Women Entering Tech: Challenges Women Face in the Technology Industry

Julia Ranta

Haaga-Helia University of Applied Sciences
Bachelor's Thesis
2022
Bachelor of Business Information Technology

Abstract

Author(s)
Julia Ranta

Degree
Business Information Technology (BIT)

Report/thesis title
Women Entering Tech: Challenges Women Face in the Technology Industry

Number of pages and appendix pages
62 + 5

The technology industry is growing rapidly, creating a demand for IT professionals in various new roles. To obtain more talent, organizations, companies and educational institutions have recently targeted individuals, especially women to join the technology industry. Despite the increasing number of women entering the industry, a current phenomenon of the lack of women in the tech field causes various challenges for women and consequences which affect women's mental health.

This thesis aim is to research the challenges women face in the technology industry, examining potential root causes of the problem and how these challenges impact women's progress in their careers. The subject is examined by explaining the phenomenon's background, addressing the current situation in the field from a worldwide perspective, but deepening the analysis for the audience in Finland.

The paper is divided into sections that support the hypothesis of women entering tech, facing challenges in the industry, and potentially planning to leave the industry. The research is made by studying various theoretical sources and by conducting a survey for women in tech in Finland. The theoretical part aims to provide a wide perspective on the phenomenon from current sources, such as professional publications and news platforms, while the practical part in a form of a survey gives the viewer a chance to explore local perspectives of working women in tech. Research methods include a combination of qualitative and quantitative research. Finally, the discussion is concluded in final results, recommendations, and future study suggestions.

The results indicate that women face similar challenges worldwide and in Finland, often describing challenges to rise from a male-dominant environment, lack of role models, inequality, and various other obstacles that don't let women progress equally in the field.

The goal of the thesis was to gather information on women's current state in the industry and bring women's challenges forward, encouraging transparency of the subject.

Keywords
Women in tech, women's challenges, mental health

Table of contents

1 Introduction 3
1.1 Problem Statement and Significance 3
1.2 Research Questions 3
1.3 Terminology 5
2 Women Entering Tech 6
2.1 Increasing Demand of ICT Professionals 6
2.2 Koodaripula – The Shortage of Coders in Finland 8
2.3 Women Playing a Big Part in the Technology Industry 9
2.4 Challenges Women Face in the Technology Industry 14
2.4.1 Challenges Start from Early Education 14
2.4.2 Male Dominant Environment 17
2.4.3 Unequal Treatment 18
2.4.4 Lack of Role Models 19
2.5 Mental Health Challenges 22
2.5.1 Imposter Syndrome 22
2.5.2 Belonging and Psychological Safety 24
2.5.3 Covid-19 Impact 26
2.6 Women Leaving Tech 28
3 Research Design 30
3.1 Method 30
3.2 Target Group and Theme 32
4 Research Results 34
4.1 Basic Information 34
4.2 Expectations 38
4.3 Challenges 43
4.4 Mental Health 45
4.5 Advice for Women in Tech 50
5 Conclusion 53
5.1 Limitations and Future Studies 54
Appendices 63
Appendix 1. Survey: Women in Technology & Mental Health 63

1 Introduction

Increasing demand for ICT professionals and the ever-growing IT sector has sparked an interest in women joining the technology industry. A phenomenon of women entering the tech field has been present for past years, encouraging more women to follow. Despite the interest women show towards tech, there have been many obstacles for women in the field. These obstacles are discussed in the following sections of this paper, giving a reader an overview of the phenomenon.

1.1 Problem Statement and Significance

The objective of the project is to understand current challenges for women in technology, further examining mental health perspectives, researching the subjective from a point of view of a woman who enters the technology field as a newcomer or a career-changer.

Tech is diversifying which leads us to a need for new perspectives on how to take care of holistic mental health in tech, especially from the perspective of women. Understanding women's position in the technology field, concrete examples including suggesting various approaches, examining current problems and solutions, and comparing these together, creating a holistic understanding of the subject is considered to be a part of the key elements of the project.

The project is significant because of its current topics, worldwide impact, and changes in the field of the technology industry - more women entering the field, post-pandemic mental health crisis, changing workplace needs that include heavier workloads, automation and constantly evolving and learning. Recently, these topics have been discussed widely in media and in various women’s communities and seminars.

The mission of this project is to raise awareness and provide perspectives on the combination of tech, women and mental health, presenting potential solutions, targeting women working in the field and people considering joining the IT – field.

1.2 Research Questions

In this thesis, research methods with mixed qualities of qualitative and quantitative data collection methods are used to answer the research questions. Methods include literature research and a survey that was conducted as a part of the thesis project.

Research questions discussed in this paper:

- How culture in the technology field affects women?
- What kind of challenges women face in the technology field?
- What kind of mental health challenges women face in technology field?
- How to make women stay in the technology field?

The thesis is divided into sections that serve the holistic understanding of the problem, starting from a short introduction to the research motives, research questions, terminology used in this paper and the significance of the topic.

Women Entering Tech Industry – chapter is divided into a chronological order, where the demand of ICT professionals is presented in the context of history, emphasizing the recent happenings, touching on subjects such as the shortage of coders in Finland and worldwide, women's positions and demand in tech and the challenges women face in the industry, starting from cultural challenges to various mental health-related challenges, describing potential reasons for the phenomenon of women planning to leave the field.

Third chapter describes the design and process of the research conducted for the project to support the theoretical framework with practical examples in Finland.

Forth chapter examines research results, in a form of survey topics, touching on women's challenges, describing expectations in tech, and examining participants' mental health state, leaving room for them to comment freely and advise future generations of women.

The last chapter summarizes the research and suggests future possibilities for further studies. Appendix provides a view on the survey created for the project.

1.3 Terminology

STEM = Science, Technology, Engineering and Mathematics, which often have in common critical thinking, hard science and problem-solving.

ICT = Information and Communication Technology, including data, software, hardware, transactions, and the internet.

Covid-19 = Coronavirus disease in 2019 caused by SARS-CoV-2 virus that was spread worldwide, causing various restrictions and regulations in different countries, affecting the majority of the population worldwide.

The Great Resignation = Employees voluntarily resigning from their jobs in early 2021 by the impact of long-term work dissatisfaction and covid-19.

AI & ML = Artificial Intelligence as an imitation of human intelligence and Machine Learning as a form of AI to make predictions of data.

Koodaripula = Finnish term for the shortage of coders, widely discussed in media.

Imposter Syndrome = Psychological experience where an individual doubts his or her competence with a sense of fraud, despite the evidence.

Diversity, Equity, and Inclusion = Also known as DEI; Diversity being ways of how people differ from others by race, ethnicity, socioeconomic status, gender, age, and abilities. Equity being fair treatment and opportunities and Inclusion having a sense of belonging with a collaborative and equal contribution without discrimination.

Equality = A state of being equal in opportunities and status.

Burnout = In the context of work, a state of psychological or emotional stress and exhaustion, often build-up by long term consequences.

Bias = A prejudice against a person.

Brogrammer Culture = Formed from words Bro and Programmer, a term used to describe the masculine culture within the technology industry, popularized in movies and media, for example in The Social Network- movie, describing the birth of Facebook.

2 Women Entering Tech

The project started because of my personal interest towards women in tech and mental health, especially within the combination of these two fields. As a woman newcomer in the technology industry and career changer, I have faced issues related to maintaining good mental health while studying programming and ICT in general; recognizing imposter syndrome “symptoms” and understanding how essential it is to maintain mental health in order to progress in studies and professional life. I have also acknowledged the lack of open discussion and lack of concrete improvements towards better mental health in the tech industry for women. After reading various books on women at work and in tech, as an example, Lean In by Sheryl Sandberg, Invisible Women by Caroline Criado Perez and Nice Girls Don’t Get the Corner Office by Lois Frankel, I have understood that these topics have been trending for several years, peaking in popularity especially during covid-19 pandemic.

The chapter is following chronological order from a need for women in the technology field, as a consequence of reconstructive change of workforce, to challenges women face, to leaving the industry, addressing various causes along the way.

2.1 Increasing Demand of ICT Professionals

Throughout history, technology has driven a great change and reinvention, changing jobs, as well as societal structures. Following the first industrial revolution that began in the 18th century with the use of steam power, which drastically improved productivity, major technological shifts have continued to power the next revolutions, from different eras of industrialization to the current 4th industrial revolution that started in the late 1990s, however, majorly accelerating after Web 2.0 in 2005. For the past decade, artificial intelligence, cloud, the internet of things, and augmented reality have become very familiar in our everyday activities, continuing to transform our work methods and habits daily, combining virtual and physical worlds seamlessly together and creating new opportunities. Not only they change how we work, but also make us think how to create real value and even re-think what it means to be truly human. (Cheese 2021, 101- 103).

Technology has also enabled greater agility and ability to respond, enabling new business models, products, and services, and new ways to work. Hence, the terms "digital disruption" and "digital transformation". Figure 1 demonstrates the stages of the industrial revolution.

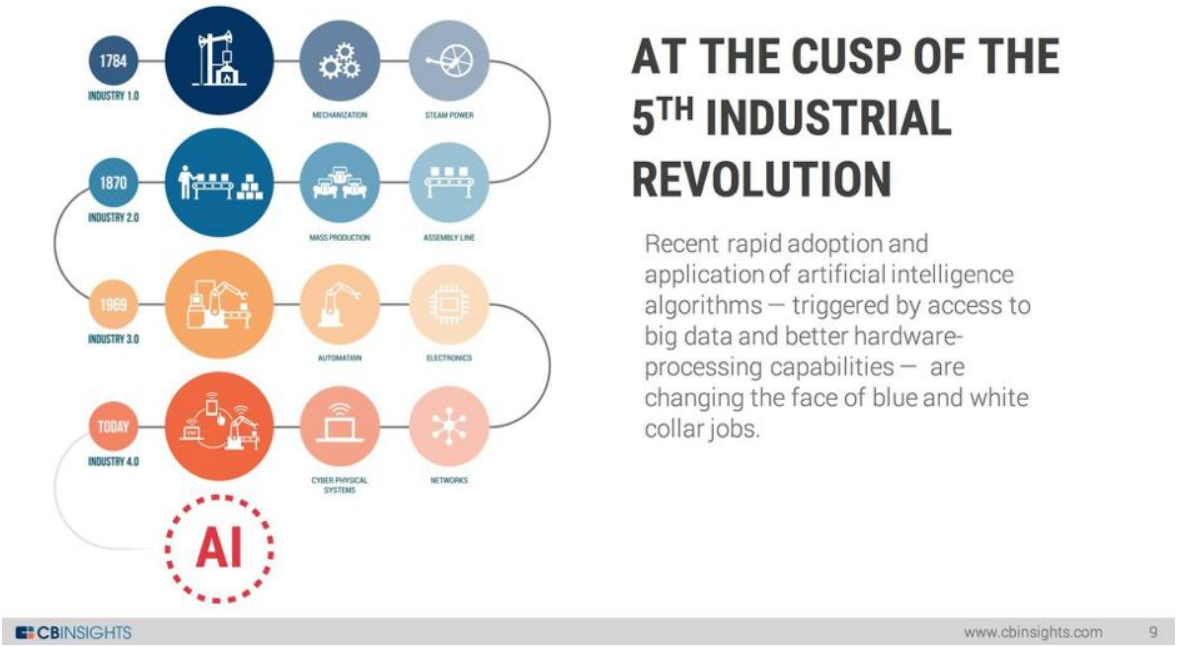


Figure 1. Industrial Revolutions throughout history, highlighting the 5th industrial revolution. (DevOps.com 2017)

Despite positive and promising possibilities, digital transformation has also created challenges in the market, increasing the need for certain professionals, such as ICT professionals, while decreasing the demand in others.

In the European Union, ICT employment is currently undergoing rapid growth as digitalization spreads throughout the workplace reshaping it. The sector represents a broad category of professionals, software developers, telecommunication engineers, systems analysts, media designers and others. In this highly promising sector, employment growth is more than eight times higher than the average EU employment growth rate, leaving ICT specialists in short supply throughout Europe, according to Eurostat. (Andre and Bona, 2018)

The increasing demand for technical jobs is shown by roles from a report by World Economic Forum in 2020 (Figure 2). Data Analysts, AI & ML professionals and Developers are in high demand, while professions with a high probability of automation are decreasing, such as Data Entry Clerks, Accountants, and Assembly workers.

FIGURE 22 Top 20 job roles in increasing and decreasing demand across industries

	Increasing demand		Decreasing demand
1	Data Analysts and Scientists	1	Data Entry Clerks
2	AI and Machine Learning Specialists	2	Administrative and Executive Secretaries
3	Big Data Specialists	3	Accounting, Bookkeeping and Payroll Clerks
4	Digital Marketing and Strategy Specialists	4	Accountants and Auditors
5	Process Automation Specialists	5	Assembly and Factory Workers
6	Business Development Professionals	6	Business Services and Administration Managers
7	Digital Transformation Specialists	7	Client Information and Customer Service Workers
8	Information Security Analysts	8	General and Operations Managers
9	Software and Applications Developers	9	Mechanics and Machinery Repairers
10	Internet of Things Specialists	10	Material-Recording and Stock-Keeping Clerks
11	Project Managers	11	Financial Analysts
12	Business Services and Administration Managers	12	Postal Service Clerks
13	Database and Network Professionals	13	Sales Rep., Wholesale and Manuf., Tech. and Sci.Products
14	Robotics Engineers	14	Relationship Managers
15	Strategic Advisors	15	Bank Tellers and Related Clerks
16	Management and Organization Analysts	16	Door-To-Door Sales, News and Street Vendors
17	FinTech Engineers	17	Electronics and Telecoms Installers and Repairers
18	Mechanics and Machinery Repairers	18	Human Resources Specialists
19	Organizational Development Specialists	19	Training and Development Specialists
20	Risk Management Specialists	20	Construction Laborers

Source
Future of Jobs Survey 2020, World Economic Forum.

Figure 2. Future of Jobs (World Economic Forum 2020)

According to Bona & Andre (2018), attracting women to the ICT-field could potentially fill the ICT-skill demand gap in the economy, while tackling simultaneously gender pay gap, referring to the ICT- sector's highly paying opportunities. Women in STEM-sector could also lead an economic growth and an increase of GDP over the long-term, however emphasizing the fact, that a lot must be done for the integration of women in the field, which has been typically seen as a more masculine, and gender-biased environment.

Along with the existing challenges to find workforce for the ICT-field, the covid-19 pandemic has also left its mark on the industry. According to Robinson (2021), there has been a spike in resignations in the high-tech and healthcare industries: Resignations in the tech industry have risen by 4.5% from March 2020 to March 2021, while resignations in the healthcare field have risen by 3.61%, making the predicted "Great Resignation" happening more sooner than later, causing struggles for the companies to retain their best talent.

2.2 Koodaripula – The Shortage of Coders in Finland

The increasing demand of ICT workers has not only impacted global situation, but also reflected on the local Finnish job market, creating a phenomenon called "koodaripula", translated as a shortage of coders. "Koodaripula" has gained media visibility not only in professional ICT-publications, such as Tivi, Mikrobitti and Tekniikkatalous or business

publications, such as Talouselämä (talouselama.fi) and Kauppalehti (kauppalehti.fi), but in well-known to public Finnish newspapers and channels, such as Helsingin Sanomat (hs.fi) and Yle (yle.fi). A website and an independent research project, called koodaripula.com, was created to provide insights on the phenomenon.

Although phenomenon has gained public visibility and being discussed actively among the industry participants, some experts in the industry disagree with the shortage of programmers in Finland, emphasizing the shortage referring only to senior professionals, rather than juniors or newcomers.

According to the research project conducted by Eetu Korhonen via koodaripula.com, majority of the participants agreed with the shortage, however, 40% of the participants emphasized the need for experienced seniors and for the right skillset, rather than coders in general. However, the answers were not black and white. Participants had mixed feelings when it came to conclusion whether there were too many or too little coders in the industry, in the context of up-to-date skills. Another factor of a confusion was the question why there is a shortage of coders, but the shortage is not transferred into salary increase. The research also highlighted a significant mindset difference between ICT-professionals and recruiters. Majority of recruiters verified the shortage, which potentially describes the difference in perception and the reality of ICT-professionals versus recruiters and HR personnel. (Kangasniemi, 2020).

Raising concerns occur when there is a need for coders, but unexperienced juniors find it difficult to get one's foot in the door. The needs of companies and freshly graduated students are unmet, creating a gap in the market, leaving juniors without the essential experience. Mindset adjustment could potentially solve the increasing problem.
"Companies should share a responsibility to provide growth opportunities for juniors where they could gradually become seniors. University cannot give the required work experience. Firms should think less selfishly, not only competing for already established professionals", describes Matti Luukkainen, Lecturer at University of Helsinki, department of Computer Science. (Luoma-aho, 2021).

2.3 Women Playing a Big Part in the Technology Industry

Currently, only 25% of ICT- professionals are female, while majority of software professionals are men, with an estimation of 90% of male coders. According to Statistics Finland (Tilastokeskus) in 2017, 4 out of 5 were male ICT-graduates. The challenge can be detected in early education, where female students are less encouraged and supported to

choose ICT related studies. According to youth survey in 2016, only 7 % of girls see ICT-industry as a dream career. (Ukkonen, 2019).

Worldwide, technology field has struggled to achieve diversity and equity for a long time, escalating to Great Resignation during covid-19 pandemic, which is suggested to be partly caused by culture fit problems. In a survey conducted by academic publishing giant Wiley, 68% of respondents felt uncomfortable in technology roles because of their gender, ethnicity, or socio-economic background. Besides cultural environment factors, other challenges in the tech industry are tied to lack of racial justice and misogyny. (Melendes, 2021).

As being roughly 50% of the population, women play a big role of diversifying technology field. It is a common interest for the society and tech companies to attract more women into the field to maintain a balance, while simultaneously invent new approaches for tackling previously ignored or unseen perspectives, such as data biases that has become a hot topic, since Invisible Women – book by Caroline Criado Perez was published in 2019 and Coded Bias – documentary aired on Netflix in 2020, causing people to pay closer attention to the future of technology, its usage and development for the benefits of all – not only for a homogenic representation of certain group of people.

To increase diverse representation, Orduna (2021) reminds that people with different backgrounds bring new ideas to solve existing problems, particularity in technology field where innovation plays a key role for development of the industry. She recommends that underrepresented individuals join or form communities to support each other and provide value for fellow participants by volunteering and networking to support personal and collective development by becoming visible in the market, helping to understand the industry by providing mentorship opportunities and by driving change forward by actions of individuals.

“People naturally connect with those who resemble themselves, and if you are the different one, you may be overlooked”, explains Orduna, while highlighting the importance of variety and diversity in technology industry.

Companies and organizations have recognized unbalanced situation and started tackling the issue by introducing various projects and programs targeted at women, making the field more appealing and concretely supporting women to transfer into male dominant tech industry, by providing free educational courses, workshops, peer supportive environment and other possibilities.

In Finland, significantly covered in news and widely popular “women in tech”- project, Mimmit Koodaa (Women Code), was created to encourage women to join the field by providing free of charge hands-on technology workshops in partnership with well-known technology firms such as IBM, Microsoft, Accenture, Amazon and many more, and various other activities supporting women presence in the field by organizing large seminars, introducing stories and paths of women working in the field from long-term professionals to career changers, highlighting different ways to enter the technology field, regardless of the background. The project had a significant impact on a perception of women in technology-field in Finland, being awarded with multiple awards, including European Union 2019 EESC Civil Society Prize.

“The long-term objective of #MimmitKoodaa is to help giving future generations an equal opportunity to study and flourish in the IT field, especially in the software industry. In the future, every company will be a software company and there will be an increasing need to use, customize, buy, and develop software “, describes Mimmitkoodaa-website, attracting more than 7000 women participants in Finland. (Mimmitkoodaa, 2021).

Other known organizations or groups for women in Finland include:

- Women in Tech Finland - a network organization that promotes technology careers for women with events and research.

- Future Female – a networking platform for women that introduces digital opportunities, highlighting new ideas.

- Mothers in Business – a network for career-oriented women, where family and career goals align.

- Ompeluseura LevelUP Koodarit – a support network for women and gender minorities on Facebook.

- Women’s Career Network – a network for ambitious female and non-binary students with connection to business, economics, or law.

- Vaikuttajaverkosto Woman Ry – woman network association with a mission to ensure visibility of women leaders in Finnish society.

- Kauppakeskuskamari, Chamber of Commerce - Naisjohtajien mentorointiohjelma (Mentoring program for women leaders) for experienced professionals in middle management positions.

Besides women networks, recruiting coding bootcamps, such as Saranen (https://www.saranen.fi/rekrytointikoulutus/mimmit-koodaa), AW Academy (https://awacademy.fi/koulutukset) and other educational technology programs, such as AMKoodari (https://amkoodari.fi/fi) have visibly targeted women candidates with their "women friendly" advertisements to attract more women into the male-dominated field (Figure 3). By presenting women as the norm in the field, not as a minority, it would be potentially more likely to encourage newcomer women to join the ICT-industry and find sense of belonging.

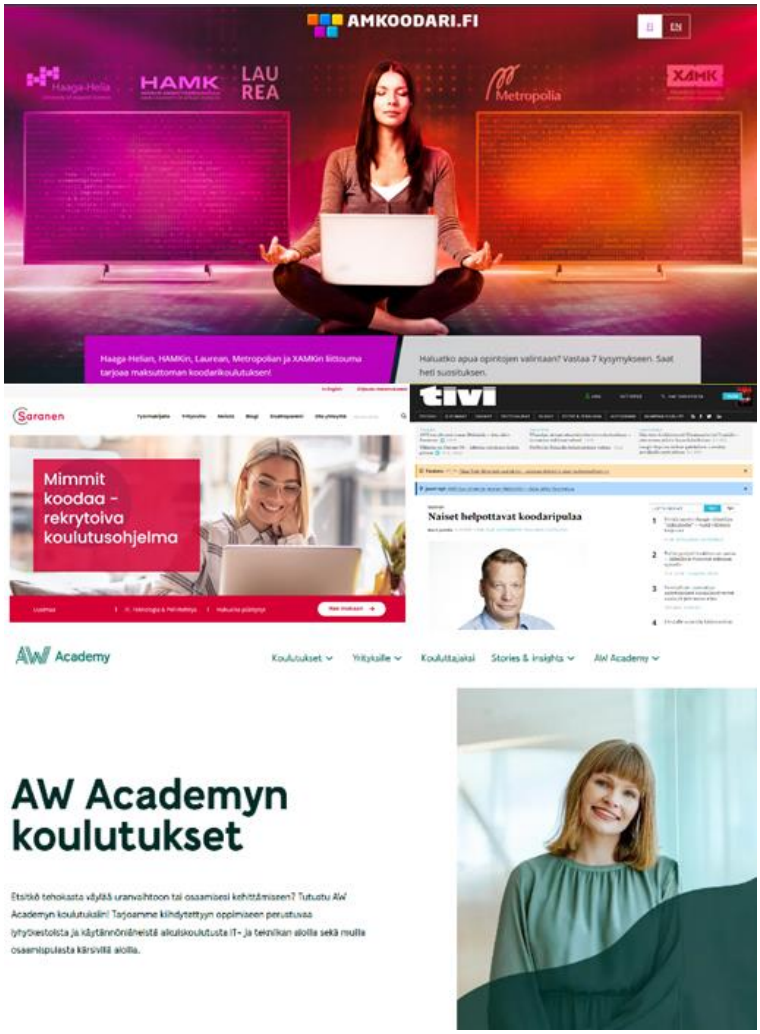


Figure 3. Inviting women to tech -phenomenon. A collage of a trend in advertisements to highlight women's presence in the technology field (Amkoodari, Saranen, Tivi, AWAcademy 2022).

The European Union has acknowledged the importance of supporting and encouraging women to join technology industry, by providing initiatives, ranging from peer supportive coding clubs and networks to grants for technical education and innovation, focusing on an entrepreneurial mindset, while emphasizing the importance of the future leaders and the mindset for diverse voices in the technology industry. Currently, European Union is providing programs, such as the Grand Coalition for Digital Jobs, the Startup Europe Leaders Club, EU Prize for Women Innovators, European Network of Women Web Entrepreneurs, EU Code Week, and many more. (European Parliament, 2018).

Although recruitment companies and various other organizations have recently targeted women and introduced the idea of more women joining ICT-field, historically, women were present in the technology field since the very beginning of the industry development.

Despite the common beliefs and stereotypes of programming and other ICT-jobs being men's professions and exclusively targeted to nerds and geeks, which is often seen as masculine traits, the very first programming language was developed in 1883 by a woman called Lady Ada Lovelace. From 1940s to 1960s, computer programming was considered being women's profession. Only after 1960s, programming was advertised mechanical and more suitable for male candidates, highlighting the monotonous nature of the profession, which was created to appeal more interesting to men. The antisocial nerd image was later born, while simultaneously computer games being marketed exclusively for boys, gradually decreasing women's presence in the field. (Salmi 2020).

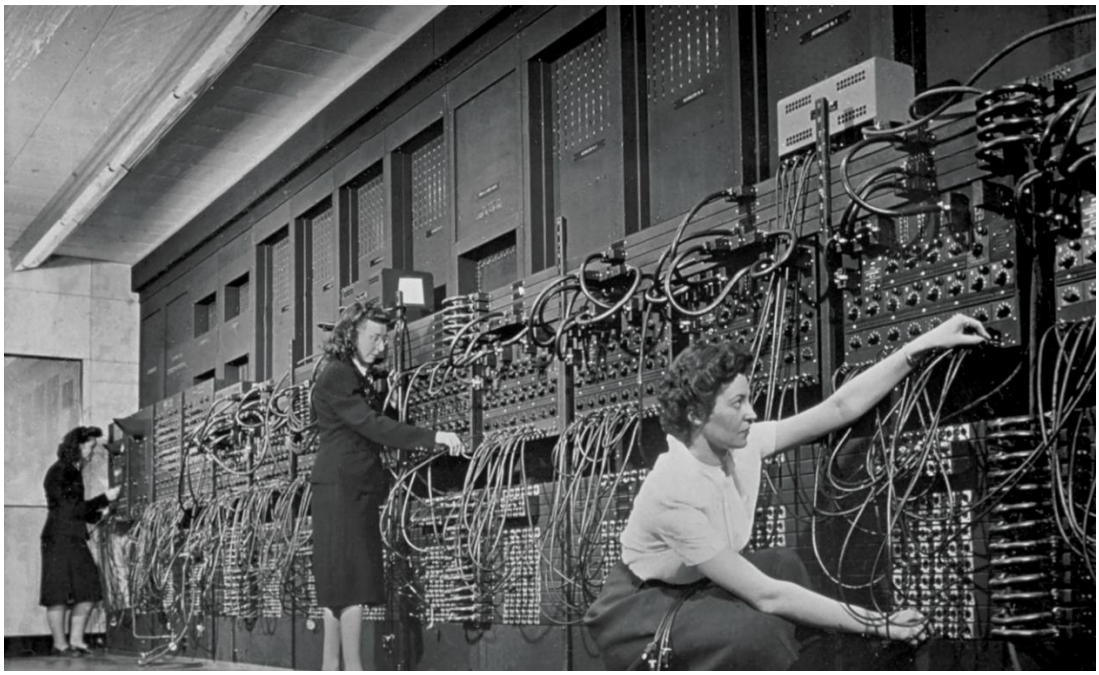


Figure 4. Computer operators with an Eniac – world's first programmable general-purpose computer. (The New York Times 2019).

2.4 Challenges Women Face in the Technology Industry

Tech industry provides many possibilities, including various career path options, good compensation, new opportunities, and other perks, such as playful office spaces and fun side activities. Often, perception of the industry is rather optimistic, creating high expectations for newcomers. Potential reason for optimistic perception could be connected to lack of professionals in the field, making recruiters highlight the perks of the work to attract best candidates. In reality, there are as many perks as challenges.

Technology industry is in constant change with evolving programming languages and other innovations; cloud and AI, for example, being the big game changers in the recent years. In order to succeed, continues learning is an essential skill to have when considering entering the industry. Tech environment is often also seen as a fast-paced, exhaustive in interview processes and it demands good self-organizing skills, to manage critical situations that might appear unexpectedly. (Orduna, 2021).

Software development is a complex field, where continuous development requires learning to plan efficiently, time management, constantly updating your skills and effective communication and collaboration with other teams. Constant up-to-date alertness is also part of the work, ensuring the security aspects of the development cycle. Challenging error tasks and expectations by others regarding “know-it-all” -mentality are common for developers to experience. (Geeksforgeeks, 2021).

As a whole, ICT-field is challenging in nature for everyone. What makes it even more difficult for women is the fact that despite already existing challenges, women face various other issues that create more blockers for women to find their place and succeed in the industry.

2.4.1 Challenges Start from Early Education

Women’s challenges already start from the early years of education, in high schools, or even earlier, when certain skills and possibilities are encouraged and provided – or in the opposite side, lack of encouragement and support affects on girls’ perception of technology industry, impacting decision making later in their life and absence of preferred skillset in the industry.

Underrepresentation of women in STEM (Science, Technology, Engineering, Mathematics) can start around age 15, having long-term consequences for the future career. 15-years old boys are twice likely to select engineering, science, or architecture work. Less than 0.5 % of girls consider being ICT-professionals. The selection of study path is deeply rooted in gender-related career expectations, varying between different countries. In science careers, girls prefer health professions (17.4 %), while boys select engineering (12.2%). (OECD, 2017).

Attitudes towards career paths often come from peers, teachers and parents. Boys are more likely to be encouraged to experiment with hobbies connected to tech, while girls directed to more domestic hobbies or other “more typical for women” activities.

It is showcased that as children, both girls and boys share same interests towards STEM, but perception changes when they grow up. Experiences, such as trading an IT-class place with a boy, suggested by a teacher because of the opinion of more suitable choice for a girl, can impact later choices in life, discouraging girls to even try. This and other similar feedbacks are received from women, when describing their IT- related memories at school. Early adopted attitudes and social environment form gender gaps in the future work life. (Kaartinen, 2021).

Gender gaps continue forming during university studies too, adding up more challenges for women. After stepping over existing threshold by selecting ICT-field as a study path in higher education, women are still gender minority in ICT, in both universities and universities of applied sciences in Finland.

According to THL (2022), in research conducted in 2019, 80 % of students in ICT- study programs in universities of applied sciences were male. In universities, the number was 78%.

In survey conducted for Aalto students in 2020, reaching especially women studying in technical programs, women describe their challenges and experiences at the university as following:

- Gaining more help from male students, but also experiencing too much attention.
- Need to prove own worth and defend authentic interest. Proving the right to belong in the field.
- Not able to form friendships during 4 years of studies, causing lack of belonging.

- Restricting own personality to prevent uncomfortable situations that touch interests from the opposite sex.
- Being recommended to choose courses based on “less hard for a girl”-attitude.
- Heard being too emotional and not humoristic enough to suit for laboratory environment.
- Security equipment being too large for women.
- Lacking women supervisors.
- Lacking gender neutrality when hearing public talk.
- Lacking diversity in general, especially when it comes to people in higher hierarchies.

Research revealed that students in general were quite satisfied with the education, however, gender minorities noticed easier the lack of diversity among industry visitors and described inability to feel freely being themselves. (Jääskeläinen, 2021).

In professional life, after studies, women continue to face the same challenges, but also being introduced to new challenges, that were absent from school life. These new challenges include pay gaps, issues in combining family life with professional career and many others.

Survey conducted by technology company Ivanti in 2019 reports the biggest challenge for women (Figure 5) remaining “being taken seriously due to gender perception”, addressed by 53,8% of women. Other challenges were “gender pay gap”, “the glass ceiling”, “having no female role models”, “sexism in the workplace”, “lack of diversity within the company” and “conservative career perspectives as a part-time employee” – which had the biggest increase of 32,9% from 2018 to 2019. (SpecOps, 2020).

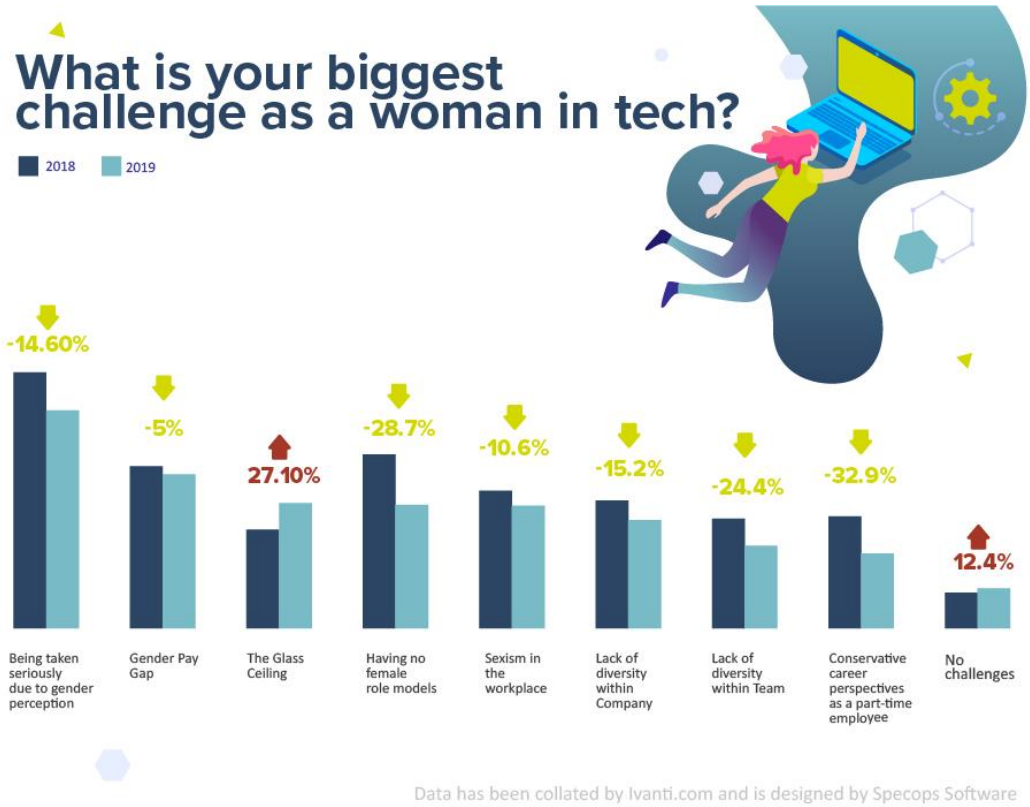


Figure 5. Biggest challenges women face in tech (Specops Software 2020).

2.4.2 Male Dominant Environment

Male-dominant environment has affected women's sense of belonging at workplace, causing loneliness and feelings of being left out, forcing women to modify their behavior to suit "manly norms".

In IT-sector, women are consciously left out from male-dominated events, because they don't belong into the inner circle. Offsite events are organized in place that are non-friendly towards women, such as strip clubs, leaving women out of important conversations regarding promotions. Women also must learn to speak up, to fit significantly more exaggerated ways of talking, which are more common for males to do, when presenting themselves in resume or while speaking. (Wood, 2021).

"Not being assertive won't get you promoted. Being assertive makes you unlikeable. Either one makes promotion difficult. Not being liked holds women back, according to Lean In, an organization dedicated to overcoming these obstacles, because women who aren't liked are seen as less competent", describes Wood (2021).

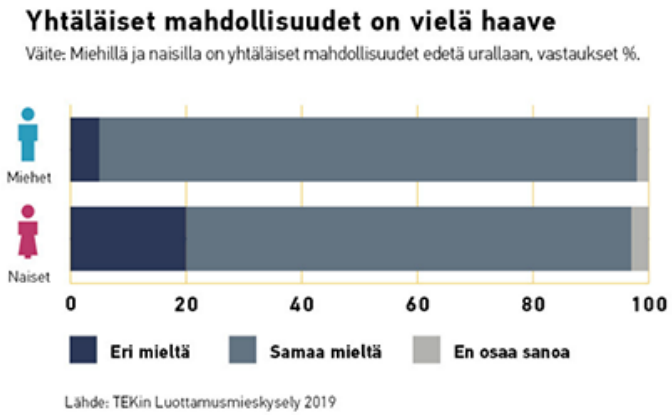
This phenomenon called bro culture, creates toxic work culture, decreasing opportunities for women to thrive.

Bro culture reflects on modern perception of patriarchy, rooting back to history when corporate world was created for men by men, while women were staying at home taking care of children. The processes, structures and standards were designed men in mind. Nowadays, bro culture is seen being bad for business, causing losses in employees and reputational damage. (Olsen, 2021).

Masculine culture has also described to be hateful towards women, openly descriptive of sexual subjects, underestimating and inacceptable towards women, leaving them behind in career development. Men don't seem to acknowledge these problems same way as women, according to the research conducted by TEK in 2019, where every tenth of male participants didn't see unequal treatment at work in correlation with gender, while 34% of women recognized the issue. (Muukkonen, 2019).

2.4.3 Unequal Treatment

Another challenge for women is unequal compensation. Pay gap still remains, being 84 cents for women for each euro men earn. When it comes to different roles in tech industry, women earn less than men in almost every category (Figure 6).



Naisten eurot ovat pienempiä

Naisten mediaanipalkan osuus miesten mediaanipalkasta sektoreittain, %.

	2008	2018
Teollisuus	86	90
Suunnitteluala	85	91
Muu yksityinen sektori	87	90
Yliopisto	91	88
Valtio	83	90
Kunta	81	89
Kaikki	**84**	**88**

Lähde: TEKin Työmarkkinatutkimus (TMT) 2018 ja 2008

Figure 6. Equal possibilities for women to advance in career? (TEK 2019).

Biggest difference is among web and multimedia developers, where women's salary median is 3520 euros, while men earn 4557 euros, under the same title, leaving women with 1037 euros less every month. In software development, men earn 578 euros more than women monthly. (Kolehmainen, 2021).

Equal treatment is not only missing from compensational perspective but from the quality and variety of tasks given, impacting women's progress in their career (Figure 7).

Undervalued tasks, called "office housework" are often delegated to women. These tasks can be anything from planning conferences, cleaning up to other service tasks, such as organizing environment and handling logistics. Men on the other hand, often participate in more glamorized tasks such a bringing in the clients, "owning the code", executing client deals and publishing strategic plans and journals. (Williams, 2014).

INDUSTRY	HOUSEWORK	GLAMOUR WORK
High tech	Managing projects	Writing the code
Law firms	Being a "service partner" who does the actual legal work	Bringing in clients
Consulting	Managing projects, delivering work, mentoring colleagues	Developing new business, managing C-suite relationships, serving as subject matter experts
Investment management firms	Handling logistics on pitches, working for low-profile clients	Making investment decisions, executing high-profile deals, managing key client relationships
Academia	Being dean of students or on the admissions committee	Publishing in prestigious journals
Architecture	Detailing bathrooms and elevators	Visiting sites, pitching to clients, being the lead in design competitions
Surgery	Managing patient care outside the operating room	Performing surgeries
Science	Organizing and executing lab work	Strategic planning of future research direction, publishing in prestigious journals

Figure 7. Housework VS Glamour work in different industries (Harvard Business Review 2014).

2.4.4 Lack of Role Models

Lack of female role models at work can cause lack of needed support, especially for newcomers that experience challenges with navigating in a new company or role.

Mentoring supports career growth and can address the skill gap in the IT – industry. Proper mentoring helps with engagement at work and effects on career development possibilities. Benefits of mentoring include knowledge sharing, encouragement, goal setting, leadership skills development, motivational support, network sharing and many others. (Mayhew, 2020).

How could women receive equal opportunities for growth, when they lack mentors that look like them, talk like them and are genuinely there to help their career growth without unprofessional thoughts of actions on the back of their minds?

Besides all previously mentioned challenges women face, they also need to adjust to manly culture by modifying their behavior to appear having more man-like qualities that are often highly appreciated in leadership positions. Women are constantly being recommended to adjust their body language to appear more dominant, change their tone of voice and forget “touchy-feely”-language, recommended to wear more or less make up and pay attention how they dress to not appear too distracting for male colleagues. These kinds of advices can be found from various books targeted at women to “keep up with business world” or to “avoid mistakes women make”, such as in Nice girls don’t get the corner office - book by Frankel, published in 2004.

Women are told to forget their femininity and advised being more rational – not emotional or creative. They are told to stop thinking like a woman and think like a man. Contradictorily, on the other hand, women are told to not stand out or be too ambitious – otherwise they will be hated. They are constantly told to blend in. (Bateman, 2013).

“Evidence shows that women are less self-assured than men—and that to succeed, confidence matters as much as competence”, state Kay and Shipman (2014) in article describing confidence gap between men and women. Women are suggested to be more unsure about their abilities, applying for promotions when they were 100 % sure they met qualifications while men needed only 50% assurance. The confidence factor seems to be connected to testosterone and early behavioral expectations by society in environment that is either rewarding or discouraging to react in certain way, decreasing or increasing confidence traits. Women’s performance is affected by hesitation, not their real ability to perform in tasks.

Behavior that highlights manly traits can be spotted already from work advertisements, before women even enter the workplace. Advertisements not only use imagery that is more

appealing to men, such as dark coding backgrounds with hooded characters and connection to nerdy inside-jokes from geek movies, but also in language selection that is perceived as gendered (Figure 8).

These unconscious biases affect women's low-representation in tech, attracting male candidates with more male-appealing word choices such as, "active", "fearless", "logical", "champion", "independent", "confident" and others, instead of word that appeal to women, such as "co-operative", "honest", "kind", "supportive", "empathize" and others. (Techbrain, 2022).

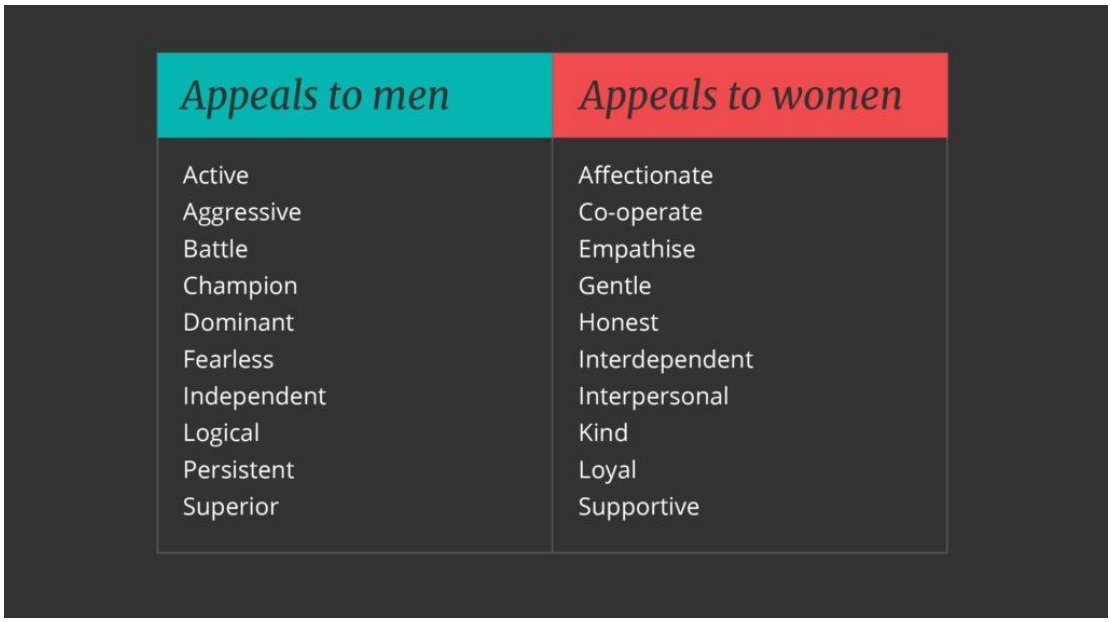


Figure 8. Words used in work ads in comparison of appealing factors between males and females (Techbrain 2022).

In summary, women's challenges in technology field include:

- Lack of mentors
- Lack of female role models
- Uneven growth opportunities
- Pay gap
- Confidence gap
- Not being taken seriously (dismissive attitude)
- Sexual harassment
- Sexism
- Lack of diversity
- Unbalanced family and work life combination
- Lack of belonging

- Not being able to be themselves
- Constantly being underestimated

To summarize women's challenges and understand where they originate from, we need to see the red thread that connects dots from early childhood to adulthood. Women's challenges in tech industry, among other male-dominated industries are rooted in recommendations and encouragement received in early childhood, either empowering girls to plan their activities towards upcoming tech careers or discouraging them by outdated attitudes that guide them away from these career paths. However, not only childhood matters, but support system throughout teenage years and young adulthood. With a proper support from parents and friends, society and allyship with men, women could have better opportunities to thrive in tech – making the world more equal and balanced.

2.5 Mental Health Challenges

When examining women's challenges in tech, it is essential to expand further to find the cause, not only the consequences. One of the causes is mental health. Mental health problems have been increasing during past recent years, not only touching adults but also impacting youth, creating various challenges at work and in personal lives.

"In recent years, there has been increasing acknowledgement of the important role mental health plays in achieving global development goals, as illustrated by the inclusion of mental health in the Sustainable Development Goals. Depression is one of the leading causes of disability. Suicide is the second leading cause of death among 15-29-year-olds. People with severe mental health conditions die prematurely – as much as two decades early – due to preventable physical conditions... Mental health conditions are increasing worldwide…there has been a 13% rise in mental health conditions and substance use disorders in the last decade (to 2017)", describes World Health Organization – WHO (2022).

2.5.1 Imposter Syndrome

When it comes to technology industry, a phenomenon, impacting people's mental health, called Imposter Syndrome has been visibly present in the conversations in the industry. Especially connected to women and their experiences working in tech.

In simplicity, imposter syndrome is a condition where a person cannot see himself or herself as a capable individual despite being one. This person often feels to be a fraud or incompetent with a fear of being exposed to others. She or he often thinks that other people think too highly of him or her. Although imposter syndrome is connected to women, the phenomenon is recognized by 70% people in general. It is often connected to a phase in life where an individual starts a new path, a project or moves into work life. (Koodarikuiskaaja, 2020).

“Imposter syndrome took a fairly universal feeling of discomfort, second-guessing, and mild anxiety in the workplace and pathologized it, especially for women. As white men progress, their feelings of doubt usually abate as their work and intelligence are validated over time. They’re able to find role models who are like them, and rarely (if ever) do others question their competence, contributions, or leadership style. Women experience the opposite”, state Tulshyan and Burey (2021).

“Academic institutions and corporations are still mired in the cultural inertia of the good ol’ boys’ clubs and white supremacy. Biased practices across institutions routinely stymie the ability of individuals from underrepresented groups to truly thrive. The answer to overcoming imposter syndrome is not to fix individuals but to create an environment that fosters a variety of leadership styles and in which diverse racial, ethnic, and gender identities are seen as just as professional as the current model, which Opie describes as usually “Eurocentric, masculine, and heteronormative”” , Tulshuan and Burey (2021) continue, highlighting the fact that confidence doesn’t equal competence, which is often demonstrated by male leadership as a desired quality, diminishing women’s traits – by telling them they have imposter syndrome.

How could women thrive when they’re constantly being told to act different and being overlooked because of different communication styles, not to mention, how can they maintain a good mental health when they are always acting a different role and constantly adjusting, creating extra psychological stress that takes all the energy from the actual work. They key is to modify the culture and fixing bias, not women.

“Imposter syndrome is especially prevalent in biased, toxic cultures that value individualism and overwork. Yet the “fix women’s imposter syndrome” narrative has persisted, decade after decade “, Tulshya and Burey (2021) conclude.

2.5.2 Belonging and Psychological Safety

Another aspect of mental health in connection to technology industry and women, can be examined from the perspective of belonging – or lack of it.

As Figure 9 demonstrates, belonging is part of Maslow's hierarchy of needs that describes individual's wellbeing pillars, being one of two main parts of essential psychological needs. Sense of belonging is described to be as a fundamental human need. If some pillars are missing, the pyramid – a person, starts to experience various challenges. To keep in mind previously stated women's challenges, we can acknowledge how this impacts overall mental health for women.

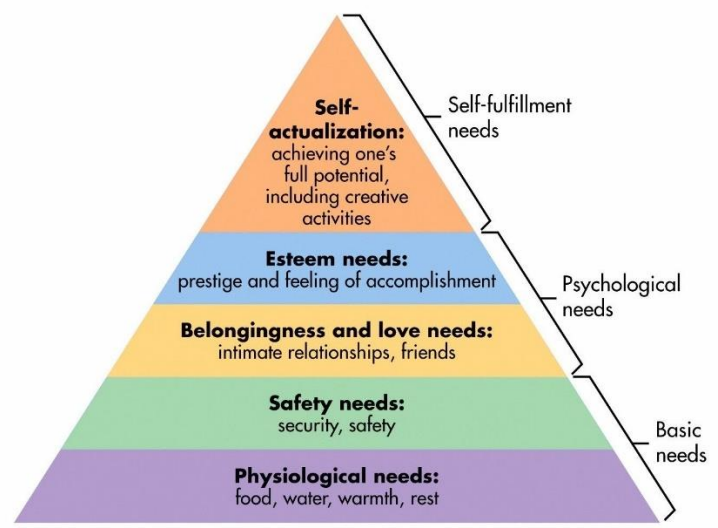


Figure 9. Maslow's hierarchy of needs (Simply Psychology 2022).

Belonging at work means feeling a connection to your co-workers, having support in daily work and career development being aligned with company's purpose and values. Key elements of belonging are "being seen", "being connected", "being supported" and "being proud". (Coqual, 2020).

It is a mutual benefit for both employee and employer to create an environment where people feel like they belong to a group or community and have needed support from fellow employees, managers, and upper leadership levels. High level of belonging not only benefits individual's wellbeing but also plays a role in employee loyalty towards their employer, boosting engagement at work and positively impacting a choice to stay longer in the same company (Figure 10).

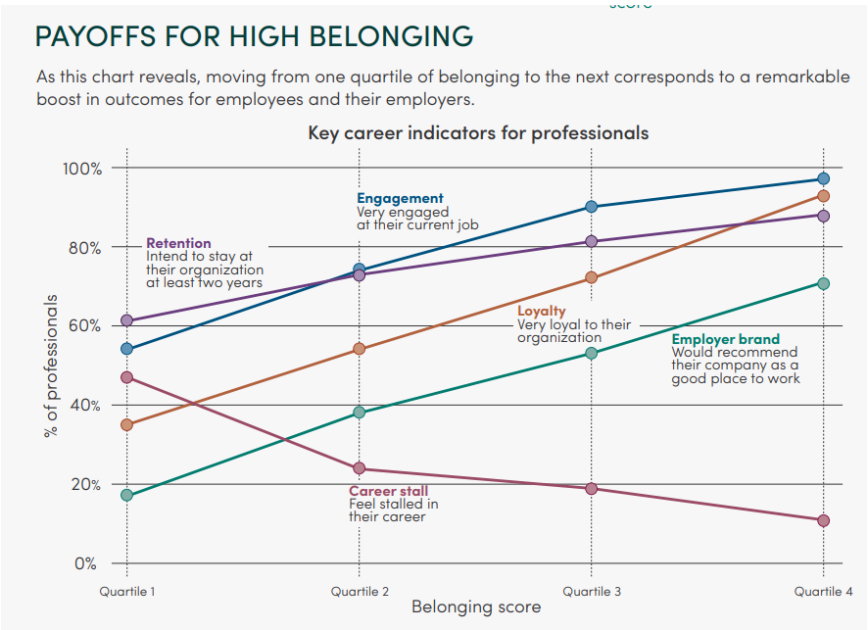


Figure 10. Benefits of high belonging at work (Coqual 2020).

In connection with belonging, psychological safety could be also examined as a perspective of mental health at work.

Psychological safety is constructed of trust, flexibility, resilience, open conversations and speaking up. What psychological safety is not – slacking, guaranteed employment, death of performance reviews and measures nor license to forgo all morality filters. Psychological safety is described to be the only lever for high performance at work. The lack of psychological safety at the top management, is the root of organizational evil that is spread in majority of organizations. Imposter syndrome, risk aversion, fear, dread, and stagnation are common side outcomes of lack of psychological safety, describes Blomstrom (2021).

Mental health is affected by lack of psychological safety, creating a feeling of loneliness, and being abandoned. It is also connected to symptoms of despair and depression. It can affect sleep, ability to think clearly because of the constant stress and create long term exhaustion.
Workplaces where psychological safety is missing can make individuals feel like they are:

- Scared of being wrong
- Reluctant to stand out
- Fearful of offending others
- Holding back instead of sharing
- Terrified of being wrong
- Shamed and not valued

(Dempsey, 2021)

2.5.3 Covid-19 Impact

Covid-19 has affected negatively mental health for many of us for past few years, leaving us with various post-pandemic physical and mental symptoms. Covid-19 has been linked to high rates of mental health problems, such as anxiety, depression, and dementia, created by both pandemic stress and physical effects of the disease. (Ries, 2020).

Women have been affected more profoundly by covid-19, compared to men. Risks of anxiety, depression and post-traumatic stress disorder is higher in women. Women were more likely to experience domestic violence, loneliness, and increased amount of housework during the pandemic, creating imbalance between home and work, which negatively affected their mental condition and career development. (Thibaut & Wijngaarden-Cremers, 2020).

Pandemic has also contributed to significant rise of burnouts among women, in comparison to male workers. Not only stress and exhaustion contributing to this, but also women's extra effort on diversity, equality, and inclusion topics, that are often led and initiated by women. Women are more burned out than they were a year ago, escalating to one in three women considering downshifting their careers, switching jobs, or leaving their company. (McKinsey & Company, 2021).

76% of respondents, participating in a Mental Health at Work 2021 survey, conducted by Mind Share Partners, Qualtrics and ServiceNow, reported at least one symptom of mental health condition in the past year, in comparison to 59% from year 2019. Covid-19 changed mental health awareness at workplaces from nice-to-haves to a seriously acknowledged issue. (Greenwood & Anas, 2021).

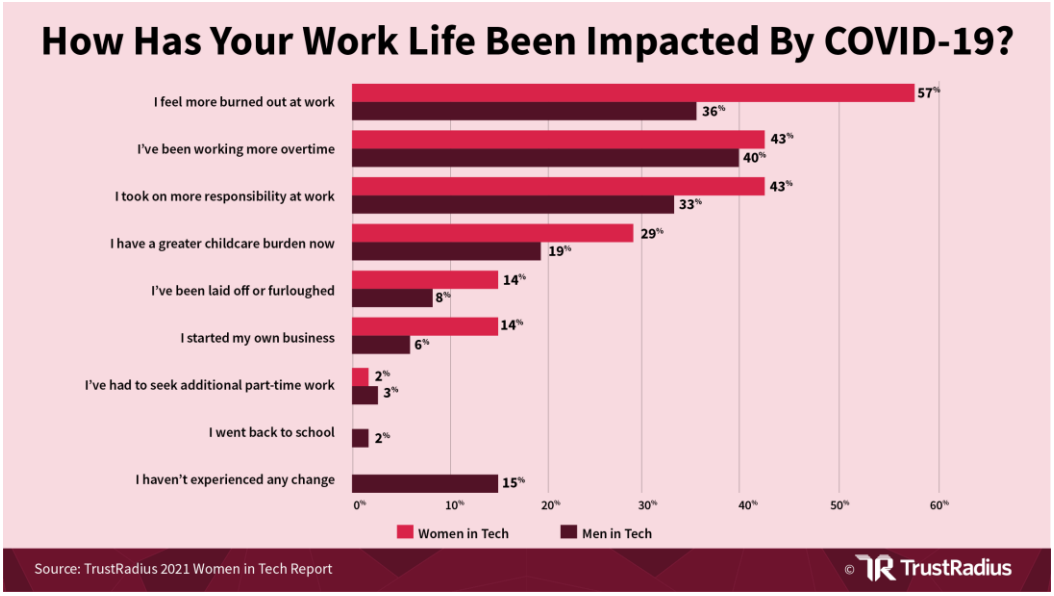


Figure 11. Covid-19 impact on women (Trustradius 2021).

Despite the recognition of such impactors and increased awareness, many workers are planning to leave their jobs for their mental health (Figure 12). It is alarming to observe how pandemic is impacting women (Figure 11), who are already experiencing challenges within technology industry, especially in connection to mental health. The mental health phenomenon has also spread to Finland, impacting knowledge workers the most.

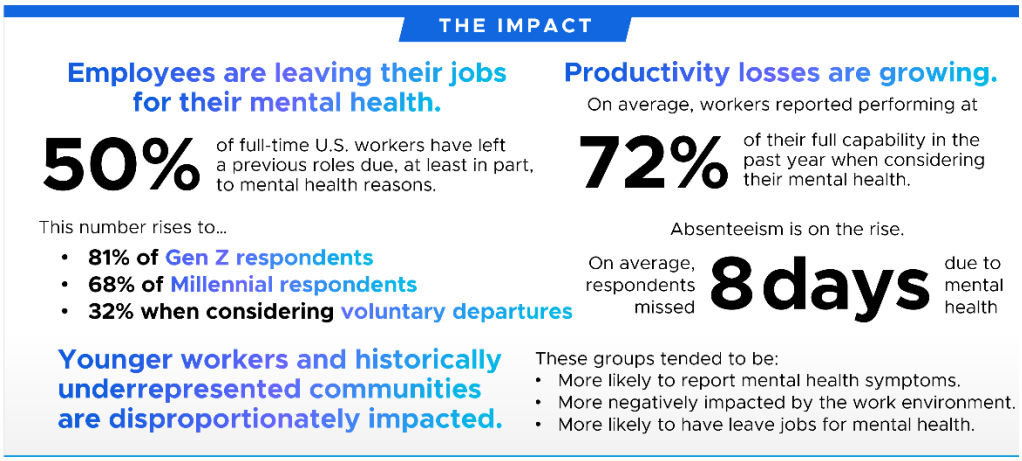


Figure 12. Extract from Mental Health at Work Report 2021 (Mind Share Partners 2021).

In Finland, employees in information and communication -industry are reported to have tens of disability pension cases in a year, making knowledge workers more impacted by mental health problems than other industries, touching hundreds of employees yearly.

The reasons vary from heave information loads that need to be processed quickly, loneliness, interruptions at work and the feeling lack of control. Distance work during pandemic also impacted workload, increasing sick leave cases in 2021. (Harju, 2022).

2.6 Women Leaving Tech

Previously discussed topics on mental health challenges, inequal opportunities and lack of support for women, address why women experience more challenges in technology industry and considered leaving the industry.

According to a survey conducted for 1000 women working in tech, 38% of respondents said they are planning to leave tech in 2 years. 46% says their employer is not promoting gender equality enough. Gender bias significantly contributes to the fact why women are leaving tech, highlighting issues such as lack of female role models, harassment and pay gaps. 43 % of women acknowledge pay gap in their workplaces, however, only 24% discussed it with their coworkers. (Jackson, 2021).

Women continue to experience bias, leaving tech industry at a 45% higher rate than men. Leaving is explained by conscious and unconscious biases; brogrammer culture, being paid less, getting worse work, and being judged for the same traits that are seen positive for men. Family -related challenges also impact leaving. (Forbes, 2017).

“ #1 reason women leave companies is because of a concern for the lack of advancement opportunity ”, states Thomas (2016), emphasizing on unfair treatment and inability to advance in career as fast as their male coworkers. Thomas also mentions that improving diversity, listening, and providing support and guidance could help with retaining women in tech. Unfortunately, support is not properly acknowledged or given, referring to a survey where technical women rated their supervisors lowest for receptiveness to suggestions, feedback, communication skills and availability, explaining that many managers in tech receive little or no training on people or leadership skills, but being rather promoted because of their technical skills, causing damage to women who are trying to progress in their career.

According to a research report “Ingredients of Inclusivity” conducted by Accenture, Mimmit Koodaa, Tekniikan Akateemiset and Women in Tech, in Finland, despite the common misconception, women are ambitious and want to advance in their career. 46% are pursuing

leadership position, however, over 30% find it hard to thrive. Those who were in more inclusive workplaces, loved their job more (73%), in comparison to less inclusive workplaces where satisfaction was rated as 16%. Also, less inclusive workplaces had a higher percentage of women who were thinking about leaving their current job (53%), compared to 7% of more inclusive workplaces. (Women In Tech, 2021).

Women benefit tech in many ways, bringing more workforce, for example, in cyber security field, where demand is increasing due the growing cyber-attacks. Women also contribute to innovation by providing different insights and ways of thinking. Diversity contributes to improving overall intelligence of the team, bringing financial success. So, what can be done to retain women in technology field? Miller (2021) suggests:

- Mentorship programs with female leaders
- Unbiased promotions
- Required respect at workplace towards all genders
- More women in leadership roles
- Providing equal parental leaves
- Supporting female tech education

Reshaping education and societal norms, however, takes time. Changing future narrative is essential to maintain the talent women bring along in the tech industry, concludes Miller.

3 Research Design

To better understand the situation women in technology field face, my aim was to conduct a survey with local population, to gain more knowledge on how women in Finland see the challenges previously presented and reflect on whether there are significant differences between overall image of these challenges worldwide in comparison to Finland.

The survey's mission was to combine previously examined aspects to find correlations between women in technology industry, their challenges in the field and how it impacts their mental health and wellbeing, by providing respondents a platform where they could anonymously and openly share their experiences without a fear of being labelled or recognized. Another aspect to survey, was to gather qualitative responds in a form of tips for younger women and newcomers to gain "inside" knowledge on industries challenges and find shortcuts to overcome them, while providing encouragement and empathic approach to showcase that there are also other women who face similar situations.

3.1 Method

The method used for the research was a mixed method of qualitative and quantitative research questions, in a form of survey that was sent directly to the potential participants and shared in women networks.

Survey was conducted in Survey Monkey platform, and it included 22 questions that varied from open ended comment box questions to predefined options of scale from 1- 5. By using different forms and question types, it was made easier for participants to be more engaged without being overwhelmed with lengthy question options or exhaustive number of pages. Survey was designed to be a page long, simple, and easy to click version, that was accessible for desktop and mobile views with easy-to-read fonts and color scheme that was pleasurable to view, without having too many elements, pictures, or other busy backgrounds, that would affect focus of the audience. The length of the survey was estimated to be 7 min long.

The selection of the survey platform was made carefully, keeping in mind the wanted outcome of clearly presented results and visually appealing content. It was also important to have efficient way of creating a survey without wasting too much time on question designs or complicated data visualization methods. Efficiency in gathering final data in one form was also appreciated when selecting the platform.

From the variety of available survey platforms that was found during the research, Survey Monkey (Figure 13) was selected because of its clean layout and easy-to-use user interface that made survey design, survey share and insights collection easier.

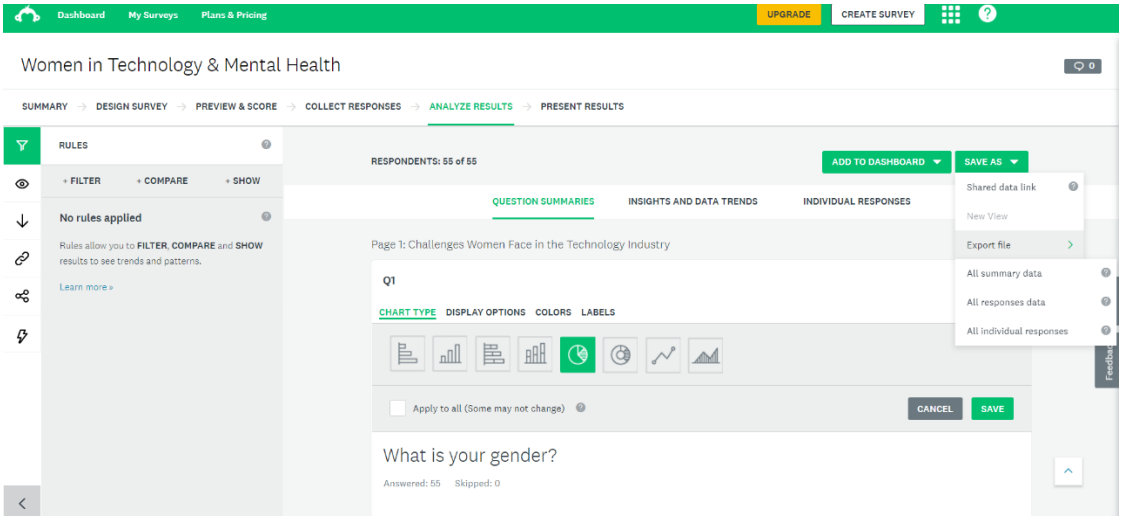


Figure 13. Survey Monkey -survey platform interface. (Survey Monkey 2022).

Other considered survey platforms, that weren't selected for the project:

- HubSpot Free Online Form Builder
- SurveySparrow
- ProProfs Survey Maker
- SoGoSurvey
- Typeform
- Survicate
- Qualtrics
- SurveyPlanet
- Google Forms
- Alchemer
- SurveyLegend
- Zoho Survey
- Crowdsignal
- Survs
- FreeOnlineSurveys

(Amaresan, 2022).

3.2 Target Group and Theme

The survey was targeted at women in technology field from newcomers, career-changers to professionals and pioneers who work in Finland. The main focus was to collect information from women already working in the field, who could provide insights on their experience in practise, in comparison to students, who have potentially heard of challenges or acknowledge the problem but haven't necessarily experienced it in professional working environment. As a student and employee in tech, myself, I have acknowledged these issues during my studies, however truly understood their impact during working hands on in the industry.

To provide wider and more versatile perspectives from the audience, target group was decided to be selected from various technology companies, networks, and organizations, utilizing existing networks of mine. The aim was to gather information from women who are working with various technologies, in different organizational structures and have diverse experience. The survey request was sent to organizations such as Mothers in Business (MIB), Future Female, Women in Tech, Mimmit Koodaa, Level Up Koodarit, Kauppakamari naisjohtajat and other women who were contacted directly through social media channels.

Because of the conscious decision to target survey to women working in Finland, survey was not sent to international women in tech networks, despite the possibility and potential for variety and quantity of the responds.

The themes of the survey were divided by categories that were designed to fit hypothetical narrative that was created to guide the survey to gather required responds. The hypothesis included a personal observation in a form of a timeline:

- Women being encouraged to join technology industry.
- Women's expectations not met, and challenges occurred.
- Prolonged challenges causing issues with mental health.

Following survey categories were formed based on the hypothesis:

1. Basic information, including age, gender, job title and career level and living arrangements – to understand respondents current professional and living situation.

2. Expectations of work life, including technology field expectations and whether they were met – to understand and potentially find a gap between the image of technology industry and reality of it.

3. Entering tech industry, including participants unique career paths and challenges they may have faced – to understand concrete examples of challenges and see correlations between paths and challenges faced.

4. Mental health and technology industry, including self-reflection for participants' mental health during 2021 and workplace involvement with mental health support – to understand current state of mental health for women in tech and employers' effort.

5. Advice for others, including reflection on younger self and free comment space to comment on the phenomenon – to collect best practices and encourage future generations to tackle these issues with an open discussion.

4 Research Results

The survey timeline was selected to be during April 2022. Survey platform was planned to be tested and questions modified few times before official survey publishing. Figure 14 showcases the survey timeline and first test case performed on April 7th by a first test participant.

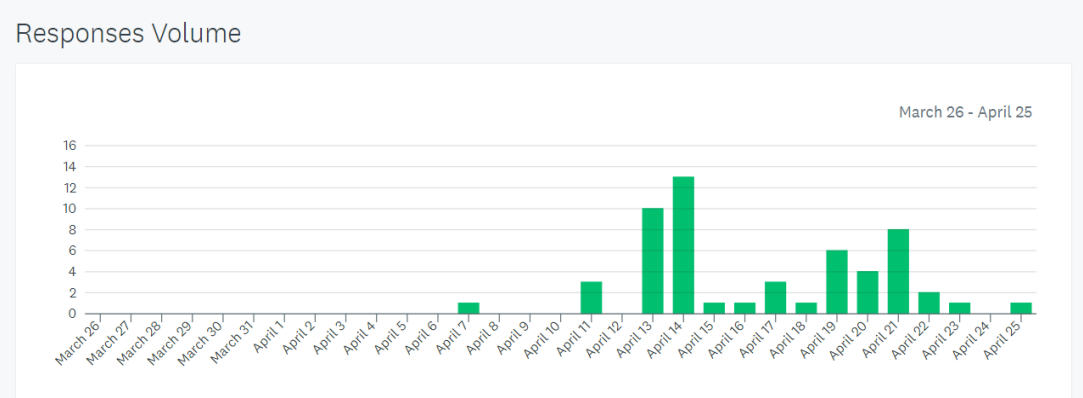
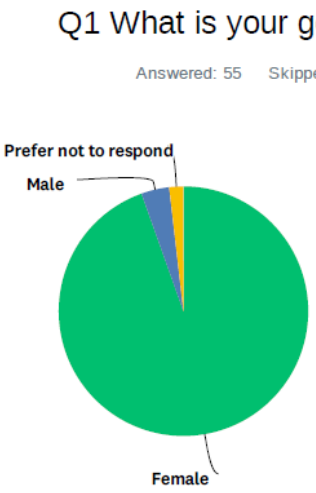


Figure 14. Extract from survey insights: Survey timeline and number of participants a day (2022).

4.1 Basic Information

The survey started with basic information which enabled to define starting point and to understand participants' current states in living and professional life. In total, survey gathered 55 participants during 20 days of open invitation. The link that was shared via email to various organizations and posted on women network platforms. Survey was conducted in English, however, participants were encouraged to reply in Finnish if it would feel more comfortable, to remove the barrier of not being able to express thoughts freely. Attachment of the survey can be found in the end of this document in Appendix 1.

Target group for the research was primarily women, however, survey gathered other genders too. 94.55% were women (52 participants), 3.64% men (2 participants), 1 participant was nonbinary and 1 preferred not to respond (Figure 15). The high number of women participants is explained by exclusively sending survey invitation to women organizations only, however, after survey was shared among participants, few male participants were involved, potentially showing support for the importance of the topic.



ANSWER CHOICES	RESPONSES	
Female	94.55%	52
Male	3.64%	2
Prefer not to respond	1.82%	1
TOTAL		55

#	OTHER (PLEASE SPECIFY)	DATE
1	Nonbinary	

Figure 15. Survey results: Gender (2022).

Majority of the participants belonged to the age group of 26 to 34 years old, being 49.09% of total participants. 35 to 44 years old formed second largest group with 32.73%. 45 to 54 years old formed 16.36% of participants, while 55+ years old were the minority 1.82%. There were no participants in under 25 years old age group (Figure 16). As expected, 26-34 years old group was a majority, reflecting on an assumption that most career changers, newcomers, and women targeted in technology firm advertisements, camps and news are women in fairly early stages of their careers or mid-level employees. Another factor could potentially be the target organizations from where a big part of participants were selected. These organizations often attract women in their early or mid-careers, who are attracted to guidance and support these organizations provide.

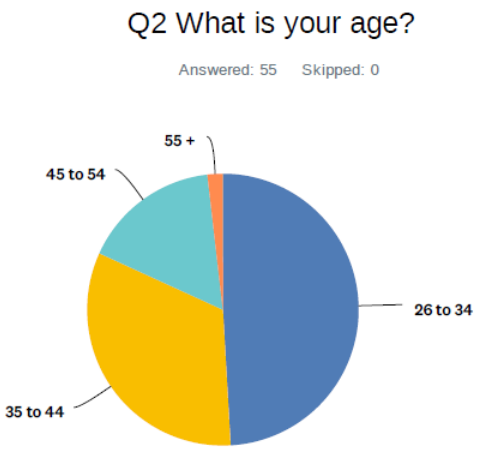


Figure 16. Survey results: Age (2022).

Participants were asked about their current job role and experience in the IT-field. Roles varied from highly technical roles, such as developers to designers, business roles and few people representing human resources and students (Figure 17). Experience level varied from complete beginners, having none or less than a year of experience in the field, to early, mid, and senior levels. Few participants were involved more than 20+ years in the industry. There was approximately equal division between mid and senior level participants, however making it challenging to point in which category they precisely belonged, due the open box answers that were more flexible on description of the experience. For example, seniors could have had for example from 3 to 10+ years of experience, which is quite a wide range to categorize as one category, taking into consideration significantly various tasks depending on the title and workplace.

Techniology Consultant	Junior Cyber Security Analyst	Student in IT
Senior Designer	Software Designer	Junior Web Developer
Lead Service Delivery Manager	Director of a Business Unit	Backend Engineer (Python)
HR role in tech	Developer	Development Manager
Scrum Master	Marketing Manager	Technology Development Leadership
People & Culture specialist	Software Specialist	UX Researcher
Head of Project Management	Junior Consultant	Consultant
Senior Manager	Development Lead	Agile Coach in Consulting Firm
Entrepreneur	Software Engineer	Student - Technical Specialist
Senior Expert	Software Developer	Test automation Specialist
Vice President	QA Specialist	Developer - Front-end Web
UX Designer	Junior Full Stack Developer	Junior Software Developer
Project Manager	Startup CEO	Lead Game Developer
Teacher	IT Support Technician	Consultant Analyst
Account Manager	Solution Architect	Business Analyst

Figure 17. Survey Participants Roles (2022).

Living arrangements question was selected to reflect on how living conditions are correlated with participants' mental health. There were also research articles available that confirmed the correlation between covid19, living arrangements and mental health.

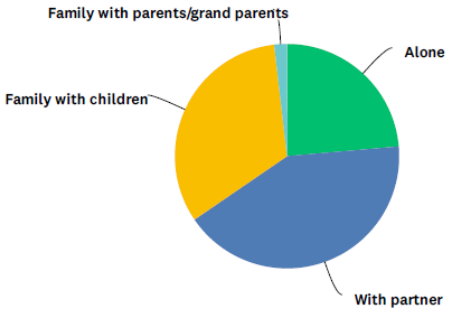
"Some types of living arrangements or household structures might be less beneficial than others in helping individuals to cope with the negative effects of the pandemic. For example, those living alone or heading a single-parent family have been found to be at particular risk of social disadvantage, both before and during the COVID-19 pandemic." (Langenkamp, Cano, Czymara, 2022).

During the covid-19 pandemic, it has been noticed that mental health has been decreasing for some individuals, revealing following symptoms, stress, depression, insomnia, frustration, fear, confusion, and boredom. (Pfefferbaum & North, 2020).

Surprisingly, in my research there was a correlation between living arrangements and self-reflection on mental health. Mental health reflection scale was assigned as 0 being poor and 5 being excellent. Participants who were living alone, rated their mental health in 2021 mostly as average, while there was significantly higher number of participants rating their mental health as 5 (excellent) from family-category. No-one rated their mental health as 0, however, there was a clear division in partner-category, having the most 4s but also the most 1s (Figure 18). These results could potentially showcase that having social support around you and living with another person impacts your mental health, either increasing it significantly or decreasing, depending on the partner selection. It seems like families play a significantly supportive role for person's mental wellbeing. Majority of the participants lived with partner or in various family arrangements. 23.64% were living alone (Figure 19).

Alone	Families	Partner
4	2	4
4	4	2
3	1	2
3	5	4
2	5	4
3	5	3
2	4	3
1	4	1
4	2	1
3	3	1
2	3	3
3	5	2
3	3	4
	4	4
	5	4
	3	4
	4	4
	3	2
		3
		5
		4

Figure 18. Participants mental health self-rating separated by living arrangements (2022)



ANSWER CHOICES	RESPONSES	
Alone	23.64%	13
With partner	41.82%	23
Family with children	32.73%	18
Family with parents/grand parents	1.82%	1
TOTAL		55

#	OTHER (PLEASE SPECIFY)	DATE
1	With dogs	
2	Uusioperhe, ei omia lapsia	
3	and at times with children and a partner	
4	Long term boyfriend (12 years, living 11 together).	

Figure 19. Survey Results: Living arrangements (2022).

4.2 Expectations

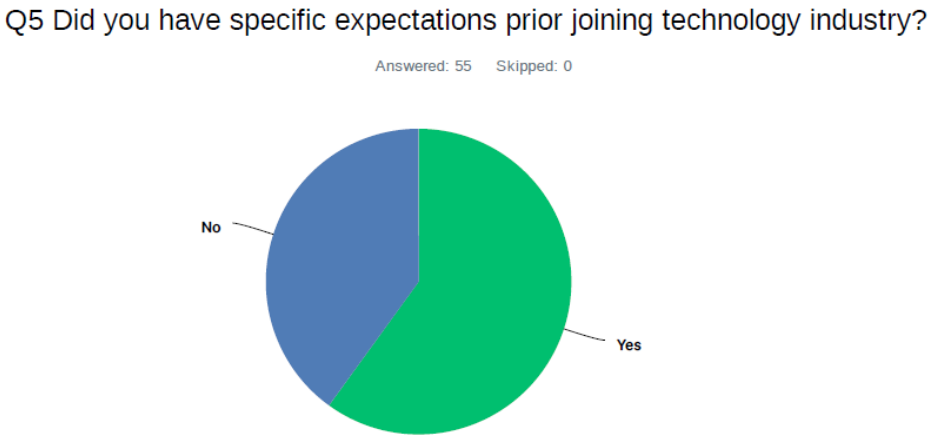


Figure 20. Survey Results: Expectations (2022).

Sometimes an image that portrays certain field can be very different from the reality. The mission was to ask whether participants had any expectations before coming into technology industry and whether they were met when working there. 60% of the participants had expectations, while 40% did not have any specific expectations (Figure 20). For most of the participants, 74.55%, expectations were met. 25.45% voted for not met (Figure 21).

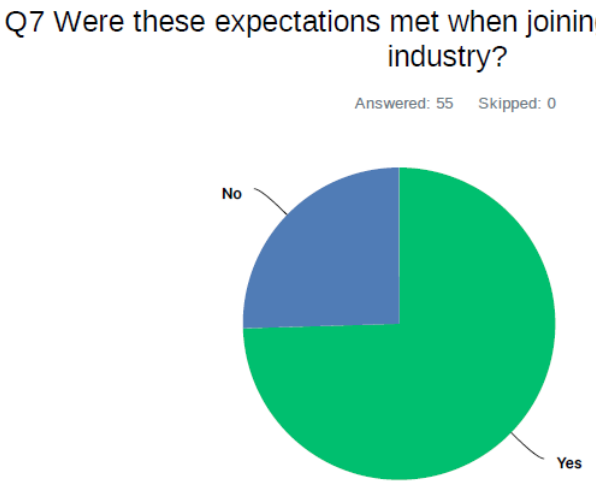


Figure 21. Survey Results: Expectations part 2 (2022).

Participants were asked to briefly describe their expectations if such existed. Responses varied from not having any expectations, to having big expectations that were not met, to having small expectations, that were partly met to skipped question. There were negative, positive, and neutral responses. To understand a bigger picture of expectations, few expectations are extracted below and formed into dominant categories that represent the topic of the discussion.

Male-dominated environment:

"Before starting my studies at the university of technology, I was told by my mother that the field is men-dominated. I had noticed the same thing at high school where I was among few girls on math and physics classes."

"I only thought that tech industry is mathematical, and male dominated."

"I was expecting to work in a fairly male-dominated industry which was also the case when I started in tech seven years ago."

"I was expecting to work in a male dominated field and many programmers to have poor communication skills."

Challenging work and constant learning:

“Constantly interesting and changing work, nerds all around, high-pace.”

“Work with interesting and challenging tasks.”

“Learning A LOT. I expected to google about everything and was a bit afraid if I'll be able to keep up with the knowledge. I expected colleagues to be professional, helpful and nerdy.”

“I thought the industry is well paid, innovative, and intellectually stimulating/challenging. I felt like smart people work there.”

Possibilities and benefits:

“A lot of freedom and good benefits.”

“Better salaries and working conditions, for example remote working.”

“Good job security, full-time permanent employment, good salary, lots of opportunities to learn and develop myself.”

“I assumed that there would be quite many job opportunities in IT, and the work itself would be versatile and interesting.”

When asked whether expectations were met and how they were not met, participants reported mostly expectations being met mostly, roughly 20 participants skipped the question, and the rest of participants had both negative and positive opinions. There were less very positive than very negative responses.

Extract of responses with a positive undertone:

“They were met, I've had wonderful 27 years working in hi-tech company.”

“Well, you definitely don't have to be an Einstein to survive there ;D”

“Starting as a trainee I found that front end development was more like a puzzle, a fun one. And as someone who enjoys games it was a pleasant discovery.”

“Expectations were partly met, most of my colleagues are male but they have excellent communication skills.”

“More women are joining tech industry! That is great! And more young people that I thought.”

Extract of responses with a neutral undertone:

” Yes and no. Salary is good. More women than I expected. A bit stiff culture but I think in process of change. Still masculine industry and for example sensitive, emotional people in IT are looked as a bit of weirdos. Nerds yes, mostly. More social that my expectations.”

” I don't know, technical industry has quite many lines of business, so you can be expert in that field, what makes you excited every day.”

“They were met, but I think keeping up with technology is even more important than I imagined. Especially front-end technologies are evolving at a crazy pace.”

“I have learned over the years that tech industry is way more about communication, problem solving, teamwork, understanding different kinds of interest groups than merely maths. Of course, mathematical, logical thinking plays a role, but just one role.”

“Yes and no. My major at uni had 50-50 men and women. But when I started at my first software development position, I was the only woman in my team.”

“One thing that surprised me was that there's little to no leadership, in either tech companies nor projects.”

Extract of responses with a negative undertone:

“There are a lot of tech companies that actually suck or are even toxic from their culture and thus that has an instant effect on the wellbeing of employees. Also understanding of basic leadership skills, emotional intelligence, and cultural issues is zero in many companies out there. Even though we talk about these things all the time. It is hard to find a good company to work for. I have personally changed many times as I start to notice toxicity.”

“I found out that industry isn't so modern as I had thought in their ways of thinking what comes to management/leadership. That hindered me finding my place within the company I worked for the most of my career.”

“I didn't expect the unfair treatment with promotions/hr that I got. I didn't realize women could be so harshly overlooked no matter what the individual did.”

“Joined a team with very little positive feedback and a poor communication culture.”

“Well, the male-centric culture (bro-culture) was way worse than what I thought.”

“I did not expect to be met with so much locker room talk, usually associated with adolescent boys. I did not expect that I would have to fight this much to have my voice heard and accepted. I did not expect to ever leave a meeting to go cry in the bathroom!”

“The industry seemed to be less creative and more challenging and stressful. People were also less intelligent than I expected. They were less emotionally and socially intelligent.”

“I haven't got the support and introduction that I need. It feels like I can learn new things if I Google myself.”

“I couldn’t find job even though it was advertised there is a shortage of coders “koodaripula”. During my studies “koodaripula” changed into “osaajapula” – shortage of professionals. I couldn’t even get an internship. If I would be a very strong coder and coding logic would be easier to understand, I could get an internship. It was challenging to find an internship where I could practice my skills. If I would have a better self-esteem and I could tolerate “fake it till you make it” -mentality, an internship could be possible, however it wasn’t for me.”

To understand the background of participants and possible connection to expectations and challenges, participants’ career path and how they joined technology industry was asked. Responses varied from early interests in school to complete career switches. For some, progress happened gradually and naturally, while others jumped into a new career in a whim. I have divided selected responses in three categories: career changers, natural transformers, and accidental cases.

Career changers:

“ I studied web design but never worked at the field, took +10 years off doing everything else and then when corona hit I started to study information technology and cyber security. It took about two years and now I work in a cyber security firm.”

“I was temporarily laid off in March 2020 and decided to change careers. I had studied coding a little bit just for fun and after I had all the time in my hands, I continued to study hard.”

“I switched careers from academia to IT. I got fed up with the numerous difficulties in academic career and wanted to do something else. I had some background knowledge about coding, and I have used computers all my life so I was thinking that perhaps IT would be a suitable option.”

“Got a master's degree in arts, worked in education for some years, got bored, went to polytech to study data processing, got a job in IT, finished my bachelors's in polytech.”

“Started studies in the University in 2004, worked over 10 years as a cashier and in customer service. Finished Master’s Degree, was unemployed, started self-studying coding, got my first job as a coder in 2020 and here I am now.”

Natural transformers:

“Graduate from technical university (Diplomi-insinööri).”

“I studied technology and graduated as Master of Science in Technology.”

“University studies, first summer jobs in different companies, then part-time work -> thesis work -> full-time work in the same company.”

“It was clear to me as a teenager that I wanted to work in information technology and so I did it for my studies.”

“After high school I studied math in university. Took computer science as my minor. During the studies, switched it to major. Got job immediately after graduation.”

By Accident:

“Almost by accident. I realized I don't want to work with mathematics, that was something I have started my studies, and computer science was easy to transfer.”

”By accident once didn’t get studying place to be become a doctor.”

4.3 Challenges

As a third category that was examined, challenges were presented in two different ways. By asking whether participants were facing major challenges in technology field (Figure 22) and what those challenges were (Figure 23). 60% of participants faced major challenges, while 40% did not.

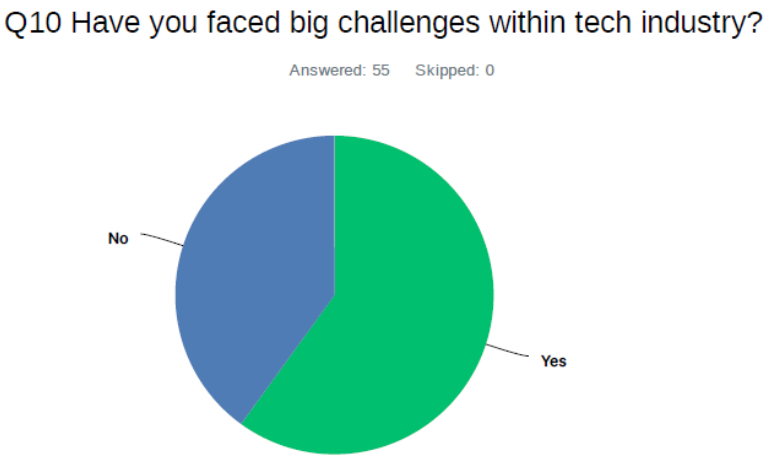


Figure 22. Survey results: Major challenges in technology field (2022).

In this category, multiple selections were available to choose. Also, comment box option "Other" was available for free writing. 72.73 % faced Imposter syndrome, 56.36 had high stress, 36.36% had issues with mental health, 30.91% had bad fit within the culture, 23.64% experienced burn out, 20 % discrimination and 18.18% sexual harassment (Figure 23). Other challenges that participants mentioned in free comment section box were:

"I think a yes or a not is way too strong for this question in general. I admit, I have faced some challenges and they have related to how it's very challenging to be a young, successful, and strong female leader in an industry where almost all decision makers at our clients are +50-year-old men and many of my leadership colleagues are men, which means the environment demands you to have a tough skin and great interpersonal skills."

"Hard to get the first job."

"Time management, leading myself, concentration."

"Unknown expectations and lack of guidance and support"

"I wouldn't call it imposter syndrome; the environment questions your skills when you are a woman. Only THEN you start doubting yourself."

"Sometimes it feels like bullying back in elementary school."

" Loneliness."

"Hard to get my voice heard as a female. Hard to make choice what I want to do at work etc."

"I sometimes find myself amazed at how knowledgeable others are and feel like I shouldn't be in the room."

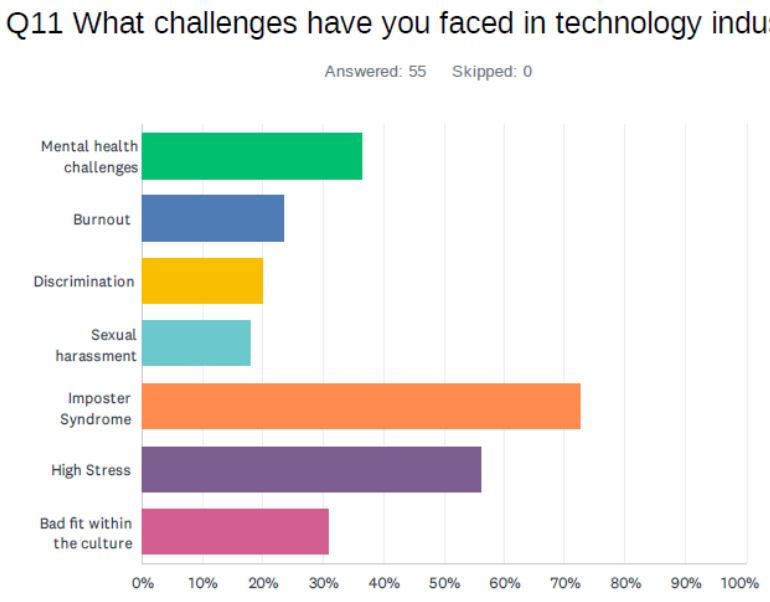


Figure 23. Survey results: Challenges women face in tech (2022).

4.4 Mental Health

Forth category, mental health was designed to observe participants' self-reflection on their mental health during 2021, while covid-19 was still impacting people's everyday life in Finland. Participants rated their mental health from scale 0 to 5. Most answers were placed on numbers 4 (30.91%) and 3 (29.09%). 2 collected 18.18% and there were 12.73% 5s, 9.09% 1s and no 0s (Figure 24).

When it was asked whether participants' mental health was sound, 30.91% agreed, 27.27 % disagreed, 20% neither agreed nor disagreed, 18.18% strongly agreed and 3.64% strongly disagreed, indicating that there were equal variations between having a good mental health and having a bad mental health. There was no clear evidence of majority extremes (Figure 25).

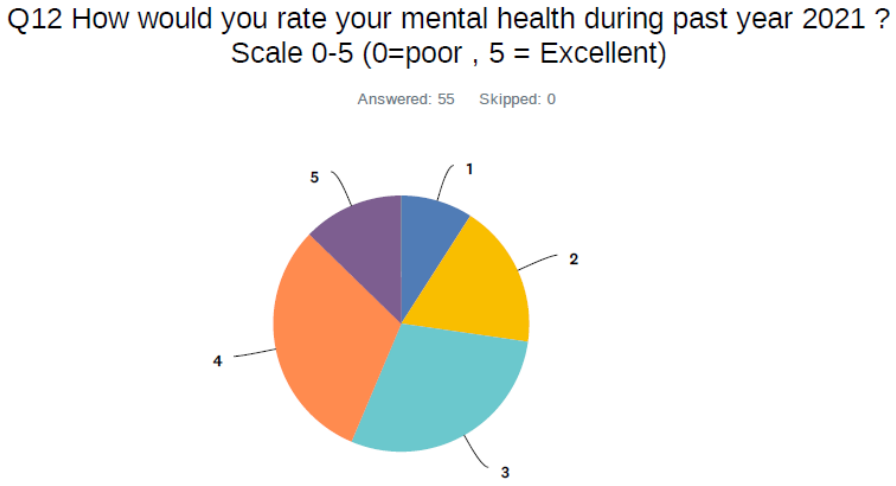


Figure 24. Survey results: Mental health during 2021 (2022).

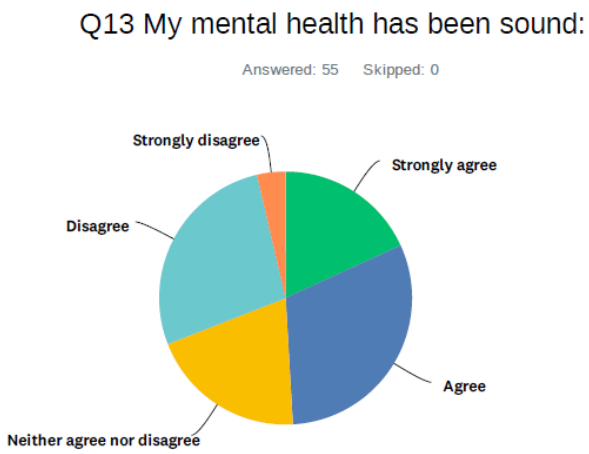


Figure 25. Survey results: Sound mental health (2022).

When examining mental health difficulties in connection with workplace, 45.45% agreed that their mental health has been challenged due to work related issues. 18.18% disagreed. 12.73% neither agreed nor disagreed. 14.55% strongly agreed and 9.09% strongly disagreed, indicating that majority felt like workplace was impacting their mental health negatively, forming in total of 60% for strongly agreed and agreed responses (Figure 26).

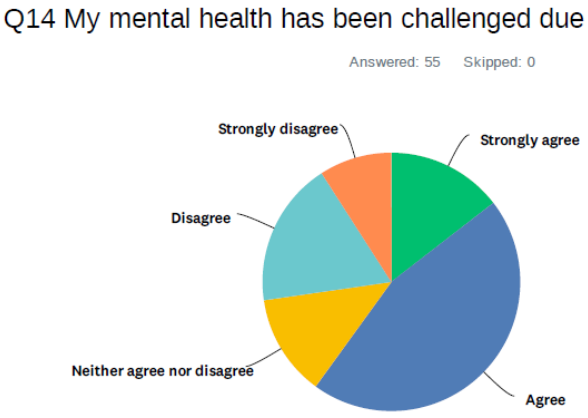


Figure 26. Survey results: Mental health challenged due work-related issues (2022).

Assuming that mental health was challenged due work-related issues, it was essential to know if workplaces offered services to improve and maintain good mental health. Majority of the participants strongly agreed and agreed that mental health services are offered through employer, forming in total 74.55%. 9.09% in total disagreed and strongly disagreed, while 16.36% neither agreed nor disagreed (Figure 27). Results show that mostly, employers offer mental health services, however there are alarming insights that some employers don't offer these services at all, when considering that technology industry is heavily dependent on brainwork.

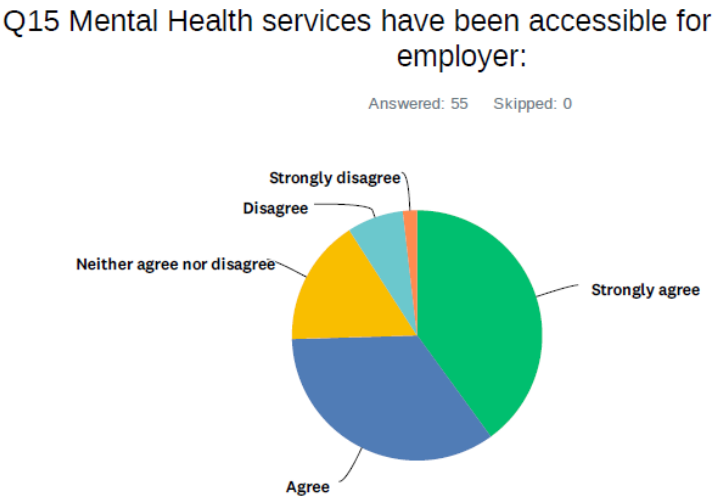


Figure 27. Survey results: Mental health services provided by employer (2022).

When asked about alternative options to get mental health support through public healthcare systems, majority chose neither agree nor disagree -option, potentially indicating that these services were offered through employers and private healthcare sector. 18.18% in total from disagree and strongly disagree responses potentially indicated that mental health services were not accessible even through public sector for some individuals. (Figure 28).

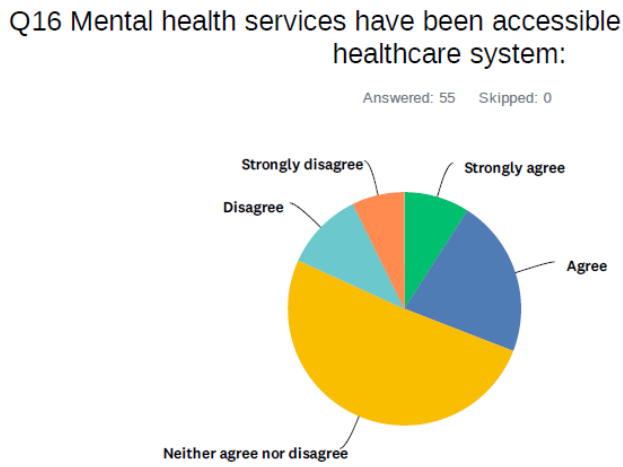


Figure 28. Survey results: Mental health accessible through public sector (2022).

When it was examined if employer supported active mental health discussion at work, 52.73% in total strongly agreed or agreed. There were in total 21.82% who strongly disagreed and disagreed. Neither disagreed nor agreed formed 25.45% (Figure 29).

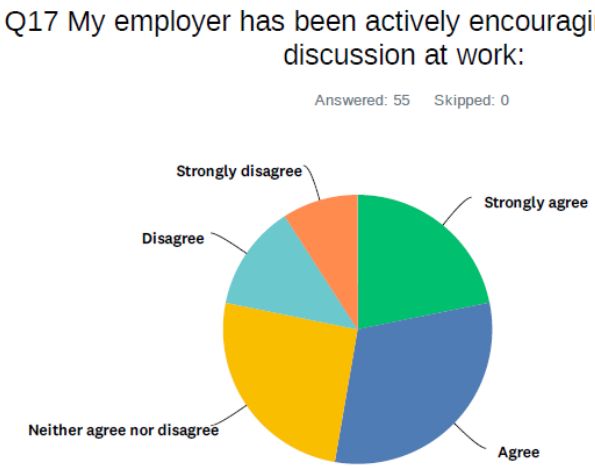


Figure 29. Survey results: Active mental health discussion encouragement by employer (2022).

Survey participants were asked to describe mental health services they received from employer. Many participants referred to psychologist services, wellbeing programs and sick leave possibilities when connected to mental health. Auntie - service was mentioned 7 times and was the only service mentioned by name. 9 participants mentioned nothing or none.

When asked what services they would like to receive from employer, responses varied from “I don’t know” to “I’m happy with the current one” to various suggestions that highlighted therapy, transparency and communication, social events to remove feeling of loneliness and others. Auntie was wished 3 times as the only service mentioned by name. Some extracted suggestions:

“Coaching, peer-mentoring, therapy.”

“Wide range of occupational health services regarding mental health (i.e. short psychotherapy), tools for the community at work to assess their own and colleague's mental health situation so that they could get help early.”

“Short therapy (5-20 times) to solve acute issues and to support in changing life situations.”

“More frequent personal discussions with my manager at that time.”

“The communication culture and inclusivity should be better, that would directly enhance everyone's mental health.”

“A more relaxed attitude regarding productivity and efficiency, discussions from management about that. Less tight budgets to allow that.”

“Transparency and encouragement from the employer to contact mental health specialists (provided by the work insurance) if needed.”

“In my opinion, nice social events would be the best support for mental health issues, but unfortunately my employer mainly focuses on official mental health services, meditation, and yoga, and forget the social side. I have worked in my current job for a year now and I know just a few colleagues from our company. Probably the biggest reason for this is that I and most of the others work remotely, and most of the customer projects are done alone. I would love to see more social f2f events (e.g., afterwork gatherings, hobby clubs etc.) and I'm sure it would ease stress and loneliness much better than official mental health services. Naturally, I know that official services are certainly needed in some cases, but maybe less people would need them if we would know each other better and spend more time together.”

” More open environment and culture, active promotion of mental health importance. Concrete steps like days off, no overtime, balance with work and free time, meditation etc provided. Having the culture of care and empathy instead of crazy rush and targets hitting only.”

“Some support and kind words from my boss/people lead.”

Mental health can be regulated and improved with internal behaviour and reflections too. Participants were asked what self-regulating methods they actively use to improve their mental health. Participants were able to select multiple options. 81.82% trusted sleep, 78.18% selected various exercises, 76.36% chose social interactions, 34.55% meditation and 12.73% special diet. None of the participants chose none of the above- option (Figure 30). Participants also had a choice to suggest other methods in a comment box. These suggestions included:

- Pets and other animals
- Nature
- Baking
- Knitting
- Somatic training, relationship courses, peer support, SoMe, apps (The-fab.page.link, Habitica.com)
- Delicious food such as ice cream
- Music
- Medication & therapy
- Wine
- Creative hobbies such as writing
- Video games
- Self-expression methods

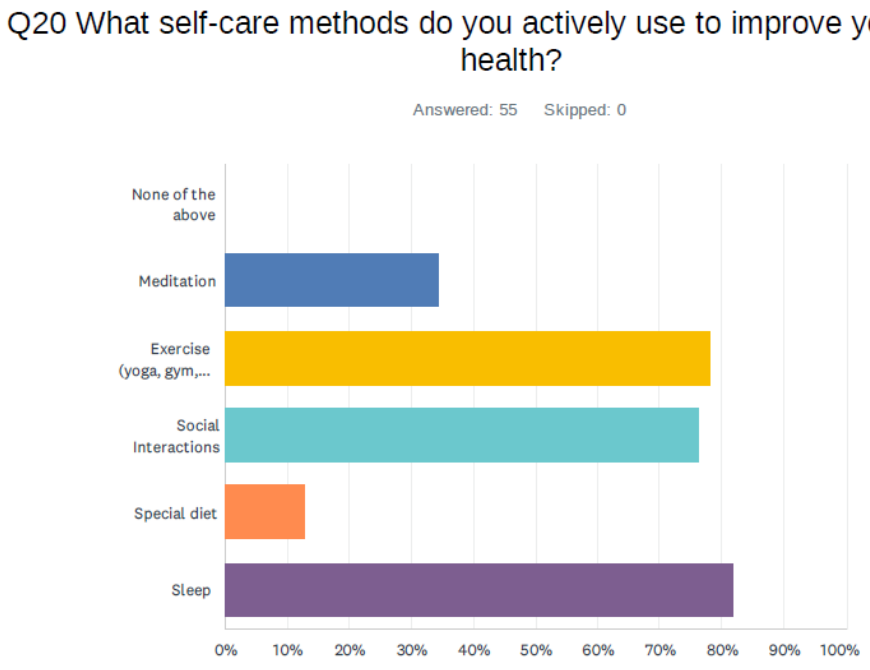


Figure 30. Survey results: Self-care methods for better mental health (2022).

4.5 Advice for Women in Tech

Lastly, participants were encouraged to write advice for younger self or for future generation of women who will join tech, to forward lessons they learned while working in the industry and minimize gap of career expectations not being met. Responses consisted of encouraging messages, empathic advice, and critical observations. Approximately 11 participants skipped the question. The decision of showcasing many responses for this question was consciously chosen, to better provide anonymous tips and encouragement for women, that would not be necessarily available when connected to respondents in live settings, since some of these responses includes sensitive and personal information. By giving concrete examples of participants' experiences, women could understand that the struggle they face are not uncommon, but mostly not verbalized in a work environment.

Extract from several responses:

"Don't compare yourself or your background to others. Be proud of yourself as who you are. Appreciate your previous work experience and don't think any job is not good enough. Find yourself a group of friends where you support each other and speak about also negative experiences. Participate in a mentoring program. Don't rush with studies but leave time also for participating other activities and clubs as you might find interesting new people or career options from there."

"We need more women to the industry so that companies actually do something about inclusion and belonging. Often times I have felt that I am an outsider as I am a women working with men and men are oftentimes bad at actually thinking if the culture is inclusive, for example they arrange sauna nights or every time there is a party people will get drunk (not all of us would like this from a party). And there is still sexual harassment as well, I have experienced that multiple times."

"The whole management paradigm should change from old school bureaucratic to network/agile, leading with competence not authority. And this is a slooooow processs. To my younger self at the start of my career: People are going to make assumptions about who you are and what you want to do but keep your goal clear and try to seize opportunities that come your way. If it feels like you need a change then just do it."

"I would say that over working and playing with burn out is not worth it. That you're valuable even when you do the normal amount of work. And I would suggest reading Valerie Young's The Secret Thoughts of Successful Women."

“Be persistent in your career endeavours even though you're being unfairly overlooked for being a woman. Skip the most obvious chauvinist areas if possible. Protect yourself & support other women the best you can.”

“Stay true to yourself, your personal values, and ambitions. Never change the above just because someone tells you to act in a different way. Be genuine, protect your values and be yourself no matter what. If one can do this, one will be a very credible leader. I advise all young female techies to spend time with understanding what ones must haves are in their career, meaning that what are the top five things that you need to have/experience in your career no matter what. These should be so strong, that if someone comes and offers you a job with a significant pay raise, you should say no if the role/career opportunity does not match the five must haves you have been listing. Woman, and actually everyone, will be much more successful in our careers if we listen to ourselves, follow our ambitions and values, and don't try to please others, or follow the direction that we think is the right one just because someone (usually men) tell us that's the right way to go.”

“Women are often discouraged by technical pre-requirements. Specifying that specially cyber security is a field where you learn by doing and curiosity is needed. Common statement is that you need to know all about computers and basically had to grow up with them. It's a perk but not a must. For my younger self - Just do it. Don't listen to people saying you can't and you need to know how to code. You don't. Just try everything. It doesn't matter if it breaks or is not a fit hobby for a girl.”

“Don't take it so seriously. And learn to prioritise, prioritise, and concentrate on one thing at a time.”

“Hardest part is not knowing what you want and what is possible. I settled for a position just because they were willing to take me in with only little experience and now I'm doing a task I don't really enjoy. When I was learning about career paths in technology, mostly I saw developers working on new projects and products. I didn't know there were other kinds of roles and was slightly disappointed when my job didn't turn out the be what I imagined.”

“I wanted to give advice to my myself in the past – don’t do it. My self-esteem wasn’t good in the first place, but my work is the biggest reason for my mental health challenges. I want to do something for it but I’m not able to. I can’t recommend this profession to anyone who suffer from bad self esteem or depression. I feel constantly stupid, not being enough and irrelevant. No-one seems to care at school whether I get a job or not, the only thing that matters to them are financial benefits. What I have left is a graduation paper that is irrelevant and increased challenges with mental health: depression diagnosis, burnout and bad self-esteem. I’m still stuck at the same work place I tried to escape 4 years ago. This industry is for those who can believe in themselves. In my case, it crushes me down.”

“I’m not sure what the gap might be. Maybe that this work could be very, maybe too much, independent, and free even for juniors. Many bigger it-firms invest in teaching, mentoring, and supporting, but could be good to find one’s own mentor while still studying. I would say myself that it is possible to find work as a coder and be good enough even when coding and technology is not a passion and a hobby.”

“Understand that women are just as good as men in tech stuff, men just fake better.”

“Mentoring, making school visits, telling my career story, training opuses, crushing the patriarchy.”

” If you do it only for money, don't do it. You need passion for this to keep up with it. Do not try to be perfect and do everything perfect. Within time you will learn, you just need to rehearse, study, try again and again. Sooner than you think you realize you got it. Respect yourself more and don't be afraid of men/people you think are more experienced or know more. Always ask if you don't know, usually people gladly explain and teach you. Be inspired of other women who have done it and spread the joy. Be yourself and the personality you are, you do NOT need to be one of the "guys". You can also be sensitive and show feelings.”

5 Conclusion

To summarize the findings of the research and evaluate the importance of the topic, the current state of the phenomenon could be examined. As observed, women in technology have been a hot topic for a minute, in addition to that, mental health at work discussions have been significantly increasing during the covid-19 pandemic. Stigma of mental health problems and public talk around the topic is slowly changing for the better. Media has brought topic into the light, providing platform for various people to tell their story and showcase the importance of the discussion, normalizing mental health related issues. Harvard Business Review has written several articles on mental health at work and diversity, Fast Company (2022) has emphasized on speaking out when it comes to mental health at work, stating:
“High-profile athletes and entertainers have increasingly been speaking out about their struggles with mental well-being in recent years. Very few business leaders have done the same”.

Diversity and inclusion have become a leverage, when it comes to attracting the best talents and keeping women in technology field. When comparing the theoretical research conducted during writing of the thesis and practical research in a form of survey, represented to women in tech in Finland, we can observe similarities between responses and topics visible in media worldwide. Women have similar challenges around the world when it comes to being a female in technology industry. Technology industry also seems to bring forward similar mental health challenges for women worldwide. Burnout, loneliness, imposter phenomenon, lack of support and role models contribute to the decision of leaving tech. Brogrammer culture, pay gaps and advancement limitations impact women on many levels. Despite the support and visibility that has been achieved during past years in a form of female friendly programs and actions towards increasing number of women in tech, there are still many challenges to overcome before women can thrive in technology field. The change starts from acknowledging the problem and measuring concrete actions towards bettering women’s position in tech. Men have an opportunity to act as an ally and support women’s progress – in the end, it is a common benefit for all. By providing encouragement, mental health support, various training programs targeted at women, advancement opportunities and meaningful mentorship, women can be better integrated into tech.

In conclusion, women can actively drive the change forward by active initiations (clubs and programs) on the topic and vocally raising concerns (public speech, workshops, surveys), however, considering ever-growing workload that touches especially women during

the pandemic, men's support is more than needed to achieve equal circumstances. Most importantly, companies' effort could be prioritized for inclusivity and women's support, creating root level solutions, that could drive company's business forward and decrease future generation women's challenges in tech industry.

5.1 Limitations and Future Studies

Despite the large number of current sources used in the research and practical aspect being examined by conducting a survey for women in tech in Finland, there were some limitations during the process that could have impacted the outcome. Although, survey being anonymous, which removes the barriers for open discussion, the structure of the questions could be limiting participants to express their concerns and ideas fully. Despite leaving open ended comment boxes to address the responses, some individuals could have felt the survey guiding them into specific direction, which in the end, was the main point of examining challenges women face in tech, instead of concentrating on positive impacts. The survey could have been longer to compare challenges and positive outcomes, on the other hand, risking the attention loss of the participants, affecting the completion rates.

Another limitation could be seen from the perspective of time. By examining such a current and interesting topic which had many up-to-date materials and room for innovative solutions, the amount of time that was personally available to me during pandemic, work and simultaneous personal life challenges and studies, was not simply enough to examine topic in more detail. The survey time was limited to a less than a month, affecting on the amount of collected responses, despite the active participation without external collaborators, that was planned to be in the beginning of the project. By being a woman in tech, a career changer and a person who has experienced challenges with mental health, the research gave me many ideas to contribute to the topic in the future in various other ways, developing further interest and professional expertise.

Future studies on the topic could be examined from the perspective of men in tech, in comparison to women. While conducting the research, I was asked whether there are similar mental health challenges for men in tech, addressing the nature of the tech industry being challenging for all genders equally. Another point of view for future studies could be a thorough dive in into mental health challenges in technology for women, concentrating on an issue in a deeper level, examining concrete phenomena, such as imposter syndrome or burnout in more detail.

As a summary, the project was successful, leaving room for further examination and activities around the topic. To answer the research questions presented in the beginning of the paper, women are highly affected by the masculine tech culture that still exists, leaving women with various challenges that impact their career advancement. These challenges not only touch the advancement, but impact women's mental health in a longer term, creating a societal problem, that affects many domains. There are no simple solutions available, however, it has been noted that inclusivity, equity, and diversity positively impact women's wellbeing and progress at work. To attract women and make women stay in tech, we need to actively create an environment where women thrive, normalize the talk around the issue and have concrete measured actions from leadership, that are integrated into everyday work life.

References

Amaresan, S. 2022. The 16 Best Totally Free Online Survey Makers & Tools. Hubspot. URL: https://blog.hubspot.com/service/free-survey-maker-software . Accessed: 05 April 2022.

Amkoodari. 2021.Sinustako tulevaisuuden koodaritähti? URL: https://amkoodari.fi/fi . Accessed: 23 May 2022.

Andre,C. & Bona, M. 2018. The ICT sector is booming. But are women missing out? European Data Journalism Network. URL: https://www.europeandatajournalism.eu/eng/News/Data-news/The-ICT-sector-is-booming.-But-are-women-missing-out . Accessed: 15 April 2022.

AW Academy. 2022. AW Academyn koulutukset. URL: https://awacademy.fi/koulutukset . Accessed: 15 April 2022.

Bateman, K. 2013. Horror stories of women in tech: The worst advice I've ever received. Computer Weekly. URL: https://www.computerweekly.com/feature/Horror-stories-of-women-in-tech-The-worst-advice-Ive-ever-received . Accessed: 15 April 2022.

Blomstrom, D.2021. People Before Tech – Importance of Psychological Safety and Team Work in the Digital Age. 1st ed. Bloomsbury Publishing Plc. London.

Cano,T. Langenkamp, A. Czymara,C. 2022. My Home is my Castle? The Role of Living Arrangements on Experiencing the COVID-19 Pandemic: Evidence From Germany. Frontiers in Socialogy. URL: https://www.frontiersin.org/articles/10.3389/fsoc.2021.785201/full .Accessed: 30 April 2022.

Cheese,P. 2021. The New World of Work – Shaping a Future that Helps People, organizations and our societies to thrive. 1st ed. Kogan Page Limited (UK). London.

Coqual. 2020. The Power of Belonging – What It Is and Why It Matters in Today's Workplace. URL: https://coqual.org/wp-content/uploads/2020/09/CoqualPowerOfBelonging-KeyFindings090720.pdf . Accessed: 15 April 2022.

Depsey, K. 2021. How Psychological Safety At Work Can Affect Mental Health. The Awareness Centre. URL: https://theawarenesscentre.com/how-psychological-safety-at-

work-can-affect-mental-health/#:~:text=Lack%20of%20emotional%20support%20in,symptoms%20of%20despair%20and%20depression. Accessed: 12 May 2022.

European Parliament. 2018. More women in ICT: empowering women in the digital world. URL: https://www.europarl.europa.eu/news/en/headlines/society/20180301STO98927/more-women-in-ict-empowering-women-in-the-digital-world . Accessed: 15 April 2022.

Fast Company. 2022. Mental health at work: It's (finally) time to talk about it. URL: https://www.fastcompany.com/90740173/mental-health-at-work-its-finally-time-to-talk-about-it . Accessed: 19 May 2022.

Forbes. 2017. Why Women Leave the Tech Industry at a 45% Higher Rate Than Men. URL: https://www.forbes.com/sites/quora/2017/02/28/why-women-leave-the-tech-industry-at-a-45-higher-rate-than-men/?sh=522e282b4216 . Accessed: 18 May 2022.

Greenwood, K & Anas, J. 2021. It's New Era for Mental Health at Work. Harward Business Review. URL: https://hbr.org/2021/10/its-a-new-era-for-mental-health-at-work Accessed: 18 May 2022.

Harju, I. 2022. Ohjelmistoalan työntekijöiden mielenterveysongelmat saavat alan pohtimaan lähityöhön palaamista – ”Meillä muhii mielenterveyden aikapommi”. Helsingin Sanomat. URL: https://www.hs.fi/talous/art-2000008783200.html Accessed: 18 May 2022.

Harvard Business Review. 2014. Hacking Tech's Diversity Problem. URL: https://hbr.org/2014/10/hacking-techs-diversity-problem . Accessed 19 May 2022.

Jackson, A. 2021. 38% of women in tech plan on leaving their job within the next 2 years—here's why. CNBC. URL: https://www.cnbc.com/2021/11/24/38percent-on-women-in-tech-plan-on-leaving-their-job-in-the-next-2-years.html . Accessed 19 May 2022.

Jääskeläinen, R, 2021.Aallon selvitys: Sukupuolittuneet opiskelukäytännöt. Tasaarvoisesti Uralle. URL: https://tasaarvoisestiuralle.fi/sukupuolittuneet-opiskelukaytannot/ . Accessed: 15 April 2022.

Kaartinen, E. 2021. KAIKKI KOODAAMAAN! Change Maker. URL: https://www.changemaker.fi/ajankohtaista/globalistiartikkeli/kaikki-koodaamaan/ . Accessed: 15 April 2022.

Kangasniemi, T. 2020. Onko Suomessa pula koodareista? Näin vastasivat koodarit. URL: https://www.tekniikkatalous.fi/uutiset/onko-suomessa-pula-koodareista-nain-vastasivat-koodarit/80c73b04-5713-4b21-a4be-89ab65563533 . Accessed: 15 April 2022.

Kay, K. & Shipman, C. 2014. THE CONFIDENCE GAP. The Atlantic. URL: https://www.theatlantic.com/magazine/archive/2014/05/the-confidence-gap/359815/ . Accessed: 15 April 2022.

Kolehmainen, A. 2021. Tällaiset ovat it-alan palkkaerot miesten ja naisten välillä – lue listaus yli 20 ammatista. Tekniikka & Talous. URL: https://www.tekniikkatalous.fi/uutiset/tallaiset-ovat-it-alan-palkkaerot-miesten-ja-naisten-valilla-lue-listaus-yli-20-ammatista/f6a760e6-9f58-49ea-897c-ae33ff241b7d . Accessed: 15 April 2022.

Koodarikuiskaaja. 2020. Mikä on huijarisyndrooma eli huijari-ilmiö? URL: https://koodarikuiskaaja.fi/blogi/mika-on-huijarisyndrooma-eli-huijari-ilmio/ . Accessed: 15 April 2022.

Luoma-aho, V. 2021. Asennemuutos auttaisi koodaripulaan. Helsingin Sanomat. URL: https://www.hs.fi/visio/art-2000008001269.html . Accessed: 15 April 2022.

Mayhew, J. 2020. Importance of Mentorship For Careers In Technology. Woz-U. URL: https://woz-u.com/blog/mentors-for-careers-in-technology/ . Accessed: 15 April 2022.

McKinsey & Company. 2021. Women in the Workplace 2021. URL: https://www.mckinsey.com/featured-insights/diversity-and-inclusion/women-in-the-workplace Accessed: 18 May 2022.

Melendez, S. 2021. One reason for the tech industry's Great Resignation: lack of diversity. Fast Company. URL: https://www.fastcompany.com/90665530/great-resignation-tech-diversity . Accessed: 15 April 2022.

Miller, A. 2021. More Than One-Third of Women in Tech Are Looking to Leave Their Jobs Within Two Years — Here's Why. All Together. URL: https://alltogether.swe.org/2021/12/more-than-one-third-of-women-in-tech-are-looking-to-leave-their-jobs-within-two-years-heres-why/ . Accessed: 19 May 2022.

MimmitKoodaa. 2022. Mimmit koodaa program increases gender equality in the Finnish software industry. URL: https://mimmitkoodaa.ohjelmistoebusiness.fi/in-english/ . Accessed: 15 April 2022.

Mind Share Partners. 2021. 2021 Mental Health at Work Report. URL: https://www.mindsharepartners.org/mentalhealthatworkreport-2021 . Accessed: 15 April 2022.

Muukkonen, H. 2019. Miehet ja naiset suosivat miestä. TEK. URL: https://www.tek.fi/fi/uutiset-blogit/miehet-ja-naiset-suosivat-miesta . Accessed: 15 April 2022.

North, C. Plefferbaum, B. 2020. Mental Health and the Covid-19 Pandemic. The New England Journal of Medicine. URL: https://www.nejm.org/doi/full/10.1056/nejmp2008017 . Accessed: 30 April 2022.

The New York Times. 2019. The Secret History of Women in Coding. URL: https://www.nytimes.com/2019/02/13/magazine/women-coding-computer-programming.html . Accessed: 15 April 2022.

OECD. 2017.” The under-representation of women in STEM fields”, The Pursuit of Gender Equality; An Uphill Battle, OECD Publishing, Paris. URL: https://read.oecd-ilibrary.org/social-issues-migration-health/the-pursuit-of-gender-equality/the-under-representation-of-women-in-stem-fields_9789264281318-10-en#page1 . Accessed: 15 April 2022.

Olsen, S. 20201. ‘Bro Culture’ Is Bad for Employees & for Business. Here’s Why These Toxic Environments Are Still So Common. InHerSight. URL: https://www.inher-sight.com/blog/diversity/bro-culture . Accessed: 15 April 2022.

Orduna, N. 10.2021. Diversity in Tech is a Problem. Here’s How to Empower Yourself. Harvard Business Review. URL: https://hbr.org/2021/10/diversity-in-tech-is-a-problem-he-res-how-to-empower-yourself . Accessed: 15 April 2022.

Orduna, N. 08.2021. Is Tech the Right Career for You? Harvard Business Review. URL: https://hbr.org/2021/08/is-tech-the-right-career-for-you . Accessed: 15 April 2022.

Ries, J. 2020. People with COVID-19 More Likely to Develop Depression, Anxiety, and Dementia. Healthline. URL: https://www.healthline.com/health-news/people-with-covid-19-

more-likely-to-develop-depression-anxiety-and-dementia#Take-care-of-yourself,-seek-treatment . Accessed: 15 May 2022.

Robinson, B. 2021. 'The Great Resignation' Migration And What This Means For Your Career. Forbes. URL: https://www.forbes.com/sites/bryanrobinson/2021/06/11/the-great-resignation-migration-and-what-this-means-for-your-career/?sh=2fec44b69aae . Accessed: 15 April 2022.

Rundle, E. 2017. The 5th Industrial Revolution: When It Will Happen and How. DevOps.com. URL: https://devops.com/5th-industrial-revolution-will-happen/ Accessed: 23 May 2022.

Salmi, M. 2020. Mitä naiset edellä, sitä miehet perässä. Buutti Consulting. URL: https://buutticonsulting.com/2020/03/06/mita-naiset-edella-sita-miehet-perassa/ . Accessed: 15 April 2022.

Saranen. 2022. Mimmit koodaa – rekrytoiva koulutusohjelma. URL: https://www.saranen.fi/rekrytointikoulutus/mimmit-koodaa . Accessed: 23 May 2022.

SpecOps. 2020. STUDY: Women in tech reveal the biggest challenges they face. URL: https://specopssoft.com/blog/women-in-tech-reveal-biggest-challenges-they-face/ . Accessed: 15 April 2022.

SimplyPsychology. 2022. Maslow's Hierarchy of Needs. URL: https://www.simplypsychology.org/maslow.html. Accessed: 15 April 2022.

Survey Monkey. 2022. URL: https://www.surveymonkey.com/ . Accessed: 15 April 2022.

Techbrain. 2022. Research into the effects of 'gendered' language in tech job ads. URL: https://www.techbrain.com.au/women-in-tech . Accessed: 15 April 2022.

TEK. 2019. Miehet ja naiset suosivat miestä. URL: https://www.tek.fi/fi/uutiset-blogit/miehet-ja-naiset-suosivat-miesta . Accessed: 18 May 2022.

Thibaut, F. & Wijngaarden-Cremers, P. 2020. Women's Mental Health in the Time of Covid-19 Pandemic. Frontiers in Global Women's Health. URL: https://www.frontiersin.org/articles/10.3389/fgwh.2020.588372/full Accessed: 18 May 2022.

THL. 2022. Koulutuksen sukupuolen mukainen segregaatio. URL: https://thl.fi/fi/web/sukupuolten-tasa-arvo/tasa-arvon-tila/koulutus-ja-kasvatus/koulutuksen-sukupuolen-mukainen-segregaatio . Accessed: 15 April 2022.

Thomas, R. 2016. The Real Reason Women Quit Tech (and How to Address It). Medium. Tech Diversity Files. URL: https://medium.com/tech-diversity-files/the-real-reason-women-quit-tech-and-how-to-address-it-6dfb606929fd Accessed: 19 May 2022.

Tivi. 2022. Naiset helpottavat koodaripulaa. URL: https://www.tivi.fi/uutiset/naiset-helpottavat-koodaripulaa/d5a57cbb-6299-4baa-a9fd-ed1881baa1e6 . Accessed: 19 May 2022.

Trustradius. 2021. Trustradius 2021 Women in Tech Report. URL: https://www.trustradius.com/buyer-blog/women-in-tech-report . Accessed: 15 April 2022.

Tulshyan, R. & Buret, J. 2021. Stop Telling Women They Have Imposter Syndrome. Harvard Business Review. URL: https://hbr.org/2021/02/stop-telling-women-they-have-imposter-syndrome?registration=success . Accessed: 15 April 2022.

Ukkonen, R. 2019. Naisia rohkaistaan, kannustetaan ja houkutellaan koodaamaan – "Vielä voi vaikuttaa tulevaisuuteen". Yle. URL: https://yle.fi/uutiset/3-10687050 . Accessed: 15 April 2022.

Vanshika, K. 2021. 7 Reasons Why Software Development is So Hard. Geeks for Geeks. URL: https://www.geeksforgeeks.org/7-reasons-why-software-development-is-so-hard/ . Accessed: 15 April 2022.

Williams, C. 2014. Hacking Tech's Diversity Problem. Harvard Business Review. URL: https://hbr.org/2014/10/hacking-techs-diversity-problem . Accessed: 15 April 2022.

Women in Tech. 2021. The Ingredients of Inclusivity. URL: https://womenintech.fi/wp-content/uploads/2021/09/Research-report-summary-2021.pdf . Accessed: 19 May 2022.

World Economic Forum. 2020. The Future of Jobs Report 2020. URL: https://www3.weforum.org/docs/WEF_Future_of_Jobs_2020.pdf . Accessed: 23 May 2022.

World Health Organization. 2022. Mental health. URL: https://www.who.int/health-topics/mental-health#tab=tab_2 . Accessed: 15 April 2022.

Wood, C. 2021. 7 challenges women face in getting ahead in IT. CIO. URL: https://www.cio.com/article/191432/7-challenges-women-face-in-getting-ahead-in-it.html . Accessed: 15 April 2022.

Appendices

Appendix 1. Survey: Women in Technology & Mental Health

Women in Technology & Mental Health

Challenges Women Face in the Technology Industry

Women in Tech & Mental Health -questionnaire is **targeted at women working in technology industry;** from beginners, career changers to professionals and pioneers.

The questionnaire is part of the thesis research conducted at Haaga-Helia University of Applied Sciences, touching on the phenomenon of women working or recently transferred into the technology field, especially concentrating on the challenges women face in the field and potential reasons for leaving the field.

The survey's target is to **understand the challenges women face in the tech industry and its correlation with mental health.** By conducting the survey, the aim is to collect data that would not only describe the current situation but give insights and recommendations for women coping with challenges in the field.

Giving only 7 minutes of your time, you are providing helpful insights for the future generation of women joining the tech industry.

Survey length: 7 min

Key Topics:
- Expectations
- Challenges
- Mental Health

* 1. What is your gender?

- ◯ Female
- ◯ Male
- ◯ Prefer not to respond

Other (please specify)

* 2. What is your age?

- ◯ under 25
- ◯ 26 to 34
- ◯ 35 to 44
- ◯ 45 to 54
- ◯ 55 +

* 3. What is your current job role and experience level?

* 4. What are your living arrangements?

- ◯ Alone
- ◯ With partner
- ◯ Family with children
- ◯ Family with parents/grand parents

Other (please specify)

* 5. Did you have specific expectations prior joining technology industry?

- ◯ Yes
- ◯ No

* 6. What expectations did you have ? Describe briefly.

* 7. Were these expectations met when joining/transferring into tech industry?

- ◯ Yes
- ◯ No

* 8. How weren't these expectations met? (If applicable)

* 9. How did you join technology industry? (Describe shortly your path towards technology industry)

* 10. Have you faced big challenges within tech industry?

- ◯ Yes
- ◯ No

* 11. What challenges have you faced in technology industry?

- [ ] Mental health challenges
- [ ] Burnout
- [ ] Discrimination
- [ ] Sexual harassment
- [ ] Imposter Syndrome
- [ ] High Stress
- [ ] Bad fit within the culture

Other (please specify)

* 12. How would you rate your mental health during past year 2021 ? Scale 0-5 (0=poor , 5 = Excellent)

- ◯ 0
- ◯ 1
- ◯ 2
- ◯ 3
- ◯ 4
- ◯ 5

* 13. My mental health has been sound:

- ◯ Strongly agree
- ◯ Agree
- ◯ Neither agree nor disagree
- ◯ Disagree
- ◯ Strongly disagree

* 14. My mental health has been challenged due to work related issues:

- ◯ Strongly agree
- ◯ Agree
- ◯ Neither agree nor disagree
- ◯ Disagree
- ◯ Strongly disagree

* 15. Mental Health services have been accessible for me through my employer:

- ◯ Strongly agree
- ◯ Agree
- ◯ Neither agree nor disagree
- ◯ Disagree
- ◯ Strongly disagree

* 16. Mental health services have been accessible for me through public healthcare system:

- ◯ Strongly agree
- ◯ Agree
- ◯ Neither agree nor disagree
- ◯ Disagree
- ◯ Strongly disagree

* 17. My employer has been actively encouraging mental health discussion at work:

- ◯ Strongly agree
- ◯ Agree
- ◯ Neither agree nor disagree
- ◯ Disagree
- ◯ Strongly disagree

* 18. What mental health support or services have you received at work?

* 19. What support would you want to receive at work regarding mental health (challenges)?

* 20. What self-care methods do you actively use to improve your mental health?

- ☐ Meditation
- ☐ Exercise (yoga, gym, running etc)
- ☐ Social Interactions

- [ ] Special diet
- [ ] Sleep
- [ ] None of the above

Other (please specify)

21. Sometimes, career expectations and real work life are not aligned. How could we minimize this gap for the future generation of women who are joining technology industry?

Looking back at the start of your technology career - What advices would you give to your younger self?

22. Thank you for your time and participation!

Your feedback is valuable for acknowledging the issues women face in technology field and for suggesting best practices or additional ways of improving women's experience in the field (for example books, networks, mentality, concrete actions etc)

If you are interested in leaving additional comments or feedback, please use the comment box below or email me directly.

Kindly,

Julia Ranta,
Business Information Technology,
Haaga-Helia University of Applied Sciences,
julia.ranta@myy.haaga-helia.fi

Comments:

Done