attracting more women into the field. Following our conversation, we exchanged a few emails; Rita wrote an email that said perhaps with more women in IT, the feelings of patronizing, condescending or dismissive behaviours may fade and that if there are more women interested in IT, or if we can light up that passion, it would be great – “I believe that nowadays, there is little to no excuses to not have more women in IT, since there are options available for them to chase their ambitions. What may be still missing is more role models or better information at young ages, maybe during high school, which is where you probably make your most important decisions, career wise.” And with this response, Rita gave me the impression that this project had, at the very least, generated some reflection on the current situation. After all, my goal is to spark some awareness and dialogue on the issues surrounding women in tech, even if it’s just amongst a small number of people.

Chapter 8: Discussion

The purpose of this study was to explore the lived experiences of four women working in tech in Portugal and how each of them navigate through, and perceive of, the male-dominated industry. After assembling each of their narratives while also weaving in social theory to their stories, this study aimed to understand each woman's reality regarding how they experienced their academic and professional careers.

The theoretical framework considered perspectives regarding the underrepresentation of women in STEM and in tech workplaces. This literature described the reasonings to which there are fewer girls and women interested in studying these disciplines, and the structural and cultural barriers related to tech, and labour markets in general. Drawing on their narratives as the core of the empirical research, this chapter will present a brief overview of findings for the following research questions.

(1) What is the discourse of women working within tech industries in Portugal?

(2) Can we find any differences in Portugal regarding the digital gender divide in comparison to previous research on this topic?

Several themes emerged from the four participants which will be presented prior to the attempt in answering these questions. Since a thematic analysis was not part of the initial design of this study, no strict coding or thematic process was used. These were patterns that I had noticed during the interviews and during the recreation of their narratives. Some of which are as follows:

The token woman

All women expressed being one of, if not, the only woman present in their university classrooms, workplace teams or being the only women present during meetings. Considering the lack of formal statistics of women who occupy technical positions in Portugal, as well as the lack of formal statistics of women who graduate from specific disciplines, this pattern came as a revelation.

In light of the favourable statics on the number of women in tech in Portugal and the increasing amount of STEM graduates (see Appendix A), the participants stated otherwise and with disbelief when mentioned these same statistics. After careful examination of the secondary

sources of data, it would be recommendable to separate disciplines away from the umbrella term of STEM so to not conflate the actual numbers. Furthermore, the situation of 'women in tech' would be coherent had it separated women in technical positions and not merely working under the term of a tech company.

Early interests

Early interests for technical disciplines and fields were expressed when recounting their experiences as children and adolescents. By high school, all four women were already keen on pursuing technical university degrees and chose their courses in preparation for their post-secondary education. Interests during childhood and adolescent years were also similar and can be grouped and labeled as more 'stereotypical' boy activities, such as LEGO's, building blocks, remote-control cars, video games and playing sports. Elaborating on this would be outside the scope of this communicative research project, however, these childhood and adolescent similarities in trajectories can be seen as influential to their later successes in academia and during their careers. This may have future implications for research on this topic. Furthermore, family influences, whether one or both parents are already working in the field or a sibling, may be instrumental to their career choices.

Job satisfaction

Contrary to what is being highlighted about women in tech in the theoretical section, all four women display high levels of job satisfaction. The narratives surrounding this topic are often overshadowed by the negative experiences of those in several phases of one's academic or professional career that we often forget about the positive stories. At times, perceiving of the situation in a different light might be useful for future research purposes.

Despite experiencing some barriers and obstacles in their careers, it was clear that all women were passionate about what they do within their workplaces. Their dedication to their work was motivation enough for the subjects to overcome whatever adversity they might have or may encounter.

The narratives surrounding how to have a work/life balance was also revealed as being healthy and manageable. Inconsistent to the theoretical framework, many tech workplaces, at least with

the company policies present in the workplaces of the participants, have fair social policies in place. For example, Luisa stated how she enjoys her flexibility, Claudia explained how her company's policies only allow a certain limit to working overtime, and Rita expressed satisfaction regarding her being able to juggle the demands of single motherhood. Furthermore, the dialogues revolving other aspects of the work/life balance such as domestic duties, are perceived as egalitarian within all the participants. The women also shared similar views on equitable household demands.

The awareness of gender

Since this research project revolved heavily around being a woman in tech and how this identity was navigated in male-dominated places, some women showed more awareness to their identity than others. Less of an awareness does not in any way entail a negative connotation, rather, that some women only noticed that their gender was highlighted after being pointed out certain interactions.

Furthermore, two of the four women that participated in this study were active in the tech scene when it came to drawing more interest and girls into tech. For this reason, their narratives revolved more around the issues of gender equality, noticed more instances of discrimination and used more tactics in the workplace when they perceived of them. For example, Claudia saying "when I hear something that I think is inappropriate, I immediately shut it down", and Beatriz approaching the situations of the 'boys club' are some ways these women enact their tactics. These women are passionate about attracting more women into the field than others, as understood by their narratives.

Others, although aware of their situatedness in the male-dominated industry, are more passive about the current situation. Situations are perceived in a different manner, such as interpreting their token status as being a part of the norm and discrimination may not be identified. Reactions will vary depending on the person. This is a tactic that is considered 'okay' or simply accepting it as being part of the workplace culture.

Discourse is a site for understanding and intervening in the way culture produces, maintains, transforms relations of identity and difference (Strine, 1998, as cited in Langellier & Peterson,

2004 :3). That is, the constitution of a person as a storyteller is a contextual feature of a particular material, social and cultural situation (ibid.). For this reason, I believed that it was appropriate to develop the life-story narratives in order to fully understand the participants contemporary views.

(1) What is the discourse of women's working within tech industries in Portugal?

As the four participants in this study often have the experience of being the 'token' woman on their team in the workplace, how do they negotiate the masculine culture and male-dominated industry, in other words, the dominant discourse? The participants had different strategies when it came to positioning themselves in their workplace. Some women do not question, or see a problem with gender in the workplace, while others are much more defiant about the current situations. Despite how they each viewed their situation, all women showed high levels of job satisfaction and focused on the positive on their line of work.

(2) Can we find any differences in Portugal regarding the digital gender divide when compared previous research on this topic?

A major focal point with this study was to produce a project that was more contextually based in Portugal. It is indicated that women in tech in Portugal face very similar situations as their international counterparts, some of which were presented in the theoretical framework. When considering women's labour patterns as affected by a nations structural social policy, there may be some differences to how one may approach this analysis. This study briefly touched upon the social policies of Portugal and may contribute to future research.

Conclusion

Research on women's labour patterns, employment opportunities and academic journeys are a complex and multifaceted task. Furthermore, while the research on the digital gender divide has been internationally studied, contextually, nation-based research has not received the same precedent. This study provides an initial step to understanding the lived experiences of women working in tech in Portugal.

The theoretical framework was constructed upon theories and literature reviews regarding the reasons for, or the cause of, the digital gender gap. These drew upon feminist, sociological and economical approaches to understand the lack of women in certain STEM disciplines, as well as in tech workplaces. Drawing on this theoretical framework, I provided a conceptual framework which I based my empirical research on, by using the narrative approach methodology, and therefore, a bottom-up strategy. The conceptual framework that was built provided specific direction to which the research would be taken. By linking the concepts of narratives, discourse, and contextually based research, these were how I choose to structure and explore the research problem. Women's narratives were collected through semi-structured interviews and analyzed using an interpretive process. The recreation of each women's story served to stand as a narrative of its own. My aim of understanding women's social reality was to provide more insight on bridging the digital gender divide gap. The findings can inform future research on this topic, in different academic fields outside of communication.

Limitations

The four women interviewed overcame barriers and obstacles that may have existed. These are success stories. It is more difficult to track down women who might have gone into STEM but were discouraged in grade school, high school, college, or even in the workplace, if they made it that far. It is difficult to gauge the level of discouragement among those who had potential but never made it to a tech career. Furthermore, tracking down the women who have also left or switched careers would also be difficult to track. Future research can aim at finding this

population of women to shed a different light on the perceived gap. Lastly, this study was conducted in a qualitative, semi-structured interview approach and the women's narratives were interpreted and recreated. The results of the study might reflect some of my bias as a researcher.

Recommendations

Limited by the small number of participants, I justified using a small sample size that is neither intended to be generalized or representative of the community of women working in tech. Due to the methodological approach, social and time constraints, this small sample size aimed to show only the realities of four women. Future research on this topic may consider incorporating different forms of data analysis to cover a larger group of women.

The lack of formal statistics on the subject include nationwide figures concerning the actual number of women in technical positions, higher management, senior and leadership positions within tech. Furthermore, the current statistics on women in tech do not fully encompass the situation, that is, the number of women who occupy technical positions are much lower than all included under this statistic. In the current formulations, "women in tech" can include such positions as HR, production, and ICT services, to name a few, which all fall under the umbrella term of those working in a tech company. By looking only at these numbers, the perception of parity can be deceiving. Therefore, conceptualizing each of the terms separately under the topic of women in tech, may produce more rigorous knowledge of the field.

Lastly, it is anticipated that this study contributed to the field of organizational communication for insights on, at the very least, the need and benefits of diversified organizations. The theoretical framework, which provided some reasons for the barriers to participation and the gender gap in tech, may inspire change within organizational cultures of workplaces and reform its organizational practices, such as hiring, promotions, and flexibility. There is both a social and institutional need to attract and retain more women not only into tech but other labour markets where we witness occupational segregation. This study suggests that there is a need for reinventing traditional workplaces that allow for progressive policies that offer greater opportunities and create more inclusive working environments.

References

Acker, J. (2006). *Class questions: Feminist answers*. Rowman & Littlefield.

Acker, J. (2004). Gender, capitalism and globalization. *Critical sociology*, *30*(1), 17-41. doi: 10.1163/156916304322981668

Agência Lusa. (2019, June 3). Portugal ainda tem "algum atraso" nas que questões de igualdade de género, diz ministro do Ensino Superior. [Portugal still lagging with gender issues, says the minister of higher education]. *Observador*. Retrieved from https://observador.pt/2019/06/03/portugal-ainda-tem-algum-atraso-nas-questoes-de-igualdade-de-genero-diz-ministro-do-ensino-superior/

Ahuja, M. K. (2002). Women in the information technology profession: A literature review, synthesis and research agenda. *European Journal of Information Systems*, *11*(1), 20-34. doi: 10.1057/palgrave.ejis.3000417

Applerouth, J. (2017, August 15). *Troubling gender gaps in education.* [Blog post]. Retrieved from https://www.applerouth.com/blog/2017/08/15/troubling-gender-gaps-in-education/

Armstrong, D. J., Riemenschneider, C. K., Allen, M. W., & Reid, M. F. (2007). Advancement, voluntary turnover and women in IT: A cognitive study of work–family conflict. *Information & Management*, *44*(2), 142-153. doi: 10.1016/j.im.2006.11.005

Atkinson, R., Kuroe, Y., & Kitahara, Y. (2006). The life story interview. In *Handbook of Interview Research*. *Japanese Journal of Nursing Research*, *39*(5), 81. Retrieved from https://methods.sagepub.com/base/download/BookChapter/handbook-of-interview-research/d9.xml

Barratt, B. (2018, October 28). The Microaggressions still prevalent in the workplace. *Forbes*. Retrieved from https://www.forbes.com/sites/biancabarratt/2018/10/28/the-microaggressions-still-prevalent-in-the-workplace/#605a97709c3b

Bermudez-Silverman, P. (2018). The coded gaze: Algorithmic bias? What is it and why should I care? *The Medium.* Retrieved from https://medium.com/africana-feminisms/the-coded-gaze-algorithmic-bias-what-is-it-and-why-should-i-care-51a416dbc3f3

Björkman, B. (2008). English as the lingua franca of engineering: The morphosyntax of academic speech events. *Nordic Journal of English Studies*, *7*(3), 103. doi: 10.35360/njes.103

Blumberg, F. C., & Sokol, L. M. (2004). Boys and girls use of cognitive strategy when learning to play video games. *The Journal of General Psychology, 131*(2), 151–158. doi: 10.3200/genp.131.2.151-158

Bowles, H. R. (2019, February 20). Why women don't negotiate their job offers. *Harvard Business Review*. Retrieved from https://hbr.org/2014/06/why-women-dont-negotiate-their-job-offers

Bridges, T & Messerschmidt, J. (2017). Joan Acker and the shift from patriarchy to gender. *Gender, Work & Organization*. doi: 10.1111/gwao.12226

Brussevich, M., Kamunge, C., Karnane, P., Khalid, S., & Kochhar, K. (2018, October 8). Gender, Technology, and the Future of Work. *International Monetary Fund.* Retrieved from https://www.imf.org/en/Publications/Staff-Discussion-Notes/Issues/2018/10/09/Gender-Technology-and-the-Future-of-Work-46236

Buolamwini, J. (2016, March). *Joy Buolamwini: How I'm fighting bias in algorithms* [Video file]. Retrieved from https://www.ted.com/talks/joy_buolamwini_how_i_m_fighting_bias_in_algorithms/up-next

Burke, R. J., Vinnicombe, S., Cross, C., & Linehan, M. (2006). Barriers to advancing female careers in the high-tech sector: Empirical evidence from Ireland. *Women in management Review*, (1), 28–39. doi: 10.1108/09649420610643394

CAP News (2019, June 14). Ban on harmful gender stereotypes in ads come in force. Retrieved from https://www.asa.org.uk/news/ban-on-harmful-gender-stereotypes-in-ads-comes-into-force.html

Chang, E. (2019). *Brotopia: breaking up the boys club of Silicon Valley*. NY, NY: Portfolio/Penguin.

Cheryan, S., Plaut, V. C., Handron, C., & Hudson, L. (2013). The stereotypical computer scientist: Gendered media representations as a barrier to inclusion for women. *Sex roles*, *69*(1-2), 58-71. doi: 10.1007/s11199-013-0296-x

Clandinin, D. J. (Ed.). (2006). *Handbook of narrative inquiry: Mapping a methodology*. Sage Publications.

Clarke, L. (2018, May 4). In the 80s, 40 percent of computer scientists were women. What happened? Retrieved from https://www.techworld.com/careers/why-does-india-have-more-women-in-tech-than-uk-3676145/

Clark, N. F. (2014, April 28). Act now to shrink the confidence gap. *Forbes*. Retrieved from https://www.forbes.com/sites/womensmedia/2014/04/28/act-now-to-shrink-the-confidence-gap/#6980f1f05c41

Cooper, J. (2006). The digital divide: The special case of gender. *Journal of Computer Assisted Learning*, *22*(5), 320-334. doi: 10.1111/j.1365-2729.2006.00185.x

Cunha, M. P. E., Vieira, D. V., Rego, A., & Clegg, S. (2018). Why does performance management not perform? *International journal of productivity and performance management*, *67*(4), 673-692. doi: 10.1108/ijppm-11-2016-0243

Dale, A., Wathan, J., & Higgins, V. (2008). Secondary analysis of quantitative data sources. *Social research methods*, 520-535. doi: 10.4135/9781446212165.n31

Davaki, K. (2018, March). The underlying causes of the digital gender gap and possible solutions for enhanced digital inclusion of women and girls. *European Union.* Retrieved from http://www.europarl.europa.eu/RegData/etudes/STUD/2018/604940/IPOL_STU(2018)604940_EN.pdf

deMarrais, K. B., & Lapan, S. D. (2003). Qualitative interview studies: Learning through experience. In *Foundations for research* (pp. 67-84). Routledge.

Domínguez-Folgueras, M., & Castro-Martin, T. (2008). Women's changing socioeconomic position and union formation in Spain and Portugal. *Demographic Research*, 19, 1513–1550. doi: 10.4054/demres.2008.19.41

Economist (2017). The gender gap in science. Retrieved from https://www.economist.com/graphic-detail/2017/03/10/the-gender-gap-in-science

Elsevier (2017). *Gender in the global research landscape*. [data file]. Retrieved from https://www.elsevier.com/connect/3-facts-about-gender-equality-in-science-and-health

Ensmenger, N. (2010). Making programming masculine. In Misa, T. J. (Ed.), *Gender codes: Why women are leaving computing* (pp. 115-141). John Wiley & Sons.

European Parliament (2016, December) Maternity and paternity leave in the EU. Retrieved from http://www.europarl.europa.eu/RegData/etudes/ATAG/2016/593543/EPRS_ATA%282016%29593543_EN.pdf

Farmbrough, H. (2018, February 28). Lisbon 2018: Why startups are booming in the Portuguese capital. Retrieved from https://www.forbes.com/sites/heatherfarmbrough/2018/02/28/all-roads-lead-to-lisbon-why-startups-are-booming-in-the-portuguese-capital/#594cd22f77ea

Ferreira, E., & Silva, M. J. (2016, September). Portuguese research on gender and ICT: The place of education. *2016 International Symposium on Computers in Education (SIIE)* doi: 10.1109/siie.2016.7751827

Fidalgo, V. (2019, February 20). A liderança ainda está longe de ser um assunto de mulheres. [Leadership is still far away from being a women's topic]. Retrieved from https://www.cmjornal.pt/mais-cm/domingo/detalhe/a-lideranca-ainda-esta-longe-de-ser-um-assunto-de-mulheres

Frayer, L. (2014, March 18). Is Portugal the new 'India of Europe?' *Deutsche Welle.* Retrieved from https://www.dw.com/en/is-portugal-the-new-india-of-europe/a-17266320

Garcia Ramon, M. D., Simonsen, K., & Vaiou, D. (2006). Guest editorial: Does Anglophone hegemony permeate gender, place and culture? *Gender, Place & Culture*, *13*(1), 1-5. doi: 10.1080/09663690500530867

Goldin, C., & Katz, L. F. (2011). The cost of workplace flexibility for high-powered professionals. *The Annals of the American Academy of Political and Social Science*, *638*(1), 45-67. doi: 10.1177/0002716211414398

Goldenberg, S. (2005, January 18). Why women are poor at science, by Harvard president. *The Guardian*. Retrieved from https://www.theguardian.com/science/2005/jan/18/educationsgendergap.genderissues

Gonzalez, G. (2018, October). How amazon accidentally invented a sexist hiring algorithm. *Inc. Magazine.* Retrieved from https://www.inc.com/guadalupe-gonzalez/amazon-artificial-intelligence-ai-hiring-tool-hr.html

Gorman, J. (1993). Postmodernism and the conduct of inquiry in social work. *Affilia*, *8*(3), 247-264. doi: 10.1177/088610999300800302

Haigh, T. (2010). Masculinity and the machine man: Gender in the history of data processing. In Misa, T. J. (Ed.), *Gender codes: Why women are leaving computing* (pp. 51- 71). John Wiley & Sons.

Hatmaker, D. M. (2012). Engineering identity: Gender and professional identity negotiation among women engineers. *Gender, Work & Organization*, *20*(4), 382-396. doi: 10.1111/j.1468-0432.2012.00589.x

Hao, K. (2019, January). AI is sending people to jail – and getting it wrong. *MIT Technology Review*. Retrieved from https://www.technologyreview.com/s/612775/algorithms-criminal-justice-ai/

Haraway, D. (1988). Situated knowledges: The science question in feminism and the privilege of partial perspective. *Feminist studies*, *14*(3), 575-599. doi: 10.2307/3178066

Hartmann, H. I. (1979). The unhappy marriage of Marxism and feminism: Towards a more progressive union. *Capital & Class*, *3*(2), 1-33. doi: 10.1177/030981687900800102

Hayes, C. C. (2010). Computer science: The incredible shrinking woman. In Misa, T. J. (Ed.), *Gender codes: Why women are leaving computing* (pp. 25-49). John Wiley & Sons.

Hewlett, S.A., Marshall, M. & Sherbin, L. (2013, December). How diversity can drive innovation. *Harvard Business Review*. Retrieved from https://hbr.org/2013/12/how-diversity-can-drive-innovation

Hicks, M. (2017). *Programmed inequality: How Britain discarded women technologists and lost its edge in computing*. MIT Press.

Idacavage, S. (2018, Oct 17). Fashion history lesson: red lipstick has a tumultuous past. *Fashionista*. Retrieved from https://fashionista.com/2016/07/best-red-lipstick-history

Hill, E., Grzywacz, J. G., Allen, S., Blanchard, V. L., Matz-Costa, C., Shulkin, S., & Pitt-Catsouphes, M. (2008). Defining and conceptualizing workplace flexibility. *Community, Work and Family*, *11*(2), 149-163. doi: 10.1080/13668800802024678

Hamilton Project, (2018). High-skilled immigration increases innovation. *The Hamilton Project*. Retrieved from https://www.hamiltonproject.org/charts/high_skilled_immigration_increases_innovation

Hochschild, A. R., & Machung, A. (1997). *The second shift: working parents and the revolution at home.* New York, NY: Avon Books.

Hunt, V., Prince, S., Dixon-Fyle, S., & Yee, L. (2018). *Delivering through diversity.* [online] McKinsey & Company. Available at https://www.mckinsey.com/~/media/McKinsey/Business%20Functions/Organization/Our%20Insights/Delivering%20through%20diversity/Delivering-through-diversity_full-report.ashx

Inman, J., & Cardella, M. (n.d.). Gender bias in the purchase of STEM-related toys (Fundamental). *2015 ASEE Annual Conference and Exposition Proceedings*. doi: 10.18260/p.24151

Jones, R. (1995). Why do qualitative research? doi: 10.1136/bmj.311.6996.2

Khalil, S. (2018). *How diversity defeats groupthink: Smarter thinking isn't about you. It's about your team.* [online]. NeuroLeadership Institute. Available from https://hub.neuroleadership.com/business-case-how-diversity-defeats-groupthink

Khazan, O. (2018, October 31). The more gender equality, the fewer women in STEM. Retrieved from https://www.theatlantic.com/science/archive/2018/02/the-more-gender-equality-the-fewer-women-in-stem/553592/

Klein, H. K., & Kleinman, D. L. (2002). The social construction of technology: Structural considerations. *Science, Technology, & Human Values*, *27*(1), 28-52. doi: 10.1177/016224390202700102

Kvochko, E. (2016, January 4). Why there are still few women leaders in tech. Retrieved from https://www.forbes.com/sites/elenakvochko/2016/01/04/women-executives-in-tech/#2ba1b5a855e7

Langellier, K., & Peterson, E. E. (2004). *Storytelling in daily life: performing narrative*. Philadelphia: Temple University Press.

Lusa. (2018, October 26). Apenas 32% dos homens portugueses gozaram de licença de paternidade. [Only 32% of Portuguese men took paternity leave]. Retrieved from https://www.publico.pt/2018/10/26/sociedade/noticia/apenas-32-homens-portugueses-gozaram-licenca-paternidade-1849005

Mandel, H., & Semyonov, M. (2006). A welfare state paradox: State interventions and women's employment opportunities in 22 countries. *American journal of sociology*, *111*(6), 1910-1949. doi: 10.1086/499912

Mares, Martin. (2016). The English Language as Internet Lingua Franca. Available from https://www.researchgate.net/publication/306038760_The_English_Language_as_Internet_Lingua_Franca

Margolis, J., & Fisher, A. (2003). *Unlocking the clubhouse: Women in computing*. MIT press.

Matos, F. & Jerónimo, M. (2017, August 8). Mais mulheres em cargos de administração, mas ainda longe da liderança dos conselhos de administração: Deloitte Portugal. [More women in management positions, but still far from board leadership]. Press release. Retrieved from https://www2.deloitte.com/pt/pt/pages/risk/topics/center-for-corporate-governance-portugal/women-in-boardroom-5edicao-press-release.html

Martin, W. (2015, November 22). The 19 countries with the highest ratio of women to men in higher education. *The Independent*. Retrieved from https://www.independent.co.uk/news/education/education-news/the-19-countries-with-the-highest-ratio-of-women-to-men-in-higher-education-a6743976.html

Massachusetts Institute of Technology (1999). A study on the status of women faculty in science at MIT. Massachusetts MA: Massachusetts Institute of Technology. Retrieved from http://web.mit.edu/fnl/women/women.pdf

Master, A., Cheryan, S., Moscatelli, A., & Meltzoff, A. N. (2017). Programming experience promotes higher STEM motivation among first-grade girls. *Journal of experimental child psychology*, *160*, 92-106. doi: 10.1016/j.jecp.2017.03.013

Maxwell, J. A. (2005). Conceptual framework: What do you think is going on. *Qualitative research design: An interactive approach*, *41*, 33-63. Retrieve from https://crlte.engin.umich.edu/wp-content/uploads/sites/7/2013/06/Maxwell-Conceptual-Framework.pdf

McAlpine, L. (2016). Why might you use narrative methodology? A story about narrative. *Eesti Haridusteaduste Ajakiri. Estonian Journal of Education*, *4*(1), 32-57. doi: http://dx.doi.org/10.12697/eha.2016.4.1.02b

McKinsey & Company (2019, February 20). Achieving gender balance in leadership why and how. Retrieved from https://leadingtogether.org/media/1272/20190220_achieving-gender-balance-in-leadership_final.pdf

McKinsey Global Institute. (2019, June). The future of women at work: Transitions in the age of automation. Retrieved from https://www.mckinsey.com/featured-insights/gender-equality/the-future-of-women-at-work-transitions-in-the-age-of-automation

Mitchell, M. C., & Egudo, M. (2003). *A review of narrative methodology* (No. DSTO-GD -0385). DEFENCE SCIENCE AND TECHNOLOGY ORGANIZATION EDINBURGH (AUSTRALIA) LAND OPERATIONS DIV. Retrieved from https://apps.dtic.mil/dtic/tr/fulltext/u2/a421725.pdf

Misa, T. J. (Ed.). (2011). *Gender codes: Why women are leaving computing*. John Wiley & Sons.

Naplitano, J. (2018, September 4). Women earn more college degrees and men still earn more money. *Forbes*. Retrieved from https://www.forbes.com/sites/janetnapolitano/2018/09/04/women-earn-more-college-degrees-and-men-still-earn-more-money/#410768439f1b

Next Generation. (2018, August). Why aren't there more women in tech? *Next Generation*. Retrieved from https://www.nextgeneration.ie/blog/2018/08/why-arent-there-more-women-in-tech

OECD. (2018). *Bridging the digital gender divide: Include, upskill, innovate*. Retrieved from http://hdl.voced.edu.au/10707/467799.

Oksman, O. (2016, May 28). Are gendered toys harming childhood development? *The Guardian.* Retrieved from https://www.theguardian.com/lifeandstyle/2016/may/28/toys-kids-girls-boys-childhood-development-gender-research.

Padavic, I., & Reskin, B. F. (2002). *Women and men at work*. Pine Forge Press.

Park, A. (2008, July 24). The myth of the math gender gap. *Time*. Retrieved from http://content.time.com/time/health/article/0,8599,1826399,00.html

Payne, C., Grey, J., Haines, E., Ray, J., Smith, K. (2018). *Debunking gender myths: The science of gender & performance* [online]. *NeuroLeadership Journal* Vol. 7. Available from https://membership.neuroleadership.com/material/debunking-gender-myths/

Palmén, R. (2016). Histories, Futures and Conceptions of Gender and Science. (n.d.). Retrieved from https://oru.diva-portal.org/smash/get/diva2:1065338/FULLTEXT01.pdf.

Pedersen, S., & Seidman, E. (2004). Team sports achievement and self-esteem development among urban adolescent girls. *Psychology of Women Quarterly, 28*(4), 412–422. doi: 10.1111/j.1471-6402.2004.00158.x

Perista, H., Cardoso, A., Brázia, A., Abrantes, M., Perista, P., & Quintal, E. (2016). Os usos do tempo de homens e de mulheres em Portugal. [the uses of time of men and of women in Portugal]. *Policy Brief*. Retrieved from https://www.cesis.org/admin/modulo_projects/upload/files/inut_livro.pdf

Petroff, A. (2017, February 28). The exact age when girls lose interest in science and math. *CNN Business*. Retrieved from https://money.cnn.com/2017/02/28/technology/girls-math-science-engineering/index.html

Pilcrow. (2015, December 7). *When women started riding bikes, men freaked out*. [Blog post]. Retrieved from https://pilcrow.squarespace.com/stories/women-and-bikes

Polar Insight. (2018). Understanding flexible working in Portugal. Retrieved from https://flex-pt.webflow.io/

Reis, C. (2019, February 12). Mulheres portuguesas: cansadas, infelizes e mais mal pagas. [Portuguese women: tired, unhappy, and poorly paid]. Diário de Notícias. Retrieved from https://www.dn.pt/vida-e-futuro/interior/mulheres-portuguesas-cansadas-infelizes-e-mais-mal-pagas-10547142.html

Safronova, V. (2019, June 14). Gender stereotypes banned in British advertising. *The New York Times*. Retrieved from https://www.nytimes.com/2019/06/14/style/uk-gender-stereotype-ads-ban.html

Sanches, A. (2016, June 24). A matemática é para o menino e para a menina? [is math for the boy and for the girl?]. *O Público.* Retrieved from https://www.publico.pt/2016/06/24/sociedade/noticia/e-para-o-menino-e-para-a-menina-1736124

Sands, R. G., & Krumer-Nevo, M. (2006). Interview shocks and shockwaves. *Qualitative Inquiry*, *12*(5), 950-971. doi: 10.1177/1077800406288623

Silverman, D. (2013). *Doing qualitative research: A practical handbook*. SAGE publications limited.

Slaughter, A. M. (2013, June). Anne-Marie Slaughter: Can we all "have it all"? [Video file]. Retrieved from https://www.ted.com/talks/anne_marie_slaughter_can_we_all_have_it_all

Spice, B. (2015, July 7). Questioning the fairness of targeting ads online: CMU probes online ad ecosystem. *Carnegie Mellon University*. Retrieved from https://www.cmu.edu/news/stories/archives/2015/july/online-ads-research.html

Stiles, W. B. (1999). Evaluating qualitative research. *Evidence-Based Mental Health*, *2*(4), 99-101. doi: 10.1136/ebmh.2.4.99

Stoet, G., & Geary, D. C. (2018). The gender-equality paradox in science, technology, engineering, and mathematics education. *Psychological science*, *29*(4), 581-593. doi: 10.1177/0956797617741719

Stoetzler, M., & Yuval-Davis, N. (2002). Standpoint theory, situated knowledge and the situated imagination. *Feminist theory*, *3*(3), 315-333. doi: 10.1177/146470002762492024

Sümer, S., Smithson, J., das Dores Guerreiro, M., & Granlund, L. (2008). Becoming working mothers: Reconciling work and family at three particular workplaces in Norway, the UK, and Portugal. *Community, Work & Family*, *11*(4), 365-384. doi: 10.1080/13668800802361815

Tabas, L. (2019, March 25). Why this engineer is betting on women to build the future of tech innovation. Retrieved from https://technical.ly/philly/2019/03/25/why-this-engineer-is-betting-on-women-to-build-the-future-of-tech-innovation-female-founders-strengths-lindsay-tabas-social-science-research/

Tan, G. & Yun, Y. S. (n.d.) Parents are crucial influencers for girls pursuing STEM careers: Inaugural MasterCard study. Retrieved from https://newsroom.mastercard.com/asia-pacific/press-releases/parents-are-crucial-influencers-for-girls-pursuing-stem-careers/

Tavora, I., & Rubery, J. (2013). Female employment, labour market institutions and gender culture in Portugal. *European Journal of Industrial Relations, 19*(3), 221–237. doi: 10.1177/0959680113493374

Tavora, I. (2012). The southern European social model: Familialism and the high rates of female employment in Portugal. *Journal of European Social Policy*, *22*(1), 63-76. doi: 10.1177/0958928711425269

Trauth, E. M. (2006). Theorizing gender and information technology research. In *Encyclopedia of gender and information technology* (pp. 1154-1159). IGI Global.

Tuckett, A. G. (2004). Qualitative research sampling: The very real complexities. *Nurse Researcher*, *12*(1), 47-61. doi: 10.7748/nr2004.07.12.1.47.c5930

United Nations Women: Unstereotype Alliance. (n.d.). Retrieved from https://www.unstereotypealliance.org/en

Vigo, J. (2019, March 11). Women in tech: Inconvenient truths and changing perspectives. *Forbes*. Retrieved from https://www.forbes.com/sites/julianvigo/2019/02/23/women-in-tech/#3ac3caa145d7

Wakabayashi, D. (2017, August 7). Google fires engineer who wrote memo questioning women in tech. *The New York Times*. Retrieved from https://www.nytimes.com/2017/08/07/business/google-women-engineer-fired-memo.html?action=click&module=RelatedCoverage&pgtype=Article&region=Footer

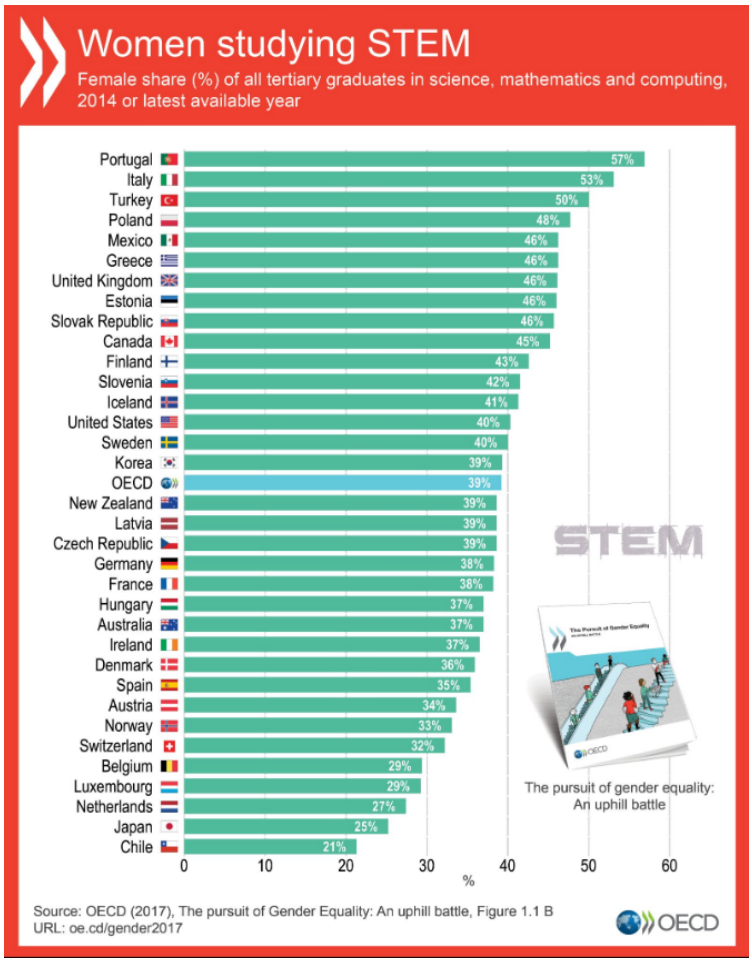
Wood, J. T. (1994). Gendered media: The influence of media on views of gender. *Gendered lives: Communication, gender, and culture*, *9*, 231-244.

Wong, J. C. (2016, February 12). Women considered better coders – but only if they hide their gender. *The Guardian.* Retrieved from https://www.theguardian.com/technology/2016/feb/12/women-considered-better-coders-hide-gender-github

You, T. (2016, May 18). Programming doesn't require talent or even passion. *The Medium*. Retrieved from https://medium.com/@WordcorpGlobal/programming-doesnt-require-talent-or-even-passion-11422270e1e4

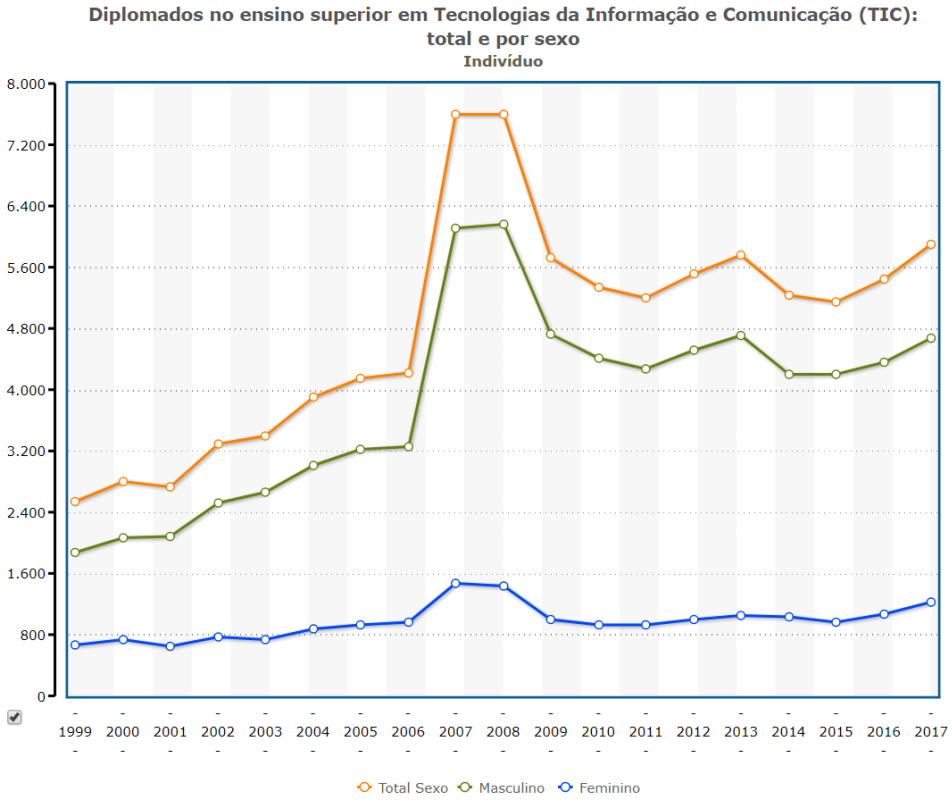
Appendix A: Secondary data

Figure 3: Women studying STEM: female share of (%) of all tertiary graduates in science, mathematics and computer, 2014 or latest available year.



Source: OECD (2017), the pursuit of gender equality: an uphill battle.

Figure 4: National data on ICT graduates in Portugal 1999-2017



Source: Pordata, 2017

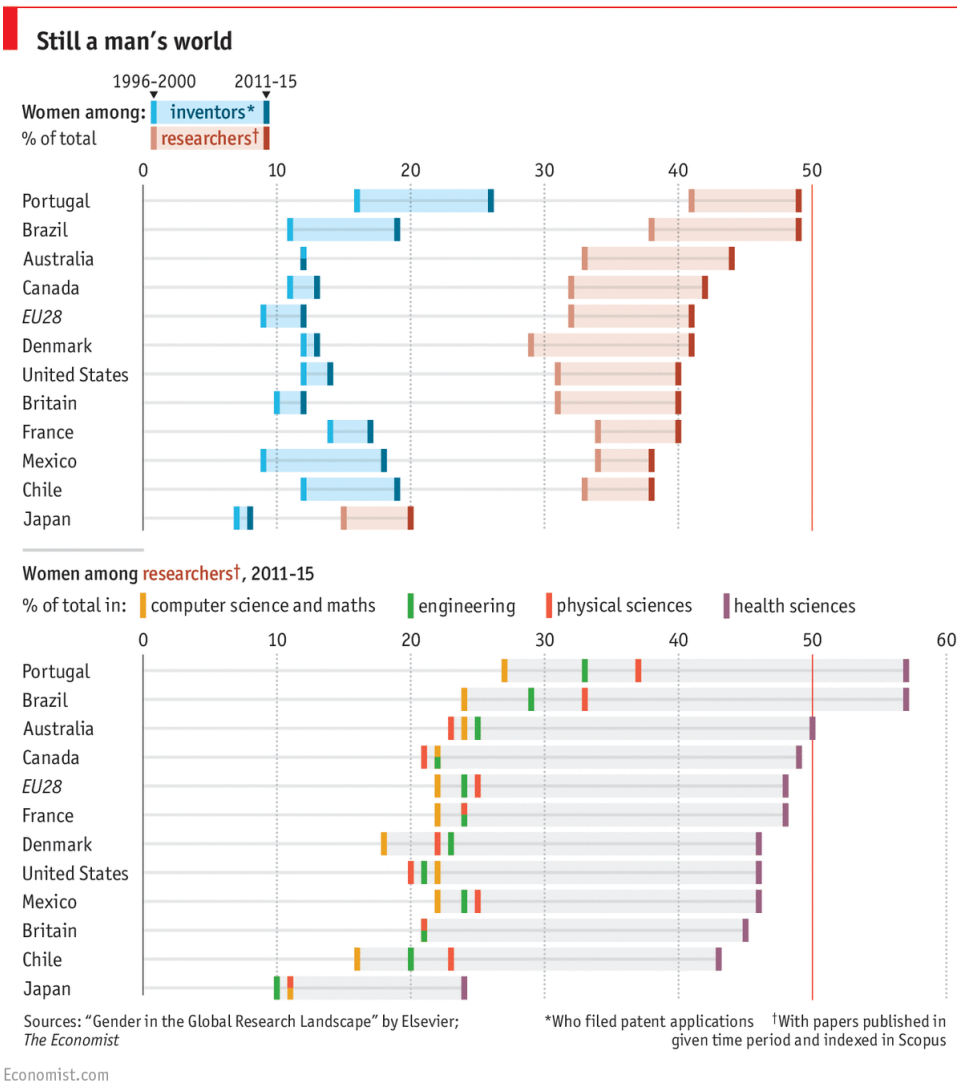
Figure 5: % of women inventors and researchers, 1996-2000, 2011-2015

Elsevier is a publishing and analytics company for world research and has a responsibility to promote gender equality in STEM and advance understanding impact of gender, sex and diversity in research (Elsevier, 2017). In their analysis of research performance across 20 years, 12 geographies, and 27 subject areas, the report, which included Portugal under its 12 comparator countries, displayed positive results for women's representation in research.

In 20 of the 27 subjects, Portugal has the highest share of women among researchers, even in subjects where women are generally underrepresented, including Physics & Astronomy (37%), Earth & Planetary Sciences (43% women), and Environmental Science (52%). Portugal is the only comparator country to have more than 60% of women among researchers in the field other than Nursing and Psychology (e.g. Pharmacology, Toxicology, & Pharmaceutics with 63% and Immunology & Microbiology with 61% women) (ibid.: 22).

In regard to the distribution of women among inventors named in patent applications, Portugal stands out as having the highest participation of women (26%) among the comparators in 2011-2015 (ibid.: 34).[13]

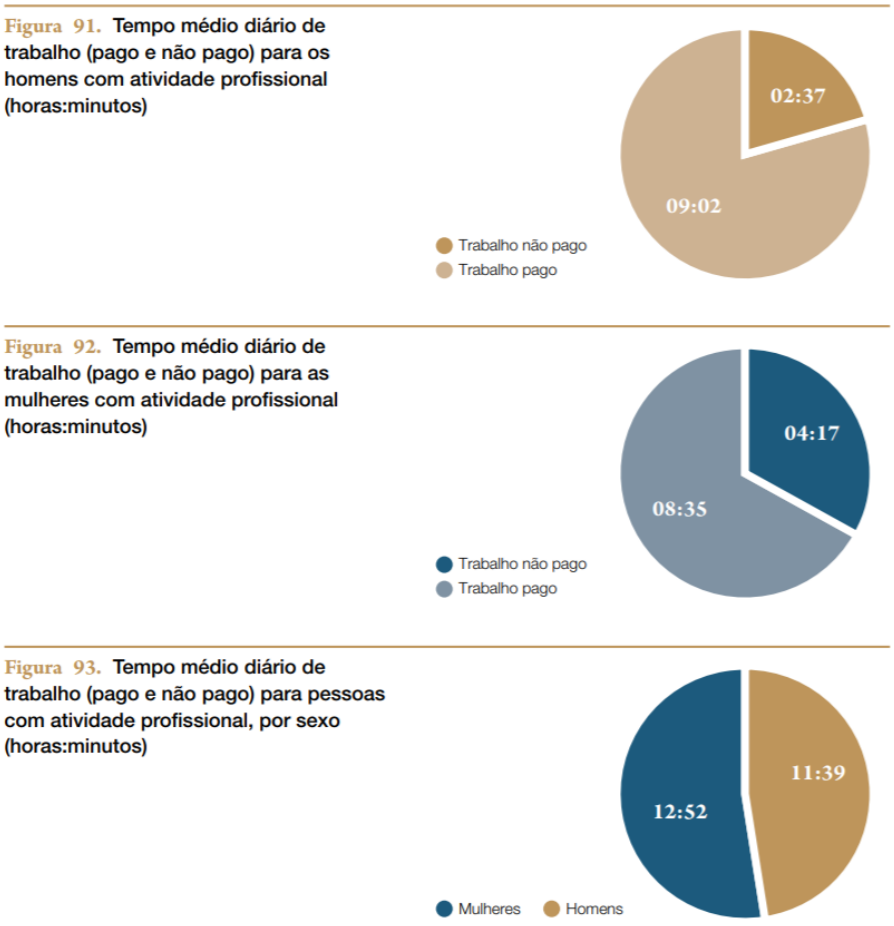
Consider this data graph created by *The Economist* using the data from the Elsevier data report.



Source: The Economist the gender gap in science, March 10, 2017

[13] For more information on this study and an opportunity to download the report, visit https://www.elsevier.com/connect/3-facts-about-gender-equality-in-science-and-health

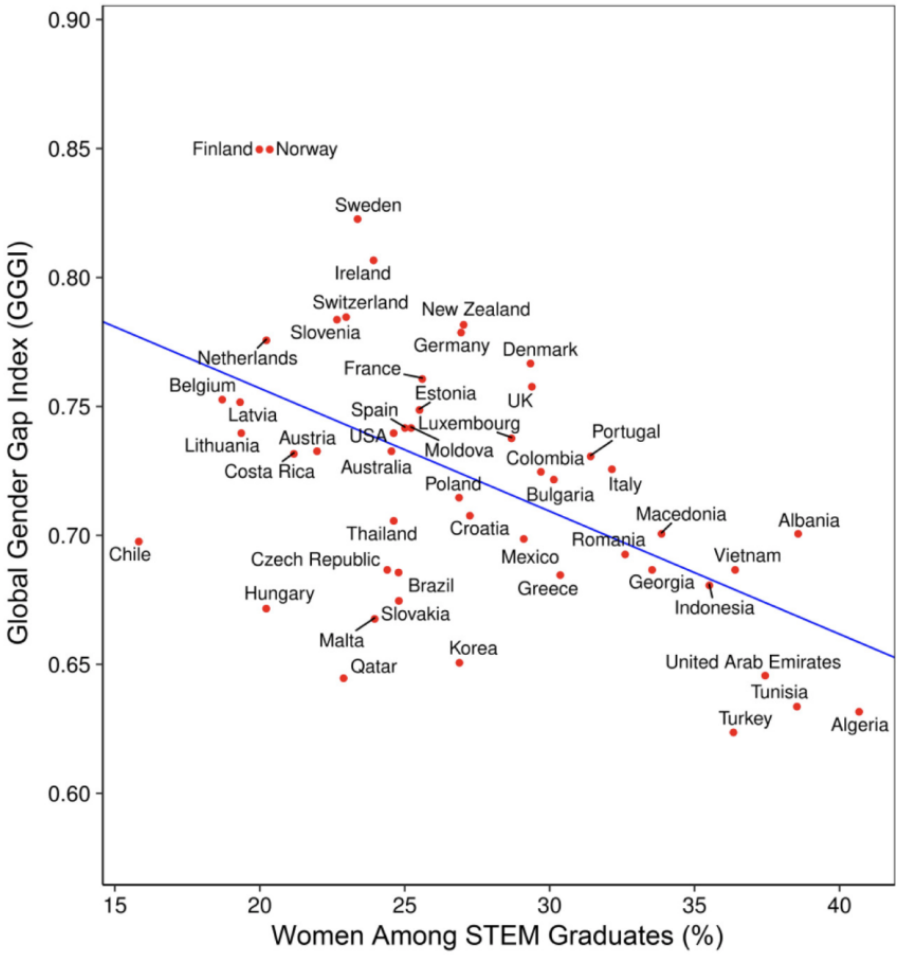
Figure 6: The uses of time of men and women in Portugal.



Source: National inquiry on the uses of time of men and women in Portugal (INUT – Inquérito Nacional aos usos do tempo de homens e de mulheres), 2016

Figure 7: The gender-equality paradox in science, technology, engineering, and mathematics education

The percentage of women among science, technology, engineering, and math (STEM) graduates. Gender equality was measured with the Global Gender Gap Index (GGGI), which assesses the extent to which economic, educational, health, and political opportunities are equal for women and men.



Source: Stoet & Geary (2018) in the gender-equality paradox in science, technology, engineering, and mathematics education.

Appendix B: Sample interview questions

With some influential parts taken from Margolis and Fisher (2003) research methodology.

Part A: Initial Interview Questions (Semi-structured, conversational setting)

For those who have a background in STEM, technical fields, computer science etc. ➔ addressing the gap in STEM / Portugal's small gap in STEM majors between women and men.

LOOK FOR ➔ CULTURAL, HISTORICAL SPECIFIC SIGNS

1. Can you tell me the story about you and computers? (when & how one gets interested?)
    - When they became interested (age)
    - What interested them (beginning interest)
    - Who interested them (family members/role models/family dynamics)
    - Where they became interested
    - Schooling experience (elementary, middle, high school, etc)
2. Family computing biography
    - Computer "expert"; parents' occupation; computer in the home, etc
3. Can you tell me about your decision to major in computer science, ICT, programming etc. (if applicable)
    - Experiences that were particularly influential
    - Mentors
    - Peers
    - Where did one find the support?
4. Experiences of being a woman in regard to your interests. This includes your experiences from a young age, in the home and in school, all the way up to university.
    - Any specific incidents that come to mind?
        i. For example, were there any incidents in the home with you family or in school with peers, teachers and staff where you can
    - Why do you think there are so few women in x? (field, class, program etc,)
    - Any ideas of what would have to be different to attract/excite more women?
5. Experiences with job market, job recruiters, finding employment
6. Is there anything else you would like to add/does anything else come to mind

Currently employed in Tech (definition of a 'tech' company varies = important to understand what exactly a company does as well to fit this concept)

1. Please describe your job, company and position – basic info
2. Elaborate on any of the following experiences you had where your gender is highlighted.
3. Can you recount any situations where you feel your coworkers/seniors/bosses have created an uncomfortable working environment?
4. Please describe your working environment (flexibility, getting hired/promoted, work structures)
5. Please describe what a normal day looks like to you:
    a. During work
    b. Outside of work (domestic responsibilities/care work/children, etc)
        i. How has this impacted your work

Conceptual Questions

1. Have you heard of the digital gender divide before? When/where, what does this mean to you?
2. Give an example:
    a. Have you heard about these statistics on Portugal having the lowest gap according to a study – why might you think that?
    b. Have you heard about the recent gender equality issues in workplaces in Portugal? What do you think of this?
    c. Why might talking about gender be such a contentious issue in Portugal?
    d. What do you understand about gender, gender-diversity/inclusion, and equality?

Appendix C: Informed consent form

Informed Consent Form

"The digital gender divide: A Portuguese Context"[14]

The Life Story interview as a Narrative Inquiry

As the foundation to this study, I use the life story interview, or also sometimes called, the narrative approach which recognizes that people use narrative, or storytelling, to make meaning of their lives and reveals how we construct and reconstruct our identities. This method of inquiry involves accounting for how people make sense of events and actions as agents in their life. As a researcher, I feel that it is important to understand another's experience and to let their voice be heard, as this subjective perspective is what constitutes the reality of their world.

I will ask you questions about your life and concerns to facilitate meaningful conversation. I want to creatively consult some of the personal and professional stories, resources and ideas expressed in the hope that they might provide new insights in understanding the digital gender divide in Portuguese society. I invite you to creatively express yourself, your personal and professional experiences, your concerns regarding gender inequality both inside and outside the labour market, and any specialized knowledge you may have concerning this area of research.

I, _____ , voluntarily agree to participate in this research study.

I understand that even if I agree to participate now, I can withdraw at any time or refuse to answer any question without any consequences of any kind.

I understand that I can withdraw permission to use data from my interview from my interview within two weeks after the interview, in which case the material will be deleted.

[14] Beginning title was later changed prior to the final hand-in.

I have had the purpose and nature of the study explained to me in writing and I have had the opportunity to ask questions about the study.

I understand that I will not benefit directly from participating in this research.

I agree to my interview being audio-recorded and allow the interviewer to take notes during the interview.

I understand that all information I provide for this study will be treated confidentially.

I understand that in any report on the results of this research my identity will remain anonymous. This will be done by changing my name and disguising any details of my interview which may reveal my identity or the identity of people I speak about.

I understand that the disguised extracts from my interview may be quoted in the thesis dissertation, and the thesis defense presentation.

I understand that signed consent forms and original audio recordings will be retained securely and with access only to Daniela Basto da Silva and the academic supervisor until the exam board confirms the results of the dissertation project (spring 2020).

I understand that the transcript of my interview in which all identifying information has been removed will be retained for two years from the date of the exam board (spring 2022).

I understand that under freedom of information legislation I am entitled to access the information I have provided at any time while it is in storage as specified above.

I can request a copy of the transcript of my interview and may make edits I feel necessary to ensure the effectiveness of any agreement made about confidentiality.

I have been given a copy of this consent form co-signed by the interviewer.

I understand that I am free to contact any of the people involved in the research to seek further clarification and information.

For further information please contact:

Researcher
Daniela Basto da Silva
MA student at Universidade Católica Portuguesa, Master in Communication Studies
Phone: +351 933149888
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or

Academic Supervisor
Prof. Dr.a Carla Ganito
Assistant Professor & Coordinator of Postgraduate Studies
E-mail: carla.ganito@fch.lisboa.ucp.pt

Signatures

_____ _____
Signature of research participant Date

I believe the participant is giving informed consent to participate in this study.

_____ _____
Signature of researcher Date