Women in Software Development

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**Introduction**

The field of information technology and software engineering is arguably very highly demanded in the 21st century. All the remaining fields including business, engineering, health sciences, finance and accounting are dependent on software and due to the digitalization of fields, information technology is the most premium in today’s age. The topic of the thesis is the role of women in the development of this field. Despite the fact that there is a significantly huge number of jobs out there in the market, the number of women working actively in this industry is considerably lesser as compared to men. Although a number of women are working in pure IT domains of the world’s leading tech giants including Google, Microsoft and Amazon, still it isn’t enough as compared to their counterparts. This trend sometimes leads to a generalized supposition that women are not capable in the field of IT and other works of technical nature. This underrepresentation of women in the field of IT is due to many reasons which will be discussed in the thesis. Also the role of women from the historical point of view in the development of computers at an early age is discussed to prove the point.

The thesis is based on the response to the perception that women are not as competitive in the field of technology as men. The question whether women possess the intellectual and logical faculty of dealing with computer software complexities and managing the integrity by fulfilling responsibilities which involve creativity, will be addressed by using the information from the history and logically possible reasons for the underrepresentation of the women in IT. The thesis emphasizes the idea that despite all the presuppositions and assumptions, women are very much capable of excelling in the field of IT. Examples of the marvellous achievements of women from history have been discussed. Also, as the number of female computer scientists, IT specialists and software engineers is increasing day by day, future prospects of the role of women in software by the year 2099 have also been highlighted.

**Literature Review**

The literature review for the thesis comprises of peer-reviewed articles about software engineering and will cover the evolution of software. Also, the contribution of women in the growing phase of software development from the journal article of Jennifer S. Light is used as a source. One of the main sources in the literature review of the thesis is the famous book of Claire Evans in which she explained how women contributed to the development of the first-ever programmable general-purpose computer ENIAC. Eckert and W. Mauchi were the two prominent women who served during the world war 2 by automating ballistic computations. In this project, approximately two hundred young women from different backgrounds worked together as a team and were able to invent this machine. We will see how women developers and programmers built this state of the art computational machine at that time. Also, we will compare the status of women in the industry today and will analyze the percentage of women in modern-day tech giants based on the statistical analysis of Microsoft. In the analysis, the percentage of workers based on gender, ethnicities and origins from different regions of the world is discussed. By carefully analyzing the status of women in history and a considerable increase in the women population in technical industry and software firms, we will predict the role of women and their active participation in the future.

In 2017, there was an issue in Google which was based on a 10 page manifesto by a Google engineer. In this manifesto, the reasons for the lack of women in technology and leadership were discussed[[1]](#footnote-1). The manifesto was a polemic against Google’s motto of diversity in innovation, as it contained content based on undermining women’s ability to compete with men in technology. The paper was focused on the study of biological circumstances which support men in the fields where logic and decision making matter the most. It argued that women lack the faculty of decision making and logical computing owing to the natural and intrinsic differences between the thought process of men and women. It was initially circulated in Google but later it was leaked in the public causing an outburst from different societies. Many considered it no more than a sexist way of labelling things and above all, it was not supported by a well organized and critically performed survey. The allegations, however, were refuted by the writer as he suggested that talking about gender gap in different fields by assessing the requirements and statistics does not necessarily have a ‘sexist’ approach. He tried to clarify and made it more explanatory by saying that women tend to consider coding and all the related jobs boring and hectic. Men have more interest in status and command as the code commands the machine to perform the tasks while women, on the other hand, are more interested in aesthetics and people. Men have a special frenzy about computers and software as they start interacting with devices from early childhood in the form of playing games with friends while girls do not do so very often.

The points given as clarification are not entirely incorrect but it is also true that they are more suggestive explanations that are not well supported by a qualitative analysis. One of the reasons is gender discrimination even in some of the tech giants. Again, taking the example of Google where such tendencies have been observed many times in past years which indicates gender discrimination in the company. The U.S. Department of Labor published a report about this where it said, “The investigation is not complete, but at this point, the department has received compelling evidence of very significant discrimination against women in the most common positions at Google headquarters [[2]](#footnote-2)”. The pay gap between men and women was also one of the factors which can be discussed in order to understand the different market and industry opportunities for different genders. Google, however, lifted this pay gap and claimed that they do not discriminate between genders and races anymore as far as the work wage is concerned.

**Historical Background**

By looking at the history of female workers' performance in the field, it is hard to believe that women lack capabilities of logic, decision making, coding and doing stressful work. The idea which proposed the lack of women's interest in the fields of information technology is not true as now, market trends have been changing for the past few decades. The drive for innovation is very significant in women as according to study, the choices made by women account for approximately 85% of buying decisions.

The Socio-historic Context

As female inclusion in the tech industry is growing day by day, the history of women who worked in the industry in the past is also rich. In the famous book of Claire Evans, she reminds the world about the marvellous invention of ENIAC during world war two. Women at that time were mostly doing clerical, health-related jobs or worked as primary teachers. At that time, when instructional manuals and guides were not available neither informatory tutorial videos were there to help. When a majority of the male population was indulged in war, women broke out into traditionally male occupations and made history by making the first-ever programmable, general-purpose computer. The task was assigned to six women due to the deficiency of male engineers in the United States. These women were tasked to first learn and interpret how a computer works and then to program the computer machine. It was not an easy job as it was a path previously unpaved by any of the computer scientists at that time. They started with very humble backgrounds both technically and financially. Kathleen McNulty, one of the scientists involved in the invention of ENIAC, described the difficulties they faced as, “Somebody gave us a who stack of blueprints and these were the wiring diagrams for all the panels, and they said ‘Here, figure out how the machine works and then figure out how to program it which was a little bit hard to do so[[3]](#footnote-3) ”. The work was such a breakthrough that it revolutionized the tracking of the trajectories. The computer scientists were assisted by 240 women from different backgrounds who worked day and night to make this possible.

These women continued to work on the project even after the war ended and it became very difficult for the managers to replace them with the returning soldiers. There is a perception that men tend to work more efficiently in teams as compared to women because they are more interested in personal endeavors. The project not only proved the ability of the women to work efficiently in a stressful job like computer programming and machine coding but also that they are equally capable of working in teams. The management has a major role in determining the success of any project irrespective of the field of work. ENIAC Six, the women who were assigned the task showed an excellent display of teamwork and management despite the fact that they belonged to different backgrounds. As said by Jennings, one of the scientists of ENIAC, “We had a wonderful time with each other, mainly because none of us had ever been in close contact with anyone from one of the others’ religions. We had some great arguments about religious truths and beliefs. Despite our differences, or perhaps because of them, we really liked one another[[4]](#footnote-4)*”*

While talking about the contribution of women in that marvellous invention, one thing which is demotivating is the response from the technology industry at that time. The work was considered a part-time overtaking of women in men’s business due to their absence. It was not considered as a fulltime achievement rather a substitution for a period of time. Despite the complexity of the work and the maximum results obtained, the women did not get the recognition they deserved. That time was the inception of women in the field of IT and as discussed above, they were called for this work. The women who started working in a team were called as ‘computer women’. The engineers working in the field at that time admitted that the accuracy and speed of women's computers are no less than men. There are a lot of examples from history that can be presented to prove the importance of women in technology and especially computer science but ENIAC is one of the major breakthroughs. We will go a little deeper into this project and analyze technical aspects and innovative strategies that are incorporated by the programmers in order to build a state of the art computer.

ENIAC is the acronym of Electronic, Numerator, Integrator, Analyzer, and Computer. The proposal of the project was presented by the scientist named John W. Mauchly in which he proposed to the government the solution of ballistic table anomalies. The United States army was facing this issue of scarcity of ballistic tables which were required in great numbers in order to accurately shoot the target from accurate angles. So based on Maucley’s proposal, a general-purpose, programmable machine was built. Previously, relays were used in advanced computing machines of that time but in ENIAC, switches were used. “The task was performed by setting switches and knobs, which told different parts of the machine (known as “accumulators”) which mathematical function to perform[[5]](#footnote-5)”. ENIAC was distinguished from all the devices previously used because it used electronic components, secondary memory and above all it was programmable and could be used as a general-purpose machine.

Even according to the modern-day programming standards, coding in ENIAC was such a horrendous task. It was manufactured to substitute the work of hundreds of previously used computers which were used at that time for computing ballistic tables. Grace Murray Hopper was the prominent mathematicians who lead the best women graduates from the different colleges of the country. She was the first term who came up with the idea of “automatic designing”. The term ‘compiler’ that we use today cane from this project. The difference is that today we think of compiler as an interface to translate the high-level language into machine level language but Murray described compiler as a way to handle hard-wired subroutine onto the ENIAC. As far as the accuracy and results are concerned, ENIAC was faster than machines which were previously used, by approximately 1000 times. Compared to human beings, the capability of calculating trajectories is about 2400 times faster is ENIAC. The first program was operated in November 1945 where ENIAC stunned everyone by running some of the initial calculations for the development of the Hydrogen bomb.

The purpose of making such a computational device was to minimize the accuracy problems while determining trajectories that may help in shooting the targets. The intention of the US government was to utilize this device in the World War against potential enemies. The reason is, due to widespread military occupations and instalments of colonies of different countries for the supremacy, war technologies were advancing day by day. To build such a programmable computer, hence increasing efficiency and control was the need of the hour. However, the project was not completed during the war and hence could not be used for the intended purpose. It was first brought to operation in November 1945. Although it could not be completed for its use in the war the results produced as a result were very impressive.

**Conclusion:**

From the detailed analysis of the role of women in the field of information technology and computer science, we come to know that despite the sceptic views about women’s competency in dealing with computers, women are improving themselves in the field every day. They are now working in almost all the big software companies and service providers. According to a recent survey, there is a considerable increase in the number of women working in Microsoft. Microsoft has almost 27.3% of women employees which is remarkable compared to the past few decades. In 2017, the total share of female workers was increased by up to 26% which is still less as compared to 2017 where it reached up to 29 per cent. According to the Microsoft sources, the decline of the women percentage nowadays is due to Nokia operations winding down. If we talk about LinkedIn which is the world’s biggest platform for business and employment-related activities. According to some resources, LinkedIn has the highest percentage of women employees as compared to all other tech giants. “LinkedIn contributed heavily to the makeup of female employees; it said last year that its employee base was 42 per cent female.[[6]](#footnote-6)”

Talking about the environment in Google, as discussed above by the example of a manifesto written by a Google engineer in which he undermined the women's capabilities in coding, programming the machines and decision making in stressful situations. They had to face a sudden backlash from different societies and even from the female google employees. The situation got so hyped that Google’s vice president had to apologize and condemn the manifesto. The wage gap of the employees based on gender is also lifted up hence equal opportunities for success and development are present for everyone in the big fishes industry. The real constraint ion the path of women who wanted to work in information technology was the environment. From the above examples, now when the environment is becoming suitable and the number of women in the field is also increasing, it is expected that in the near future the remaining gap will be minimized further. With the widespread of IT industry where everything is interfaced with software, only men are not capable of handling the requirements. The role of women in the IT industry is not only a liability but is becoming a necessity. So the female population of the country must be encouraged and equipped with the necessary training to join men in the industry to meet the challenges, the world is facing.

According to a survey, the age group of women who are working in the fields of IT is between 18 to 39. The number of female workers is also increasing in the silicon valley. They are changing their attitude to reward and recognize female employees. So it is very important to promote and motivate women to join the IT industry. Women must consider this option not because they are in competition with men and have to prove themselves but due to the fact that the IT industry is generating the highest revenue. This can be achieved by organizing different STEM-base activities from high school level and making the computer courses compulsory at least at the high school level so that a student entering college must have extensive know-how of computers. This is necessary because of the future requirement of the workforce in the field of software engineering. A growing number of women in information technology and computer-related fields suggests a decrease in gender gap which a very positive sign. Because women are not only working on technical and client service positions but also reaching up to executives and CEO which may become reason for further inclusion of female workers in the industry. Marissa Mayer, CEO of Yahoo is one example of them and there are other examples too. This will encourage more and more women to take IT and software engineering as a career path.

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