

A cross-national, cross-sectional study of women's retention and advancement in Information Technology (IT) and Engineering careers

Interviews/Focus Group Summary Report

By: Drs. Lyn Hoang, Jennifer Dengate, Tracey Peter, Annemieke Farenhorst, Minna Salamin-Karlsson, and Andrea Wolfram

Acknowledgements

This report was prepared as part of the Cross-National, Cross-Sectional Study of Women's Retention and Advancement in Information Technology and Engineering Careers. We would like to thank the Social Sciences and Humanities Research Council for their support and funding of this project.

A special thank you to our collaborators Dr. Minna Salminen-Karlsson from the Centre for Gender Research at Uppsala University in Sweden and Dr. Andrea Wolffram at the Institute for Sociology at RWTH Aachen University in Germany for their contributions and feedback in developing this project. We also want to thank the remaining research team including Chris Campbell, Cornelia Kauenhowen, and others from the University of Manitoba for all their assistance.

We want to express our gratitude towards all the Canadian, Swedish, and German universities and colleges, and professional groups and organizations that helped in the distribution of the survey and in the interview/focus group participant recruitment.

Finally, thank you to all who participated. We deeply appreciate you for your honesty and for taking the time to complete an interview or focus group.

Introduction

The representation and experiences of women in Engineering and Information and Computer Technologies (EICT) fields have been a subject of extensive research and discussion. This report aims to provide a summary of the experiences of women in these fields across three countries: Canada, Sweden, and Germany. By examining 58 semi-structured interviews and 4 focus groups, this report identifies commonalities and differences in their experiences, challenges, and opportunities. The goal is to understand the factors that influence women's participation and retention in Engineering and ICT, and to provide recommendations for improving gender equity in these fields.

The interviews and focus groups were conducted, transcribed, and analysed by research team members. These qualitative data illustrate experiences and complement the results of the statistical analyses from the earlier cross-national survey administered in each country.

The qualitative data aims to:

- illustrate the lived experiences of participants with respect to being a woman (or gender diverse person) working in EICT fields in Canada, Sweden, or Germany. They explore the individual dimensions of work experience (i.e., career path, biography, career satisfaction), social dimensions (i.e., family life, social networks, mentoring, relationships with colleagues/peers), and structural dimensions (i.e., workplace policies, government policies, educational systems)
- better understand the context around career decisions, including factors contributing to both job changes and retention.
- find out whether, and if so how, the welfare state model of each country (i.e., liberal, conservative, and social democratic) can help to explain some of the cross-national variations in access to public work-family entitlements and other government entitlements, and how such entitlements shape or reflect on actual working experiences.
- explore the extent to which the experiences with discrimination, hostility, incivility, and (sexual) harassment shape participants' perspectives on working in EICT fields.
- identify ways in which EICT workplaces in Canada, Sweden and Germany can better support or retain women or gender diverse person in their EICT jobs or careers.

Methodology

This report presents the findings from the qualitative component of a mixed-methods research design for the project. The qualitative component of this project followed the quantitative nationwide survey administered in the three partner countries. To complement the findings from the survey, we conducted semi-structured interviews and focus groups with women and gender diverse persons of various age groups and educational levels in Canada, Sweden, and Germany. These participants work in a variety of EICT fields, specialities, and sectors.

The rationale behind the qualitative component of the project was to provide more in-depth understanding of participants' experiences and more contextualised insights into the factors that influence women's career decisions. The qualitative interviews and focus groups offer a richer picture of the participants' experiences working in EICT. The interviews and focus groups also allowed us to explore differences in experiences based on culture and country. This is particularly useful in the context of a comparative study that contrasts and compares countries with different histories, cultures, and traditions.

Data Collection

We conducted interviews and focus groups in 2023 – 2024 using a semi-structured guide developed by the research team following preliminary analysis of the survey data. The guide explored a variety of topics including career background, current employment, work-life balance, family dynamics, intent to leave or reasons to stay in workplace, networking, mentorship, previous employment, experiences with incivility, hostility or harassment in the workplace, and questions related to improving women's retention in EICT. The focus group guide similarly asked questions related to these topics but condensed and phrased in a manner more suitable for group interview. We used the same guides for Germany and Canada. We used a revised guide for the Sweden qualitative interviews which removed all questions that could reveal sensitive personal data (as defined by the Swedish Ethical Review Authority).

Interviews and focus groups were held either in-person or through video-conferencing software Zoom and lasted between 40 and 90 minutes. All interviews and focus groups were conducted in either English or German, and audio-recorded using recording devices or Zoom's built-in recording feature. Recordings were first transcribed using AI-powered software, then independently reviewed by the research team for accuracy and data familiarization. Transcripts were anonymized by the research team. German transcripts were translated to English first using AI-powered software, and then independently verified by German-speaking team members.

Ethics approval for this project was granted by The University of Manitoba Research Ethics Board (Protocol #HS24033). A full German ethics application and review was not required. A

data review officer at RWTH Aachen University reviewed and approved of the necessary documentation related to this project. A full Sweden ethics application and review was not required as the study did not process special category data or sensitive personal data as stipulated by the Swedish Ethical Review Authority.

All participants in each partner country were provided with a Letter of Information outlining the study and its objectives and gave written consent to being interviewed individually or as part of a focus group, and to being audio-recorded. They were informed of the context of the study and the use that would be made of their data, as well as their right to withdraw their data from the study. The transcripts contain no information allowing to link back the interview data to the survey responses of the interviewee. To further preserve the anonymity of the interviewees, the list with the full demographic characteristics of our interviewees (such as place of residence, name of employer, role, etc.) is not integrated to the present report. Only a simplified and aggregated list is added to this report.

Qualitative Analysis

We used QSR Nvivo 12 for data organization. Our approach, based on Reflexive Thematic Analysis was deductive, latent, critical, and relativist-constructionist (Braun and Clarke, 2022).¹ We began with open coding, generating initial codes from literature on EICT and coding semantically from survey comments or participants' words. This enhanced our descriptive understanding. We then conducted latent coding drawing on our reflexive considerations to expose underlying meanings and attitudes. We then grouped codes critically, around certain topics and issues, and developed and refined themes to best showcase how participants construct and understand their lived realities (Braun and Clarke, 2022). We engaged in reflexivity throughout each stage of the analysis process whereby the research team reflected on how their perspectives, values, biases, and beliefs may influence the coding, analysis and interpretation of the data.

¹ Braun, V., and Clarke, V. (2022). *Thematic analysis: a practical guide*. SAGE: Thousand Oaks, CA.

Sample Size and Description

A total of 70 individuals participated in the one-on-one interview or as part of a focus group. Table 1 provides a breakdown of the participants by age category where applicable.

Table 1: Age range of participants

Age Range	Frequency (Percent)
20 to 29 years old	7 (10%)
30 to 39 years old	15 (21.4%)
40 to 49 years old	17 (24.3%)
50+ years old.	10 (14.3%)
Not available	21 (30%)
Total	70 (100%)

Across the three partner countries, we conducted 26 interviews, and 1 focus group with 31 participants in Canada, 16 interviews and 3 focus groups with 23 participants in Germany, and 16 interviews with 16 participants in Sweden. Table 2 provides the geographic region of participants in Canada, Table 3 provides the geographic region of participants in Germany, and Table 4 displays the geographic region of participants in Sweden.

Table 2: Geographic regions of Canada participants

REGION	FREQUENCY (PERCENT)
ATLANTIC PROVINCES	6 (19%)
QUEBEC AND ONTARIO	5 (16%)
PRAIRIE PROVINCES	10 (32%)
WESTERN PROVINCES	10 (32%)
TERRITORIES	0 (0%)
TOTAL	31 (100%)

Table 3: Geographic regions of Germany participants

REGION	FREQUENCY (PERCENT)
WESTERN GERMANY:	
North Regions (Bremen, Hamburg, Niedersachsen, Schleswig-Holstein)	6 (26%)
South Regions (Baden-Württemberg, Bayern, Rheinland-Pfalz, Saarland)	8 (35%)
West Regions (Hessen, Nordrhein-Westfalen) and East Regions (Berlin)	5 (22%)
EASTERN GERMANY (Brandenburg, Sachsen, Sachsen-Anhalt, Mecklenburg-Vorpommern, Thuringen) OR UNKNOWN	4 (17%)
TOTAL	23 (100%)

Table 4: Geographic regions of Sweden participants

REGION DESCRIPTION	FREQUENCY (PERCENT)
STOCKHOLM/GOTHENBURG/MALMÖ/LUND AREA	7 (44%)
MIDDLE SIZED TOWN (50,000 INHABITANTS OR MORE)	9 (56%)
SMALL TOWN/RURAL AREA (UP TO 50,000 INHABITANTS)	0 (0%)
TOTAL	16 (100%)

We interviewed individuals working in Engineering and Information and Communications Technology (EICT). Of the 70 participants, a total of 52 participants (74%) reported working in an engineering field, speciality, or having an engineering background. The remaining 18 participants (26%) noted working in an ICT field and speciality. By country, most participants in Canada indicated working in Engineering, and several participants reported working in ICT. Most participants in Germany indicated working in Engineering, and a few noted working in ICT. Of the participants in Sweden, an equal number reported working in either Engineering or in ICT.

The vast majority of participants reported that they are presently employed full-time or part-time. A very small number of participants reported another type of employment status such as self-employed, retired, or unemployed at the time of interview. In terms of current employment, most

participants work in the academic sector, followed by private or non-profit sector, then government or public (non-academic) sector.

We did not ask participants about citizenship status, however, thirteen participants self-identified as being non-native born to the partner countries. In terms of family dynamics, 41 participants self-disclosed that they have a child or children.

Summary Analysis – Findings

Similarities Across Canada, Sweden, and Germany

When comparing interview and focus group transcripts from Canada, Sweden, and Germany, we identified eight primary thematic similarities among participant responses. We briefly describe these similarities below and offer sample quotes from participants to illustrate these themes.

1. **Underrepresentation of Women:** In all three countries, participants report that women are significantly underrepresented in Engineering and ICT fields. This underrepresentation is evident at both the educational and professional levels whereby many participants reveal working in workplaces with few other women. For example, a participant from Canada mentioned, "I was the only woman in my software development team for years". Similarly, a participant from Germany echoed this sentiment "So engineering. I'm the only woman out of almost 40 professors [laughs] in the professor league. Yeah. And so, that's not very diverse."

Participants working in Engineering noted that some specialities have more women represented than other subfields (e.g., civil compared to mechanical). However, most participants working in ICT discuss being underrepresented within their respective workplaces. Consider this quote from a Canada participant, "So I work in, my background [is] software, which is pretty male dominated, and I work in aerospace and defence...since I graduated in 2008, and honestly, the number of times on the software team that there has been another software developer female, I can count on one hand. Usually, I am the only one". A Sweden participant similarly highlighted the lack of women represented in her ICT department, "So we are around ten people and let's say above the level of PhD student there are, there is only me full time as a woman and then another person not full time, partial".

2. **Work-Life Balance Challenges:** Many participants in all three countries face challenges in balancing work, family, and life responsibilities. Some participants attribute this to the long working hours expected in Engineering or ICT fields. For example, one Canada participant mentioned, "I work 80 hours when I'm teaching and I spend two months being burned out. And I've taken one week of vacation since starting this job.... honestly, I don't even aspire to be any kind of a superstar or anything. I aspire to average level of competency. But this is a job where you feel that you're constantly behind. That you're not doing enough. That you don't accomplish anything. And so, you have to work and work and work and work, and you still feel like you're not doing anything, and you're not succeeding". A Germany participant also echoed the experience of long working hours, "I would say I started counting hours a while ago, it was like 60 to 80 hours a week, and now I'm seriously trying to cut back on that. I have decided that I will not work on weekends anymore. If I can help it. And I will also stop, stop after 8 p.m. during the week".

Having challenges balancing work and family responsibilities was particularly pronounced for participants with children. In all three countries, most participants with partners or spouses also report that they take on a greater share of household responsibilities and childcare responsibilities compared to their partners or spouses. For example, a Sweden participant noted the unequal division of labour in her household, “I've had to bear the responsibility to pick up the slack on just maintaining a household over that, for the last couple of years...it's not so bad. Let's say, cooking is 50/50. But, keeping place clean is definitely not 50/50. So, this is maybe it's 20/80, 30/70, and I'm doing the majority...but maybe that's quite common, I think... And relative, I mean let's, let's say overall maybe I don't know, 40/60...I'm doing 60”.

3. **Gender Bias and Stereotypes:** Gender bias and stereotypes persist in Engineering and ICT fields across all three countries. Many participants discuss situations where they have been dismissed by others because of their gender. For example, a Sweden participant explained, “I have more than once been referred to as, as the wife of one of my colleagues, or the, the secretary”.

Participants often feel the need to prove their competence, and they also indicate experiencing skepticism about their abilities from others. For example, consider this statement from a German participant who explained having to establish herself amongst her peers, “I often have to prove myself more than my male colleagues to be taken seriously”. A Sweden participant discussed having to prove her knowledge with new groups of students, “If I come to a new student group, I have to kind of first establish the like ‘Okay, look, I really studied computer science. I'm really a computer scientist. I'm almost a professor’. Then we can talk about something. Whereas if there's a man coming in, I think that they more assume that he knows what he's talking about without him listing his CV basically first, and kind of motivating why they should listen to him... This of course doesn't go for all students, but there are usually a couple of students in every group that tries to kind of test you and ask some questions to see if you really know what you're talking about or not. And this kind of thing, I think happens more to the female teachers than to the male teachers”.

Gender bias and stereotypes can also come from people in positions of power and influence. For example, a Canada participant shared experiencing stereotypical comments about maternity leave in a work meeting, “the Dean had made a comment about, well, people in my program, which was industrial [engineering] at the time. [He claimed] if people were more devoted then there wouldn't have been a problem. But he included amongst that, like maternity leave and, and I thought holy crap. Like, that's, that's absolutely not acceptable”.

4. **Mentorship and Networking:** The importance of mentorship and networking is highlighted by participants in all three countries. Having access to mentors and professional networks is seen as crucial for career advancement and overcoming challenges. A participant from

Sweden emphasized that "mentorship has been essential for my career growth and navigating the male-dominated industry".

Mentors vary in terms of their impact, role, and level of support. However, participants across all three countries distinguish the need for more champions – a dedicated type of mentorship that can advance women's careers. For example, one Canada participant explained, "you need those people who are able to champion you, you know, like they do... People who will actually put you there... Someone who sees a potential in you and takes you there... They know your worth and they sponsor you to do something better, to get something".

Another participant from Canada elaborated on why women need champions within the Engineering and ICT fields, "We're not always great at kind of like tooting our own horns, so to speak. So having someone who can champion what you're interested in doing, the kind of work that you'd like to do, things that you'd like to learn about, like having somebody on your side who can kind of advocate for you, I think is essential to having those things happen. And if you don't have that, then I don't think you're going to have a chance, really".

5. **Career Advancement Barriers:** Participants in Canada, Sweden, and Germany report facing barriers to their career advancement. These barriers include a lack of opportunities for leadership roles, limited access to professional development, and the "glass ceiling" effect. A Canada participant mentioned, "I feel like I have to work twice as hard to get the same recognition as my male colleagues". In another example, a Sweden participant explained how stereotypes about women, and part-time work hindered her advancement into a leadership role, "There was a time when I was about to be promoted to, you can say deputy research director. I was working part time. I know I had opposition from some of my colleagues and the little bit older men that didn't want to see a woman working part time taking that responsibility. So, yes, I banged the glass ceiling, quite substantially at the time".

Participants working in academia in all three countries also noted added challenges to their workload resulting from legal policies which stipulate that committees must have gender representation. These added responsibilities reduce the time that women have for conducting research due to the lack of women in Engineering and ICT fields. For example, one Sweden participant mentioned that she has been on substantially more Ph.D. committees than her husband, who is also a professor: "My husband, he's 15 years older than I am. He's been on Ph.D. Committees 4 or 5 times, and I've been on Ph.D. committees almost 50 times".

A Germany participant echoed this feeling of having increased academic service responsibilities especially following changes to policies which require at least two women to be represented on faculty hiring committees, "now we have six female professors, and right now we have seven new professorships to be set. So, we have seven councils and we have six

women. So, you can imagine how many councils you have to attend. And this is a lot of time. We spend a lot of time sitting there hearing like trial lectures, discussing about applications and stuff like that... The idea is good to have a second woman in there, so you have more female opinion. I do like the idea. But for engineering, it's really hard because we have so little women... now we spend so much time in all councils and looking for gender stuff, and it keeps us away from doing research and stuff and publications”.

6. **Supportive Policies and Practices:** All three countries have supportive policies and practices aimed at promoting gender equity in the workplace.² These include parental leave policies, flexible work arrangements, and initiatives to increase the representation of women in STEM fields. A Sweden participant shared, "The parental leave policies here are very supportive and encourage both parents to share responsibilities".
7. **Positive Impact of Role Models:** The presence of women role models in Engineering and ICT is seen as a positive influence by participants. In all three countries, participants emphasize the importance of having visible role models who can inspire and mentor the next generation of women in Engineering and ICT careers. A German participant stated, "Having female role models in leadership positions has been inspiring and motivating for me".

Participants also discuss various programs and non-profit initiatives to introduce girls and women into engineering and ICT careers. For example, one Germany participant explained how such programs can be important for showing girls that a career in EICT is possible, “I’m part of Women in Tech Networks. At least where I was growing up, I didn’t have a lot of women around me being in tech... And I think it's very important to have that. To know that they [women in tech] exist, which is then the role model area more, but also network that can help you to either talk through situations, let's say, or to find a job”.

8. **Workplace Culture:** The workplace culture in Engineering and ICT fields is often described as male-dominated and not always inclusive of women both within the workplace, and in interpersonal interactions with colleagues outside of the workplace.

Participants in all three countries report experiencing a lack of support from their men colleagues and exclusion from the “old boys club”. A Canada participant in ICT noted, “All these upper management guys, like an old boys’ kind of club, and ...there's a certain amount of alienation between these upper management types and then us”. Similarly, a German participant echoed this perspective of feeling disadvantaged compared to her men colleagues in networking and building connections with colleagues and supervisors, “I’m not drinking alcohol, so I usually skip the evening events where the guys all go off for a beer. But it's also

² Note: see differences section below for a discussion of how their policies differ.

because of that atmosphere. So, there's this, the boys' club. And still, we are only very few women. So. It's not so easy to join and you always feel awkward.”

Participants in all three countries also highlight a workplace culture in Engineering and ICT that encourages overworking and long hours. For example, one Canada participant explained “overwork is rewarded and lauded”. Another participant in Sweden explained that for persons working in Engineering and ICT, there are added pressures within the academic sector that promote a culture of overwork “the problem I see within academia, for instance, is that we're competing with countries where people don't have that much work-life balance. So, you sort of have to make up your mind, do I want to be like a top researcher, or do I want to still keep, like what is most important”.

Differences Across Canada, Sweden, and Germany

When contrasting the transcripts from participants in all three countries, we also identified seven primary thematic differences in the perspectives of participants from Canada, Sweden, and Germany. We briefly describe points of dissimilarity below and offer sample quotes from participants to illustrate these themes.

1. **Parental Leave Policies:** All three countries boast parental leave policies. Overall, Sweden has more progressive parental leave policies compared to Canada and Germany. Swedish policies encourage both parents to share parental leave and reserves a portion of parental leave for each parent, which cannot be transferred to the other parent. A Sweden participant mentioned, "The parental leave policies here are very supportive and encourage both parents to share responsibilities". Their parental leave policies are also more flexible (e.g., can be used up until the child is 12 years old), which helps participants in balancing work and family responsibilities. Sweden also provides parental benefits to care for a sick child. One participant explained, “Any parent across Sweden has 100 something days to stay at home with a sick kid or take them to the doctor or anything like that.”

In contrast, Canada and Germany’s parental benefit policies, while supportive, are not as extensive as Sweden’s policies. Germany’s policies encourage both parents to share parental leave. Many Germany participants who have had children within the past 10 years also explained having divided parental leave more equitably with their partners/spouses. For example, one Germany participant mentioned both parents taking 6 months of parental leave, “So I did the first six months and then my partner the other six month”. Another Germany participant discussed a different dynamic “we split nine [months] and four [months], due to nursing. It just made it easier for me.” By contrast, many Canada participants with children reported taking approximately 12 months of parental leave, with their spouses/partners either

not taking any parental leave or 6 weeks of parental leave. For example, one Canada participant described her parental leaves, “I took 12 months with my first... And then with my second, I had [intended to take] the 18 months...[but] my son was 15 months... which was kind of my goal of, you know, get that little bit of extra time past the year before he actually had to go into a day care setting”.

Most Sweden participants with children did not perceive their parental leave as adversely impacting their careers. However, some participants did report that motherhood could be viewed negatively at times. For example, a Sweden participant noted that taking too many days off to care for sick children could be construed as unreliable, “What became a problem was this taking care of their sick kid days um where you have a legal right to this. But if you just are using them a lot. I've seen people who've been told, like, ‘well, you're not reliable because we don't know when you're going to have to stay home with your kids or not’. So, the plan part with a lot of notice [e.g., parental leave] works great. But the other part, I think, even though it's your legal rights, sometimes it's seen as, you know, being unreliable”.

By contrast, many Canada participants reported feeling as though their careers were negatively impacted by parenthood. For example, one Canada participant explained, “So your career stalls because nobody wants to hire pregnant women. And when you come back, ‘oh, you just had a baby’, so they're not paying attention to [your] work anymore. Your salary does not move. It is barely catching up with inflation””. Another Canada participant echoed this sentiment with her experience, “the second I got pregnant, everything changed. People immediately treat you like you're going a break, and they take your work away from you because they know you're leaving. So, unlike men who are seen as more respectable when they're going to have a baby. Right. So, so it was a gong show both times. Both times they took away my projects right before I left. Or even months before I left. And then when I came back, I would not have the position anymore. Why? Because ‘Oh, we did a rearrangement of roles’. So, like, literally, if it wasn't for the law that says that I have to have my same salary, they would have cut my salary too.”

2. **Cultural Attitudes Towards Gender Roles:** Cultural attitudes towards gender roles vary across the three countries. Sweden is generally seen as more progressive in terms of gender equality, while traditional gender roles are more prevalent in Germany. A Sweden participant shared, "Gender equality is a significant focus here, and there is a strong emphasis on equal opportunities for men and women". In contrast, a German participant mentioned, "There are still traditional gender roles that influence career choices and opportunities". Another Germany participant elaborated on this “if we look at the statistics of who stays at home and who doesn't. And I think it's independent of what these people did before they, before they got a family in most cases in Germany. The mother does most of the, spends the most time at home... Somehow I think, it puts some idea of roles into the kids’ heads”.

Participants in Germany also discussed experiencing negative attitudes about their mothering because they chose to continue working. Take for example this experience of a Germany participant, “I started working again after the minimum time I had to have off, after 8 weeks. I started working immediately... I mean, we shared the childcaring responsibilities. I wanted to work as an engineer.... But in Germany it is still to this day, it’s expected that you stay at home a year with your child, if not 3 [years], and people do that. I was called *Rabenmutter*³ [raven mother] at the time because I was working”.

In Canada, participants also discussed how traditional gender roles are still culturally prominent in regard to the division of home and childrearing responsibilities. For example, one Canada participant explained that even though she and her husband are both professors at universities, there are more parental expectations placed on her, “I’m the primary parent who always gets called by the school whenever something happens. These things really delay me”.

3. **Representation in Academia:** The representation of women in academic positions in Engineering and ICT varies. Sweden has a higher proportion of women in academic roles compared to Canada and Germany. This difference is attributed to targeted initiatives and policies in Sweden aimed at increasing gender diversity in academia. A Sweden participant noted, "There are many initiatives to support women in academia, and it has made a significant difference".
4. **Workplace Flexibility:** Swedish workplaces are generally more flexible in terms of work arrangements, allowing for better work-life balance. A Sweden participant shared, "The flexible work arrangements here have been crucial for managing my career and family responsibilities". In contrast, women in Canada and Germany report less flexibility in their work environments. A Canada participant mentioned, "It's challenging to find a balance between work and family with the rigid work schedules".
5. **Support for Career Development and Mentorship Programs:** Participants in Sweden report having better access to career development opportunities and professional growth compared to their counterparts in Canada and Germany. This includes access to training programs, workshops, and mentorship opportunities. A Sweden participant stated, "The career development programs here have been instrumental in my professional growth".

The effectiveness of mentorship programs varies across the three countries as well. Our Sweden participants report more positive experiences with mentorship programs compared to participants in Canada and Germany. This can be attributed to the structured and well-

³ Rattenmutter – “Raven Mother” a German expression used to denote a bad mother, who does not take sufficient care of her children, often because she is combining family with work.

implemented mentorship initiatives in Sweden. For example, a Sweden participant noted, "The mentorship programs here are well-structured and have been very beneficial".

6. **Gender Pay Gap:** Many participants in Germany and Canada highlighted that the gender pay gap in Engineering and ICT fields has personally affected them. Most participants in Sweden did not discuss the gender pay gap as impacting them. Women in Germany report significant disparities in pay and career advancement opportunities. For example, a German participant mentioned, "The gender pay gap here is quite noticeable, and it affects career progression". Similarly, a Canada participant explained that her wages are below her husband who is also employed as a professor at a university, despite the participant having obtained her Ph.D. before her husband, and holding a prestigious Canada Research Chair position, "I am ahead of him, I'm a Canada Research Chair. And, you know, I have had so much success, but we're still not, it just still doesn't show in our wages".

Another Canada participant described how such gender pay gaps are systemic issues. She provided a detailed example of how parental leave can contribute to pay gaps. She explained, "So for example, I had three kids in the earliest stages of my career, as many women will do... And so, I took three maternity and parental leaves. When you go on leave, you don't get any, any raise or salary, like merit adjustment. So, you basically, if you start with for example, 100K [thousand], your salary during that year [of parental leave] stays 100K [thousand], and the next year is 100K [thousand], whereas there's a 5% increase in everyone else's salary. So, if there's another person who starts with 100K [thousand], same place you are, they'd make 105K [thousand next year]... Some people say, 'well it's fair because you didn't do work for that year'. But then every year [of parental leave] you also don't get another 3%, 5%, whatever the increase of salary is on that [previous] 5% you didn't get. So, for my life, you know, I had my first child like 19 years ago. And so, for 19 years... there is a gap, a small gap. There was no gap at the beginning. Usually there is a gap because women make less. But imagine there's no gap. The gap comes in, but then the gap starts to grow as you progress. Why? Because... you are also not getting the extra percentages that you would have got. So that's a systemic problem. That means that any woman or man who goes on a maternity leave, comes back, and for the rest of their career they have to pay for it. And it's not just a career, but it's also for the rest of their life because it also affects how much pension they put away for you and so on. So, for the rest of my life, I am paying, literally paying for having children, you know. So, this is a systemic problem. Now, unfortunately, because of the way the culture works in our system, mostly women are the ones who are paying this."

7. **Industry vs. Academia:** Participants in Canada and Germany report different experiences working in industry compared to academia. In Canada, participants find academia to be more supportive and inclusive compared to industry. For example, a Canada participant shared, "I

find the academic environment to be more inclusive and supportive compared to the industry". In Germany, participants report facing similar challenges in both sectors. A German participant noted, "The challenges in academia and industry are quite similar, and it's difficult to navigate both".

Conclusion

Esping-Andersen's (1989) welfare state typology provides a useful framework for understanding the findings of this report⁴. Esping-Andersen (1989) categorizes welfare states into three types: social democratic, conservative, and liberal. Social democratic welfare states, like Sweden, prioritize universal benefits and equality, leading to more progressive policies and support for work-life balance and gender equality. Conservative welfare states, like Germany, emphasize traditional family values and social insurance, resulting in more rigid gender roles and less flexibility in work arrangements. Liberal welfare states, like Canada, focus on market solutions and individual responsibility, providing some support but lacking the comprehensive policies seen in social democratic states.

The experiences of women in ICT and Engineering fields in Canada, Sweden, and Germany reveal both common challenges and unique differences that align with Esping-Andersen's (1989) typology. Sweden's social democratic welfare state offers extensive support for work-life balance and gender equality, reflected in the positive experiences of women in ICT and Engineering. Canada's liberal welfare state provides some support but lacks the comprehensive policies seen in Sweden, leading to challenges in balancing work and family responsibilities. Germany's conservative welfare state shows more traditional gender roles and less flexibility in work arrangements, contributing to the greater challenges faced by women in these fields.

However, we are seeing more equitable progress in Germany's policies compared to Canada's policies. For example, Germany's parental leave (Basic Elterngeld) provides more financial support compared to Canada's Standard Parental Benefit. Germany's policies also allow parents up to three years of parental leave per child and can be shared between both parents. The policies are also flexible allowing parents to take parental leave in blocks or as part-time leave until the child's 8th birthday. Canada's Extended Parental Benefit is capped at a maximum of 18 months when combined with maternity leave. The number of maternity and parental benefits in Canada does not increase for multiple births/adoptions at a single time unlike Germany's and Sweden's policies which are allocated per child. In addition, parental leave in Canada cannot be taken part-time or in blocks, which make them less flexible.

⁴ Esping-Andersen, G. (1989). The three worlds of welfare capitalism. Polity Press.

Addressing gender bias, improving work-life balance, and providing better access to mentorship and career development opportunities are crucial steps in supporting women in Engineering and ICT. By learning from the successes and challenges in each country, we can develop more effective strategies to promote gender equity and create a more inclusive environment for women in Engineering and ICT. This may help to retain women in their Engineering and ICT careers. For example, employers can exert a positive impact by offering or improving mentorship programs and committing to increasing the representation of women in leadership roles. Similarly, by expanding access to generous and flexible leave options, governments would also be supporting women in EICT careers and helping to reducing the gender wage gap. For future research, we aim to explore these connections more deeply alongside our survey data.