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Meaningfulness as a driving force for women in ICT

What motivates women in software industry?

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Abstract. The gender bias in the ICT industry has been a widely discussed topic for decades. Yet, there has not been great success in fixing the gender balance of IT professionals, especially in the technical fields. The ICT industry is suffering from expert shortage and there is need for a more diverse competence. This could be the moment for women to step out and enter to the industry. We cannot only wait for our education systems to deliver enough diversity for the labour market. In order to motivate more women to change their career to the ICT industry, we have to understand the professional motivation of women in the ICT industry. In this paper we use the stories of 23 women who are working in the ICT industry to learn more about the motivation, challenges and best practices for different career paths into the ICT industry. The results show that women in ICT value the creativity and diverse possibilities of the work in the industry and they see that industry could benefit from more diverse employees.

Keywords: Women in STEM, gender bias, gender equity, gender equality, expert shortage

1 Introduction

When we are talking about gender bias in the software industry, we are referring to the under-representation of women in the industry - the sheer fact that there are significantly less women working in the industry than men. There are differences between continents and countries but the overall trend has been clear for years - the ICT industry is dominated by males. [1] The research about gender in the software industry is usually focused on the importance of the diversity as a driving force for the success of the industry overall. Currently, there is interest in more diverse skills in the industry because previous studies argued that diversity in the software development teams influenced the creation of new innovations as well as on renewing the industry [2].

The under-representation of women in the software industry is not a new issue. For decades, a significant amount of work has been done to attract more women into the industry and efforts has been focused especially on younger generations. Still, the change

has been slow and there has not been an increase in women participating in the software industry. That has led to the situation, where some researchers have already pointed out that we would need a new viewpoint if we really want to ensure that we will get more women into the industry in practice. [?]

Reasons for the lack of the women in the software industry are complicated. Nevertheless, adult aged women still find the industry attractive and are pursuing jobs in the industry, despite the challenges they face when making a career change at adult age [?]. The peer support for women who are interested in the software industry or would like to train themselves further has been shown to be crucial. [? ?]

Identifying different ways to enter to the software industry is important when the industry is facing big changes and more high skilled labour is needed - and this is the situation, where both educators and industry has to respond. At the same time, there is discussion going on that some jobs are disappearing via automation. Therefore, the guidance and different career paths for the adult aged population is growing in importance as well as the effect of lifelong learning. This study looked at the motivational factors of women working in the ICT industry and elements of their different career paths into the industry. The research question for this study is:

RQ1 What motivates women in ICT industry?

The paper is structured as follow: section 2 contains the background research on diversity and gender bias in ICT industry. Section 3 presents the research process and section 4 describes the results of research. In section 5 we go through the key findings of the research and limitations. Finally, section 6 concludes the paper.

2 Background

The need for more women in the software industry is driven by the need for more diversity in the industry. Diversity is more than just a gender issue - it can refer to culture, age and diversity in terms of experience. While innovations, products and services make up the industry, there is a need for people with different backgrounds, values and ideas to participate. Therefore the paucity of women in the innovation processes could impact detrimentally on our future [? ? ? ?]. It has been also researched that women value different aspects in software professional work than men. It was found that women value the possibility to renew their career and have changes in the daily workdays more than men. Women also thought that new technologies and agile working methods were more important for them than men [?].

The under-representation of women in the software industry has been a problem for long time and it seems to be that change is coming but it is not going to happen fast. The problem is not only that there are not enough women in the industry, but the problem is also that women job duties divide differently in the industry than men. For example, in the USA's software industry only 11 % of chief officers or senior leadership positions were occupied by a woman [?]. It has been studied that women usually do not pursue towards more technical jobs inside the industry and they also doubt their skills more than their male colleagues [?].

The background of the lack of women in STEM (science, technology, engineering, mathematics) industries has troubled researchers for decades. The problem has been researched from different viewpoints starting from the childhood to the academic career opportunities. The early childhood attitudes towards math-intensive fields has been shown to be one of the reasons, why women do not find the software industry attractive [?]. Cultural beliefs do also have their effect on what kind of career choices women and men will make. The possibility to use computers in the early ages and in the adulthood also matters. It has been researched that people who have been using computers do not suffer from computer anxiety as much as those who has not been given the access to the computers. Women also tend to have also more negative attitudes towards computers and their own computers skills than men and it can be because of the lack of computer usage of women. [?]

Adult aged women find the software industry attractive. The variety of positions in the industry, an equal wages, meaningful work and interesting career opportunities attracts women. Software communities especially set up to help women who are entering to the industry from another industry are useful. These career changers are seen as one solution for the software industry's labour shortage problem. [?] Peer-support and mentoring from other women has been proven to have a positive impact on getting more women to the industry and also stay in the industry [? ? ? ?].

The labour shortage of the software industry is also partly one reason why software companies are getting more interested in women [?]. For example, the World Economic Forum has stated that there are already some job categories, where finding new talent is difficult and most of these positions are in the software industry [?]. However a crucial change in future work life skills is needed. The 21st century skills, so called 'soft skills' has become more important, especially in the software industry. These skills are such as problem-solving, self-direction, information-processing and communication skills. [?] This all leads to the situation that there could be potential momentum for women to really take their place in the software industry and fix the gender gap.

3 Research process

The research method used in this paper is digital ethnography, also called netnography. Digital ethnography takes it form from the ethnographical viewpoints in the digital world [?]. In this research we are using digital stories, blog posts, of women who are already working in the ICT industry. These blog posts were selected, because there was good representation of women who have chosen the ICT industry as their first choice for career and for women who have made a career change to the ICT industry later in their working life. The motivation to approach the topic via digital ethnography was that the blog posts and stories offer an important place to dive deeper into women's experiences and stories about what motivates them to work in the ICT industry.

The blog posts are from The Finnish Software and E-business Association's #mimmitkoodaa (women who code) project and they are posted in 2019. #mimmitkoodaa is a program, which offers free of charge, hands-on workshops in different technologies, with the help of Finnish software companies. These events have been really popular and at the moment they have over 4,000 women on their mailing list. These #mimmitkoodaa

blog posts, used in this research, are open for everyone and collected to give peer support, guidance and inspiration for women who are working or interested to work in ICT industry. Blog posts are interviews, made by the same interviewer and every post presented one career story. The blog post series still continues to publish stories and they publish one post every week.

In our research we went through the stories and identified common themes by thematic analysis [?]. Blog posts were reviewed in two rounds get deeper overview for the shared themes. There were 24 stories in 26 blog posts. Two of the stories were both in Finnish and English and one story did not fit the research purpose, because it was written by one of the authors of this paper. All the other blog posts were included for the research. In thematic analysis, we identified 17 common themes (see Table ??).

4 Results

4.1 Themes

The blog posts were published between March and October 2019. All the blog posts are written in Finnish, two of them have been translated into English to serve the career changers who have an international background. From the blog posts, 12 of the stories were from women who pursued a career in the ICT industry as their first option and 11 stories were from women, who made a career change into the ICT industry later in their working life. From those 11 career changers, eight of them revealed their past profession. Two of the career changers had background in Business Administration, two had past experience in customer service and then there was a music educator, translator, travel consultant and one person who held a Master of Philosophy.

In the next subsections, we are going to dive deeper into four most popular themes common in the blog posts.

4.2 Lifelong interest for the technical field

The lifelong interest towards technology, starting from childhood was mentioned in 14 out of the 23 stories. Women usually mentioned that they had access to the computer in their childhood home or they had strong problem solving skills identified in their early childhood. A couple of women also mentioned that they had software professionals as their relatives (usually their father) and that they found out about the job possibilities in the industry. Related to their own interests and positive experiences using technology, teachers were also mentioned in three stories as important actors for career choice. Early interest in technology did not directly influence women to work in the industry, however it was a critical factor when changing careers in their later working life. The following quote from the blog highlights this.

Since school, Hanne has been fond of mathematics and science, and wanted to study computer science in junior high school, but did not get a place from an optional computer science course. In High School she got a chance to attend some web page courses and after high school her father tried to convince her to choose computer engineering as a major because he saw that her strengths were there.

Table 1. 17 common themes found from #mimmitkoodaa blog posts

n	Theme
14	Interested about technology already as a child
14	View industry supporting creativeness and versatile job opportunities
12	View diversity important for the industry
10	View networks important
9	Enjoys the possibility to use problem solving skills in the work
8	Has drifted to the industry by accident
7	View mentoring important for the career success
6	View gender (women) as a strength in the industry
5	Enjoys the diverse working environment
5	Has faced prejudices because of gender
3	Is self-taught for the industry (no official degree)
3	Does not see that fits to the basic role of "nerd"
3	Highlights the importance of the teachers support for choosing the ICT industry
2	Values the career stories of other women
2	The importance of choosing the right kind of working place
2	The importance to make visible the own skills to the potential employees
1	Identifying own strengths is important

4.3 Diverse and creative industry

The versatile job opportunities in the industry were seen as one of the most empowering aspects in working in the industry. From the stories, 14 out of 23 mentioned that they valued the diverse job possibilities of the industry and 9 out of 23 mentioned that they enjoyed the possibility to use their problem-solving skills in their daily job. The following quotes highlight this.

I see that best in this industry is the possibility to evolve constantly and finding new things. It can also be really frustrating because this industry is never ready and one has to accept the limitations of own understanding and learn to cope with that.

What is the best in this industry is to create new projects, challenging yourself with different problems, the possibility to improve people daily life with the help of technology and that every working day is different from other. What is challenging is the balancing the working life and free time.

4.4 The importance of diversity for the industry

Overall, six women out of 23 highlighted in their stories that they see their gender only as a positive factor in a male dominated working environment and five out of 23 see that working in the diverse teams was one of the most positive aspects of their job and they highly valued this. However, there were some negative experiences. The following quotes highlight our results.

Rosa's team has colleagues with different strengths and backgrounds, from babysitters to journalists and social workers. Rosa admires her systematic and precise colleague because she is more generous. Her strengths, in turn, are her excellent problem solving and brainstorming skills.

Indeed, the industry needs all sorts of diversity, and female coders can bring a lot of good to the industry with a variety of thinking, empathy and softness. It is important to get more women excited about the industry and stay in the industry by changing industry cultures, attitudes and roles so that women can work well and feel safe in their work environment.

4.5 Networks and mentoring

Because stories in the blog post were presented by the #mimmitkoodaa project, which also referred to the strong community of women supporting each other, it was not surprising that mentoring, peer support and networks were mentioned in the stories. From the stories, 10 out of 23 women identified that networks were highly important for them and seven of the of 23 mentioned that mentoring had a big impact on their career success. Also, two out of 23 women mentioned that they found the stories of other women really empowering and supporting. The following quote shades further light on it.

Eevis thinks that she was very lucky, because in the first job, she found a mentor who was able to look after, answer questions, and be a true mentor. Unfortunately, along the way, there have also been cases of reverse mentoring. But for this first mentor is to thank that Eevis is still working in the industry. Mentoring and mentoring skills are key to growing less experienced but learning-capable juniors into top performers.

5 Discussion

5.1 Key Findings

When it comes to the under-representation of women in the ICT industry, there has been a lot of discussion on how we could support and encourage young girls to become inspired about this field. In this research, we found that the majority of women mentioned in their stories had been interested in technology since childhood. Still, this does not directly mean that these women would choose a technical field as their first choice as a career. The importance of positive experiences and teachers guidance was crucial for choosing a career in the field of technology.

The meaningfulness of the job, the possibility to use their own strengths and skills, such as problem-solving skills or past experiences from other industries were seen important. Women highlighted in many ways that they felt that it was important to identify their own skills and strengths and find the right kind of job in organisations where they can grow as professionals. This also affects the education side of things; that is education providers need to be clearer on their offerings to assist career changers. They could

recognise prior experiences that career changers bring and offer more flexible pathways into lifelong learning. Given career changers have identified that *meaningfulness* and *identifying own strength* is important to them, education providers could use these two areas to their advantage when developing curriculum.

Women also valued diversity in job descriptions, job possibilities and also in their everyday working teams. They felt that the diversity of people with different backgrounds made their job more interesting and meaningful. They also saw that industry would benefit from more diverse organisations and felt pride in their diverse background or capability to think out of the box. Women also saw their gender as a positive factor in the male dominated industry because they could stand out.

The peer support, mentoring and right networks were important for women working in the ICT industry. That is something which educators and industry could take more advantage when planning the strategies to get more diversity to the industry. The career stories from different kinds of people, the importance of teachers and close relatives and the effect of sharing the best experiences could boost the diversity in the industry. There were no differences identified in shared themes and attitudes between women who were career changers and women who chose the software education path straight away. This aspect could be interesting for future researchers to look into.

5.2 Limitations and future research

This paper used digital ethnography and thematic analysis to approach the issue of the motivational aspects of women working in the ICT industry. There are some limitations in this research. All the stories were collected from people who wanted to share their story about successful career changes or career choice. This can also lead to the situation where some negative issues were wiped from the stories. Also, the interviews were made only by one interviewer. This can affect to the story line and issues raised in stories. For more precise results more diverse ways to approach the topic is be needed. Overall, this research was about the women in the ICT industry. When we are talking about diversity and inclusion in the industry, more voices and underrepresented groups should have a voice. Also, some comparable data from different countries could be beneficial. For example the World IT project data mentioned in this research [?] could provide more answers.

6 Conclusion

In this research we examined the job motivation of women working in the ICT industry by going through 23 stories. We used digital ethnography and thematic analysis to find out what is meaningful and important for women working in the industry. We found that women saw lifelong interest in technology starting from childhood and continuing into adulthood as the most important driving force. Women also identified diversity as important in their job and for the industry's success. They also saw that mentoring, peer support and networks highly important for their career success.

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