The key to recruiting newly graduated female engineering students from Sweden

A case study of Womengineer Day to uncover if there are barriers and a potential gap between female engineering students and recruiting companies

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1. Introduction

Gender equality has become more important for today's society and many engineering companies aim to achieve a more equal working environment (Margolis & Fisher, 2002). A reason is that there is a movement in society for an equal and inclusive platform for technological innovation, and studies have shown the importance of having diversity when creating new technical inventions. However, there is still a big difference in gender equality between different professional groups, such as engineering, despite the changes and promotions of gender equality within the STEM fields of science, technology, engineering, and mathematics (European Commission, 2021).

1.1. Background

Sweden has implemented different initiatives and events to inspire girls and young women in Sweden to pursue engineering studies, such as Introduce a Girl to Engineering day (Womengineer, 2022a), Datatjej (2022) and the mentorship program Pepp (2022). Also for women already studying engineering at university there are programs and events held by companies, universities, and organizations, open only to women. An example is Womengineer Day which is the study object for this study. It is held once a year by the Swedish foundation Womengineer and they describe the event as a "networking event for female engineers and companies" on their website (Womengineer, 2022b). Womengineer Day is a national event held digitally and is open for female engineering students in their last two years or the first three years after graduation. During the day the students get to talk to ten companies from different industries to learn more about their opportunities.

In the study year 20/21, 35 percent of the engineering graduates in Sweden were women which is the highest ratio since Statistics Sweden (SCB) started its surveys in 1977/78 (SCB, 2021). There are more female students finishing their degree than males. An explanation could be that women have made a more conscious choice since the industry is male-dominated (Thorsell, 2021). However, only every second student reaches final graduation, the reasons why students do not reach graduation are getting a job before graduation, and not having sufficient knowledge in mathematics and physics (Thorsell, 2021).

While the number of females in engineering studies is increasing there is still some way to go in different industries where graduated engineers enter afterward. Recently, the Swedish institute of key figures (Nyckeltalsinstitutet) published recent statistics on the equality ratio between women and men in different industries, employees in general, and not only engineers (Haltorp, 2022). Industries with the lowest rate of women are construction (10 percent), transport and logistics (21 percent), manufacturing (25 percent), and energy and environment (25 percent). These industries are therefore presumably hungry for female talent among engineering graduates. At Womengineer day companies from these industries are represented to attract more female talent.

The number of females in engineering is slowly increasing but the gender imbalance still remains despite the promotions and efforts from organizations. Since many engineering companies are working towards creating an equal working environment, but still face challenges in attracting and recruiting female talent, an interest has been aroused which has resulted in the creation of a research study. This research aims to identify the barriers to the recruitment of female engineering students by investigating the factors and values they consider when applying for their first job in engineering, and comparing them to what engineering companies currently offer. The goal of this research is to help companies to understand the underlying causes for difficulties in recruiting women, and to assist them in overcoming these barriers by bridging a potential gap to ultimately increase the representation of women in the field of engineering.

1.2. Aim

The aim of this study is to uncover the current recruitment situation in the Swedish engineering field for young female engineering students in their early work life and identify barriers to their recruitments. This will be done by determining important factors and values for young female engineering students when choosing their first employer by taking the recruiting companies' perspectives into account and to distinguish if there could exist a gap between them.

1.3. Research questions

Based on the problem description, the following three research questions have been formulated:

- How do young female engineering students in their early work life perceive their confidence when applying for a first job, and what characteristics they are looking for in the first job?
- Do the corresponding companies, actively working to improve the equality ratio, understand their target group's confidence and expectations on their first job, or could there be a gap?

1.4. Scope

The overall study object is Womengineer Day with 80 female engineering students and ten companies participating. Therefore, the study objects consist of female engineering students in either their two last years of studies or the first three years after graduating and companies in the private sector. The market that will be researched is the Swedish market.

2. Literature study

In the literature study first a further background to the gender imbalance is given. Thereafter, literature presents previous examples of a gap between employers and students searching for a job. Then studies will be presented about students' perception of their own abilities and desires for a job accompanied by gender stereotypes. The current situation for recruiting companies in Sweden is then presented to set the frame for this study. Finally, a summarization is given to motivate the research questions of the study.

2.1. Gender imbalance in the field of engineering

The number of men and women in the population are represented almost equally. However, in the field of engineering there is a significant gender imbalance with men outnumbering women at a ratio close to 9:1 in the world (Patrick et al., 2021). The authors explain that the disproportionated distribution has been linked with the mismatch in the perceptions of engineering and the interests of girls and women. Patrick et al. (2021) did a study to further examine the gender gap in engineering profession identification and the underlying causes. The results of the research show that women and men have different affinities towards engineering work which result in men being used to applying more to technical jobs which include analysis, design, and tinkering and women want to work more with framing, problem-solving, and project management. These findings suggest that women may be more inclined towards careers that are more people-oriented while men have a stronger affinity for technical practices that involve working with “things” rather than people.

One of the main reasons contributing to the gender distinction in technical skills is that men are used to being supported and encouraged to develop within these fields since childhood due to the expectations from society and gender norms (Patrick et al., 2021). This leads to men making career choices that are aligned with the gender roles which in turn results in the imbalance distribution within the engineering and other technical educations.

In Sweden, women, and men have formally the same rights both in the market and at home (Nordvall, 2017). However, the distribution between women and men within technical education and the engineering industry is still unequal. Nordvall (2017) explains that this is mainly because of the historical perspective, and not biological reasons. The author believes that the image and perception society had of what engineering work entails still remains today. This adds up to the discussion by Patrick et al. about gender roles and not sex determining the equality of the engineering field.

2.2. Gap between recruiting companies' and students' expectations

When the number of women graduating from engineering programs is less than men there is a bigger competition between the recruiting companies to attract female students to their company. A recruitment process is a two-way process with the student on one side and the employer on the other side. To reach a contract there must be an agreement between the parties. The student must find the company interesting and the company must feel that the student is the perfect match. This can be evaluated through employability skills. *"Employability is the ability of a person to find and retain a job with the help of both generic as well as specific occupational skills"* (Rizwan et al., 2018, p. 1). The authors explain that employability skills are important for both students and employers but the perceptions between these two parts can sometimes differ.

The results of studies in Pakistan and Saudi Arabia show there is a wide gap between what newly graduated engineering students consider to be the most important employability skills in order to get a job versus what companies and recruiters are looking for (Rizwan et al., 2018; Rizwan et al., 2021). The students believed technical skills were the most important factor while the employers thought interpersonal skills such as communication, creativity, and problem-solving were more distinguishing to have. Rizwan et al. (2018) explain that this existing gap results in students putting the wrong focus and instead focusing on developing within less important areas, which in turn leads to difficulties for students to find their first jobs. In addition, the gap also affects the students and increases stress as the available in the market are not in line with what the students expect to work with.

2.3. Students' perception of their abilities and desires for a future job

To understand potential barriers for recruiting companies the students' perceptions of their abilities and desires for a future job must be understood, along with the recruiting company's situation. In a study conducted by Magarian and Seering (2022), the aim was to define ideal candidate-career matching by analyzing the interests and abilities of mechanical engineering students, both female and male, at nine US universities. To see what interests and abilities the students had and how they affect the choice of career the authors set up different hypotheses. The hypotheses are based on earlier findings in the literature and are tested by the results of a survey sent out to the students. A similar indication of a desire to continue in engineering is found among students that enjoy mathematics and if there are creative opportunities in engineering positions. No significant difference could be found in mean salary expectations between engineering and non-engineering professions.

Moreover, specific answers about the student's career aspirations could be valuable for recruiting companies. Itani and Srour (2016) looked into this in their study among senior engineering students in Lebanon, with 20 percent female respondents and 72 percent male. A third of the respondents in total expressed their interest in jobs with the title engineer involving both technical and administrative tasks. One-quarter answered a desire to have a purely technical job and the rest were equally spread between the alternatives technical consultant, general or nontechnical consultant, a position involving management or supervisory training, or being a part of a job rotation program. Nine percent of the respondents were unsure about what their first job would be. The majority seemed to have a certain desire for their first job, but this was tested by being asked about the likelihood of selecting another job compared to their initial answer. This led to the insight that more than half of the respondents saw the first job as one of many transitions for the future, in line with studies of current trends in engineering careers.

When reading headlines such as "Gen Z Knows What It Wants From Employers. And Employers Want Them" (Krueger, 2022), and by putting the graduate students in the spotlight their qualities and interests might seem different to other generations. But that is most often not the case and in general, there are more similarities between younger and older generations than differences in how

they value different aspects of jobs (Zaharee et al., 2018). When the workplace landscape shifts due to technological and societal change, aspects become normative. Therefore, for example, flexible hours and telecommuting are important for employees of all generations from millennials to the baby boomers although they are recent innovations (Zaharee et al., 2018). However, some aspects differ between younger and older generations. The study by Zaharee et al. (2018) found that younger workers have a higher desire for quicker rotations at a workplace and continuous feedback from managers. This could be seen as a result of the generations being in different life stages, as pointed out by the authors, where the younger generation is looking for a start in their career with a high level of development.

2.4. Difference between female and male engineering students

Womengineer Day is exclusively open for female and non-binary students, which makes it interesting in looking into if there are any differences between the genders in their aspirations for future careers. In a study by Powell et al. (2012) at UK universities they found out women answering their survey were more likely to have chosen an engineering and technology path for studies with little knowledge of what engineers actually do. Meanwhile, other literature mentions that it is men that have continued pursuing an engineering path with only a little knowledge. Powell et al. (2012) propose a solution for this lack of knowledge among engineering students attending different educational programs inspiring and informing the youth. Womengineer Day is a mix of networking and letting the companies describe their business further. It can therefore be seen as a step to increase the knowledge among female engineering students.

In the interviews by the authors Powell et al. (2012) it became clear that the women believed that men were better suited for engineering and technology by holding stereotypical views. The women also tended to value their ability in maths and science subjects when choosing a future career. This could be an interesting aspect to examine in this study to see if it is an important factor in the Swedish market as well. In the survey, 89 percent of the respondents answered that they believed choosing an engineering and technology degree would be opening doors for the future.

2.5. Current recruitment situation for Swedish companies

In a fresh report by the Swedish staffing and recruitment company Academic Work (2022), based on a survey among 5 267 young professionals in various areas, the most popular future employers brands are companies with popular consumer products or services. The youth already use their products and have a good sense of the company beforehand. In the meantime, the biggest reasons why young professionals opt out of an employer are the industry, uninteresting, far away, reputation, and the working environment (Academic Work, 2022).

The respondents in the survey (Academic Work, 2022) were also asked to rank which top ten factors are most important when choosing their future employer, shown in fig. 1. Even when the responses are divided into the fields of financial, IT, and technology it is the same three factors that are the most important: good colleagues and working environment, salary and benefits, and career and development opportunities.

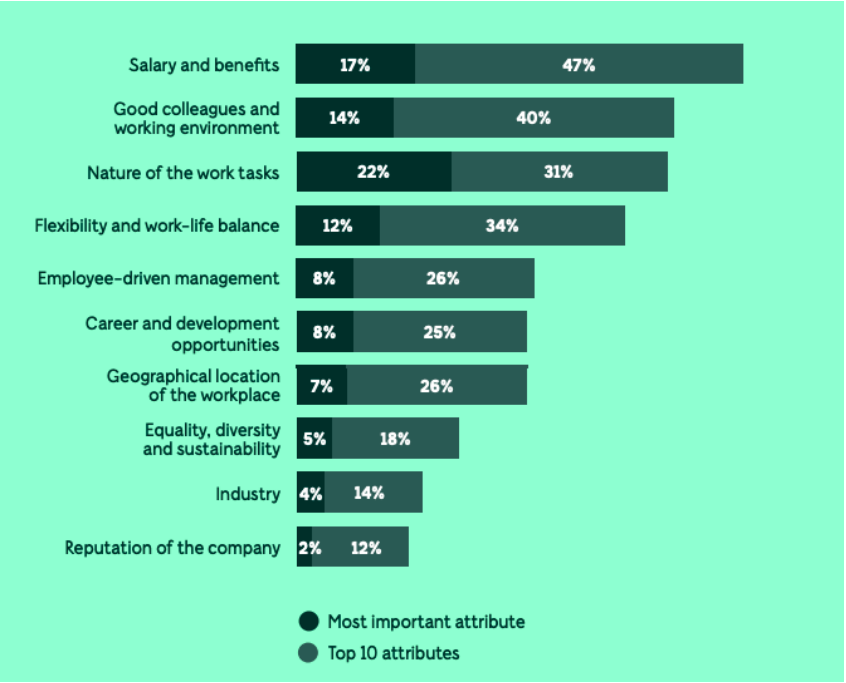

Fig. 1. Top ten most important factors for young professionals at their future employer (Academic Work, 2022).

The Swedish union organization for engineers (Sveriges Ingenjörer) conducts different surveys among its members on a regular basis. In another report by Sveriges Ingenjörer, the result from a survey about salary is presented (Ihrfors Wikström, 2021). The result shows that the gap between women's and men's salaries is very small for the first three years but after this, the gap starts to

increase. Of the current average for all engineers, women's salaries represent 90 percent of men's salaries (Ihrfors Wikström, 2021). In this report, the salaries are also compared based on educational background. Although the highest-paid engineers work in finance and management there is also the largest difference between women's and men's salaries. Women in finance and management earned 84 percent of the men's salaries. Other backgrounds where women earn less than 90 percent of the men's salary are energy and electrical, mechanical, and construction engineering. However, those with the lowest paycheck are civil engineers accompanied by engineers in the fields of data science, chemistry, and biotechnology (Ihrfors Wikström, 2021).

2.6. Uncover barriers and a potential gap between Swedish engineering students and companies

Previous research has studied various explanations behind career choices for engineering students and aspects they value in their job. Different factors such as perception of abilities such as self-confidence have been raised as potential barriers to recruit female engineering students (Magarian and Seering, 2022, Powell et al., 2012). Research has also shown a shift in which values job seeking students belonging to a younger generation see as most important when looking for a job (Zaharee et al., 2018, Academic Work, 2022). As there is a lack of female engineers in several Swedish technical industries (Haltorp, 2022) it is important that the recruiting companies understand their target group. If not there might exist a potential gap.

Similar gaps were previously undiscovered by Rizwan et al. (2018, 2021), and uncovering a potential Swedish gap could be a step to understand how to create a more equal Swedish engineering field in the future. The gaps between students and companies were found in both Pakistan and Saudi Arabia when investigating how students and companies perceive employability skills. As Womengineer Day is an event aiming to help companies market themselves to female engineering students, and furthermore recruit them, finding out if the students and companies perceive the recruitment situation similarly is valuable. Companies participating in Womengineer Day have actively chosen to participate and therefore have an awareness of the importance of increasing the number of female engineers in their company, and industry. This is the second year

of Womengineer Day and when continuing in the future the foundation is striving to improve the concept, and thus, understand the conditions for the recruitment situation.

To clarify which explanations and hypotheses will be formulated to test the insights from the presented research, it will be presented in chapter 3.

3. Method

This chapter aims to give the reader a better understanding of the theory behind the chosen method together with a detailed description of the method.

3.1. Research Strategy and Design

Bell et al. (2019) explain that the philosophy of science has a great impact on how research is carried out. The research design and methods should support an individual's ontological and epistemological views to generate good research. In this study, we have adopted an objectivist ontological position, which means that we view social phenomena as having an existence independent of social actors. This objectivist view allows us to approach the study objectively and encounter social phenomena as external facts that cannot be influenced. Our epistemological position was positivist, which means that we believed that knowledge can be gained through directly or indirectly observing and measuring reality. Based on these views, we acted objectively to describe, explain, and examine the research hypotheses.

In terms of research strategy, there are two main approaches: quantitative and qualitative. Quantitative research involves collecting and analyzing numerical data using statistical analysis, while qualitative research focuses on verbal and written information and images. In this study, we have chosen to use the quantitative approach, which involves collecting and analyzing quantified data and allows us to test hypotheses and draw conclusions based on the collected data and the analysis.

3.2. Data collection methods

Insights on how to undertake this topic have been obtained by taking part in previous articles investigating the recruitment situation and a potential gap between employers' expectations and graduates (Rizwan et al., 2018; Rizwan et al., 2021; Magarian and Seering, 2022). We have therefore chosen to use similar data collection methods to investigate the topic with a focus on the Swedish

market. The data collection methods that have been used are; literature study, surveys, and interviews. In addition, hypotheses will be used as support to answer the first research question.

3.2.1. Literature Study

A literature study has been conducted with the help of scientific articles to generate basic knowledge and get a deeper understanding of the studied area which helped us to formulate relevant questions for the surveys and interviews. In order to increase the trustworthiness of the sources, first-hand sources have been used and compared with other literature. The literature review will provide the theoretical foundation for analysis and answering the research questions.

3.2.2. Sample strategy

The research aims at investigating existing barriers and a potential gap between what factors and values are important for young women when choosing their first job compared with what the companies are searching for in future employees. The sample group consisted of soon-to-be or newly graduated female engineers, also called female engineering students in this study. There will be no limitation to age, but they must however study at a Swedish university.

According to Bell et al. (2019), research questions provide guidelines for researchers when choosing sampling strategy. It helps the researchers to understand which people and groups they should focus on and how they should be sampled. Furthermore, the authors explain that purposive sampling can be used in both qualitative and quantitative research (Bell et al., 2019). The aim of purposive sampling is to carefully sample relevant participants to the research topic in order to answer the research question. To collect data we participated in the Womengineer Day event where 80 engineering students in their fourth or fifth year of their education or newly graduated female engineering students and ten companies working to attract more women participated. This event was particularly relevant for our study as it focuses on the sample group we are interested in and provides valuable data to help us answer our research questions.

3.2.3. Survey to female engineering students

In this study, a survey consisting of both closed and open questions has been conducted on the sample group to gain insight into their thoughts and experiences regarding their first job. The closed questions provided a clear and organized method of collecting data, while the open question allowed for a more comprehensive and deeper understanding of the participants' perspectives. Doing this enables a more in-depth understanding of how they feel and interact with their first job.

The survey consisted of two parts: the first part included more general questions about their personal information, such as age, field of studies, and when they will graduate or have graduated. In the second part, the questions were focused on the participants' thoughts and expectations about their first job. These questions and the alternatives in this part are based on the insights from the literature study. Some of the questions are asked to answer the stated hypotheses, and some to analyze if there are barriers between the students and the companies. The students have been asked to rate their confidence on a Likert scale 1 to 5. The Likert scale is used to see the nuances in the students' ratings. Then they have been asked what their first job will be. After this, they have been provided with a list of different important aspects when applying for a first job. These aspects have been chosen out of insights from different studies. The respondents were able to rank from 1 to 7 in order of how important the aspect is. The full questionnaire can be found in Appendix A.

In this study, we first conducted a pilot study before distributing the questionnaires to the sample group. The people chosen to be involved in the pilot study had the same characteristics as the respondents we intended to collect data from as well as persons with good knowledge of the sample group. Their task was to control the understandability and correctness of the questions. With the result of the pilot study, we could identify if there are any ambiguous or problems with the questionnaires and thereby make changes before sending them out to the participants after the event Womengineer Day.

During Womengineer Day the authors of this study participated in a live session with similar questions as used in this study to get the participants interested in the survey. This was done through a Mentimeter presentation and therefore the background questions of the students cannot be ensured. The answers to these questions will not be used in this study since it is not possible to

draw connections between the students' backgrounds and answers. However, a final question asked them to write a word describing a concern they have when applying for a first job will be used to display a summarization of the open-ended answers from the survey.

At the end of the Womengineer Day event, the survey has been combined with the evaluation of the event and sent by email to all the participants. A total of 46 responses were received out of 80 participants. Two reminders have been sent out to increase the answer rate. The data collected from the survey has first been guaranteed that they are correctly answered and can be used for the following analysis. Then they were analyzed and examined by using statistical methods to assess if the hypotheses stated are correct or not.

3.2.4. Interviews with the companies

In this study, there will be fewer companies than students participating and therefore interviews were possible to conduct timewise. When interacting with the companies it was possible to get a deeper understanding of their perspective. Structured interviews and semi-structured interviews have been used in accordance with our quantitative research. The structured interviews tend to be inflexible as the interviews are more standardized, which would be useful in quantitative research as they provide precise and consistent data that can be easily analyzed and compared (Davidson & Patel, 2019). However, the interviews also included more open questions where the respondents could be more flexible when answering the questions (Davidson & Patel, 2019). In that way, it was possible for us to get more developed and detailed answers. The interviews were conducted in written format due to the companies not having time for a meeting. The written interviews were conducted by sending out a document containing a set of questions to the companies, allowing them to answer in their time and then return the document. Then if there were difficulties to understand the companies' responses and thoughts further contact has been done.

The interview was divided into three parts with different focuses. The first part included introductory questions aimed at gaining a deeper understanding of the company, including the proportion between female and male employees and the types of roles that are available. This information helped to establish a more complete picture of the company. The second part focused on the company's expectations of the students, and what factors and values they consider to be

most important. Questions were asked to gain insight into what the company looks for in potential recruitment and what they believe to be the most important factors and values for employees in order to succeed in their organization. This information was crucial in understanding if the company's expectations aligned with those of the students. By comparing the company's with the students' perspective, it was possible for us to determine if there are barriers for the companies resulting in a potential gap. Lastly, the companies were asked about how they are working to recruit more women and at the end, they had the opportunity to add additional information or comments if needed. The full questionnaire can be found in Appendix B.

The interview questions were sent out to all ten participating companies and five of them returned with the questions answered. After receiving all of the answers to the interview questions, a compilation of the responses was conducted which was used for analyzing the research questions. The company's responses were also compared to the students' responses to identify barriers.

3.3. Ethical issues

Principles of research ethics are important to consider when conducting a study to avoid ethical issues (Bell et al., 2019). There are four principles, whether there is; harm to participants, lack of informed consent, invasion of privacy, and deception.

In order to ensure that the four principles were adhered to, the participants in this study were informed beforehand during Womengineer Day of what the research will entail and who will have access to it. The participants were also given the option to remain anonymous in the report to protect them from victimization by the organization, and the option to refrain from answering sensitive questions.

3.4. Hypotheses

A hypothesis is a speculation about the possible relationship among different variables (Denscombe, 2014). It states the prediction of the results of the research and is used to help to answer research questions. According to Denscombe (2014), the hypothesis has to be based on existing knowledge and theories. It is important that they are clearly formulated and can be tested,

meaning that the results have to be supported by scientific research methods, for example, quantified data collection, statistical analysis, and experiments.

In this study two hypotheses have been formulated based on the conducted literature study, see table 1. These hypotheses were developed based on previous research findings in the field and were meant to identify barriers of recruiting women engineers and investigate the potential gap in expectations and perceptions between young female engineering students and the companies that are recruiting them. The hypotheses were formulated with the intention of providing a basis for the analysis and discussion of the collected data.

Hypothesis 1 is based on the stereotypical views women held found by Powell et al. (2012) in their study. They saw that women tended to base their future choice of career on their ability in math and science subjects. In engineering technology is one of the most important subjects. Hence, the hypothesis is to see if female engineering students with strong confidence in mathematics and technology are more likely to choose a more technical job.

The second hypothesis is based on the options Itani and Srour (2016) gave their respondents to choose between for their first job. Different job positions open for engineers after graduation. An obvious hypothesis would be for students with a background in a more technical program would choose a technical job position. However, the result of the study by Zaharee et al. (2018) was that younger workers have a higher desire for quicker rotations at the workplace. This could be reflected by the option “Job rotation program”. Hypothesis 2 is based on the obvious starting point but opens for a shift regarding the job program alternative.

Table 1. Presenting the hypotheses and variables that will be examined.

Variables	Hypotheses
• Level of confidence • Choice of first job	Those with strong confidence in mathematics and technology subjects are more likely to apply to more technical positions
• Educational background • Choice of first job	There is a higher interest in a purely technical job or with the title engineering involving both technical and administrative tasks by students from a technical program.

4. Results

The data collection for this study will be presented in this chapter, both the survey sent out to students and the written interviews with companies. In total 46 students out of 80 participants in Womengineer Day answered the survey. This is a good representation of the participants but the target group can be seen as too small to draw wide conclusions representing all female engineering students in Sweden. Half of the companies participating in Womengineer Day answered the written interview sent out to them. Hence, a good representation of the participating companies but not a widespread picture of all engineering companies in Sweden. The final part of the result chapter includes a comparison of the students' and companies' answers to prepare the reader for the discussion chapter.

4.1. Survey to female engineering students

In total 46 answered the online survey, where the majority were still students, in the age between 25-34, and field of studies - Industrial Engineering and Management, see fig. 2. There were no participants answering with the study programs Data science, Electrical engineering, and Medical technology. Not all age groups were represented either but that was predicted since the target group is newly examined students. In some of the categories, there was also a low amount of responses resulting in the answers depending a lot on the individual person. These three aspects will be taken into account when conducting the analysis. Additionally, it is also vital to note that the sample size of 46 respondents is relatively small and therefore the conclusions drawn from these results should therefore be considered.

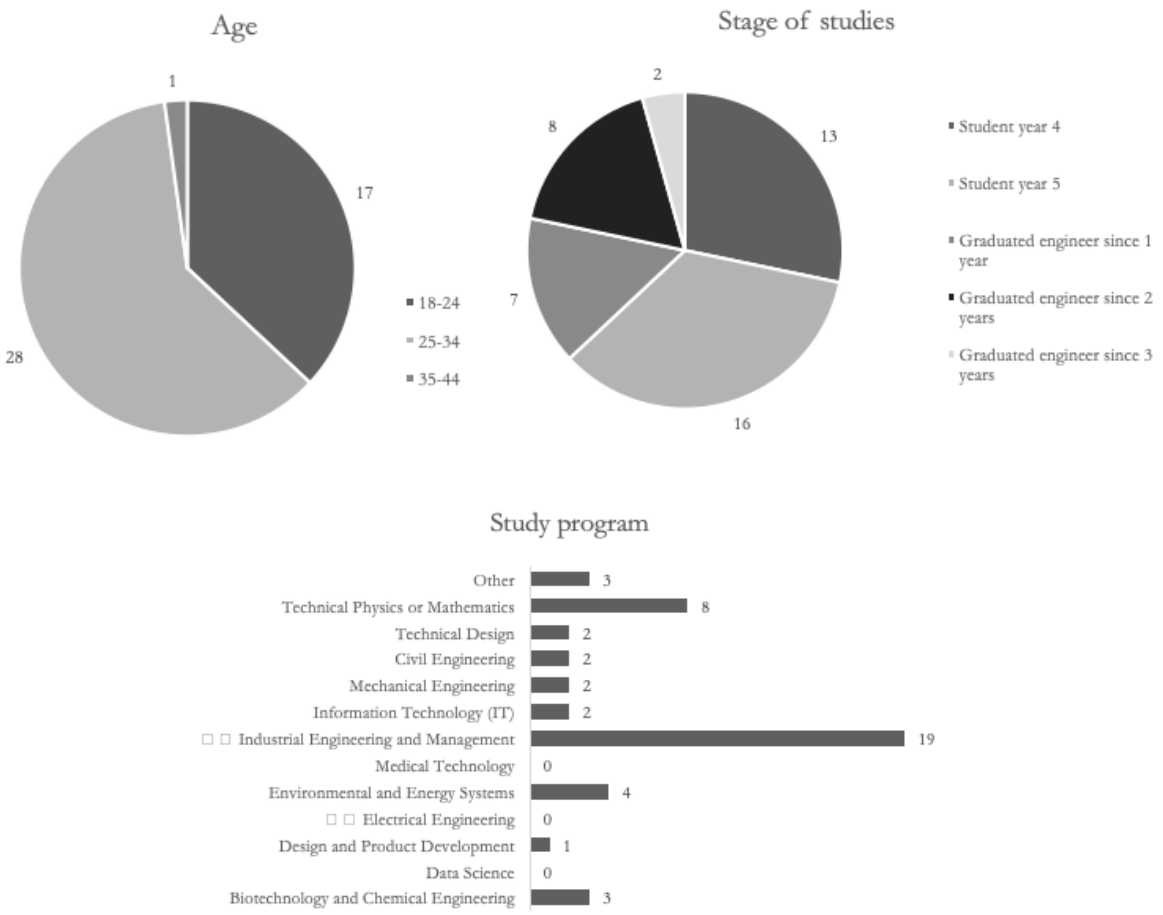

Fig. 2. In the three above diagrams the distribution of respondents' backgrounds is displayed in terms of age, stage of studies, and study program.

4.1.1. Confidence in mathematics and technology

All participants answered the questions about their perceived confidence in mathematics and technology. When comparing the answers without sorting them by attributes it is seen that the perceived confidence is higher in mathematics than in technology, see fig. 3. With an average scoring of 3,70 in mathematics and 3,37 in technology, see table 2.

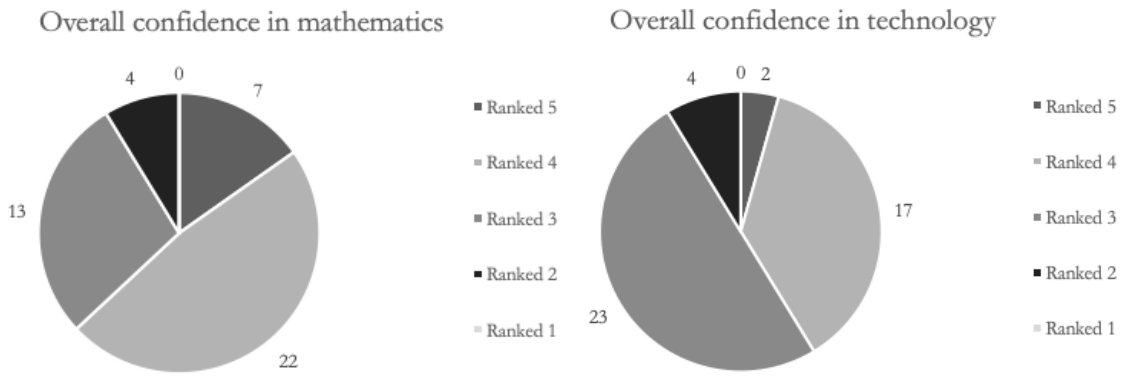

Fig. 3. Showing the distribution of the scoring the survey participants did of their confidence in mathematics and technology. Five is the highest.

Students in year 5 scored higher confidence in mathematics than students in year 4, see table 2. On the other hand for technology the students in year 5 scored lower than in year 4. When sorting the response by age groups it can be seen that the youngest participants are most confident in mathematics but become more confident in technology when getting older. Finally, when sorting the responses by study program all have an average between 3-4.

Table 2. The average value of responses on the questions regarding self-perceived confidence in mathematics and technology. The responses have also been divided by sorting them by different factors of the categories.

Sorting factor (responses) / **Average confidence in**	**Mathematics***	**Technology***
All responses **(46)**	3,70	3,37
Student year 4 **(13)**	3,69	3,54
Student year 5 **(16)**	3,94	3,19
Graduated since 1 year **(7)**	3,29	3,29
Graduated since 2 years **(8)**	3,38	3,25
Graduated since 3 years **(2)**	**4,50**	**4,50**
Age 18-24 **(17)**	**4,12**	3,35
Age 25-34 **(28)**	3,43	3,36
Age 35-44 **(1)**	4,00	**4,00**
Biotechnology and Chemical Engineering **(3)**	**4,00**	3,67
Design and Product Development **(1)**	**4,00**	3,00
Environmental and Energy Systems **(4)**	**4,00**	**3,75**

Industrial Engineering and Management **(19)**	3,68	3,21
Information Technology **(2)**	3,50	3,50
Mechanical Engineering **(2)**	**4,00**	3,50
Civil Engineering **(2)**	3,00	3,50
Technical Design **(2)**	3,50	3,50
Technical Physics or Mathematics **(8)**	3,75	3,38
Other **(3)**	3,33	3,33

* The highest value in each category is marked in bold.

4.1.2. Potential future job position

In order to understand the perspective the respondents have on future work life they were asked about their potential first job position. They could choose from six categories or answer not sure. All respondents answered this question and the responses were also sorted by study program to see if there are any conclusions to be drawn. The most popular job position was "General or Nontechnical consultant (incl. Management consultant)", see table 3. This could be an effect of a majority of the responses coming from Industrial Engineering and management students. The second most answered job position is "A job rotation program (e.g. Trainee or graduate program)".

Table 3. A representation of the responses regarding future job positions, both in total and sorted by program. For each row the job position with highest number is marked in bold.

Study program (total responses) / **Job position**	**Engineer (ONLY technical tasks)**	**Engineer (BOTH technical and administrative tasks)**	**Technical consultant**	**General or Nontechnical consultant (incl. Management consultant)**	**Position involving management or supervisory training**	**A job rotation program (e.g. Trainee or graduate program)**	**Not sure**
All responses **(46)**	6	7	5	**12**	2	10	4
Biotechnology and Chemical Engineering **(3)**	1	1	1				
Design and			**1**				

Product Development **(1)**							
Environmental and Energy Systems **(4)**	1					**3**	
Industrial Engineering and Management **(19)**	1	3		**12**	1	2	
Information Technology **(2)**	1						1
Mechanical Engineering **(2)**			1		1		
Civil Engineering **(2)**		1	1				
Technical Design **(2)**						1	1
Technical Physics or Mathematics **(8)**	1	2				**3**	2
Other **(3)**	1		1			1	

4.1.3. Ranking of aspects when choosing the first job

In the literature study different aspects are mentioned to be vital and/or important for students when deciding on a job. These were gathered in a question where all students had to rank them from 1-7 depending on the importance of the aspect. When compiled it can be seen that the work environment is both most commonly ranked as number 1 and number 7, see table 4. This shows how the opinions differ regarding the importance of the work environment and colleagues. For the second most important aspect, ranked as 2, three aspects scored the same number. The only aspect not scoring highest for any ranking is “Possibility to flexible work hours and remote work”.

Table 4. A representation of the responses from the question where the respondents were asked to rank the aspects in order of importance when applying for a job. For each rating the highest-scored aspect is marked in bold.

Times ranked as number / Aspects to choose between	Possibility of a steep development curve	Possibility to rotate between different positions	Continuous feedback from supervisors and managers	Level of required technical competence	Salary and other benefits	Work environment and colleagues	Possibility to flexible work hours and remote work
Ranked 1	3	4	5	8	3	**18**	5
Ranked 2	7	**9**	1	**9**	**9**	4	7
Ranked 3	3	6	**12**	3	7	4	11
Ranked 4	**9**	4	**9**	8	**9**	2	5
Ranked 5	6	7	9	7	**10**	2	5
Ranked 6	**11**	8	6	4	4	7	6
Ranked 7	7	8	4	7	4	**9**	7

4.1.4. Concerns related to applying for a first job after graduation

The final question of the survey was to let the female engineering students express their concerns and thoughts about applying to their first job post-graduation. A similar question was also a part of the live session during Womengineer Day, see fig 4. The words described in the live session question is summarizing the longer comments from the survey.

Fig. 4. At the live session of Womengineer Day the participants were asked to freely write a word answering the question in the picture. The bigger the word is the more students wrote it.

In the survey question, most of the students raised concerns about doubt in themselves in different ways. For example, not having enough previous knowledge, to get shortlisted prior to signing for a job, but also concerns about not being able to perform well enough at their future workplace.

> *It feels like there are an incredible number of opportunities but they are difficult to find. It feels difficult to be noticed among all the other applicants.*
> - Student year 4.

Other students raised concerns about having too little information about the roles they were interested in and for it to result in not matching their expectations. The information they wish would be receivable in order to make the decision of signing or not. The following comment is an example of expectations of the work environment.

> *Finding a work place where one will thrive, especially in terms of colleagues as there can occur racism, sexism and favorism in work places. Favorism can lead to obstacles in one's development.*
> - Graduated since one year.

4.2. Interviews with Womengineer Day companies

Interviews were made with five of the ten participating companies in Womengineer Day and the companies are spread among different industries, from 25 up to 17 000 employees. The diversity in companies will therefore give a wider perspective on the engineering industry. To maintain their anonymity details are shared to a limited extent. The five companies (A, B, C, D, E) recruit from all study programs the students got asked about, see table 5.

Table 5. Visual of the companies representation in different study backgrounds.

Study program / Company	**A**	**B**	**C**	**D**	**E**
Biotechnology and Chemical Engineering			X	X	
Data Science	X	X	X		
Design and Product Development	X	X	X	X	
Electrical Engineering	X	X	X		
Environmental and Energy Systems	X		X	X	

Medical Technology			X		
Industrial Engineering and Management	X		X	X	
Information Technology	X	X	X		X
Mechanical Engineering	X	X	X	X	
Civil Engineering			X	X	
Technical Design	X		X		
Technical Physics or Mathematics	X			X	
Other			X	X	

None of the companies have a general 50/50 representation of women at the company, see the dark grey bars in figure 5. When specifically looking at the engineering employees at the companies two of the companies had numbers available of the number of female engineers. In both of the cases it was lower than the general distribution, see the light grey bars in figure 5. The other companies left comments regarding which departments with a lower amount of women. These were for example construction and engineering, road design, and further ones related to engineering. One company mentioned sales as a department with a low proportion of women.

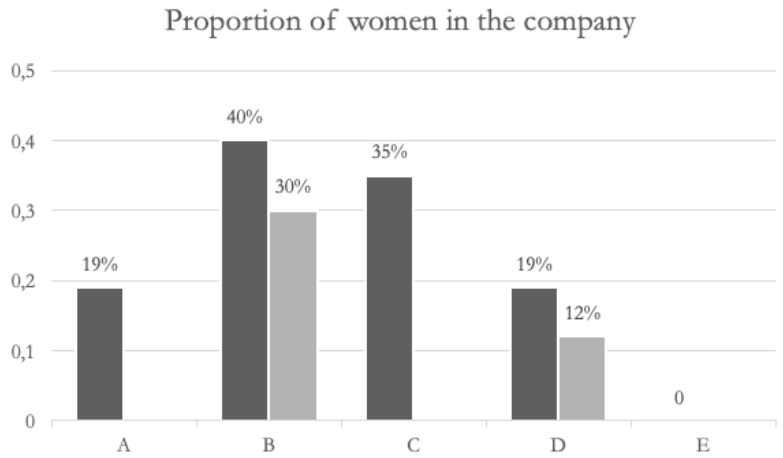

Fig. 5. Shows the distribution of women in the participating companies. The dark grey bar is representing the company in total and the light gray bar is the engineering employees in the company. Company E did not have this data available.

To match the students' responses regarding future job positions and important aspects when applying for a job the companies were asked which job positions they offer to newly graduated engineering students. Together the companies offer all roles but as seen in table 6. It is only one company offering a managerial role with personnel responsibility. One of the companies

commented that their managerial roles require more knowledge than newly graduated students have and therefore does not offer them to the students.

Table 6. The companies were asked which job positions they offer to newly graduated engineering students. The result can be found in this table.

Job position / Company	A	B	C	D	E
Engineer with responsibility for ONLY technical tasks	X	X	X	X	X
Engineer with responsibility for BOTH technical and administrative tasks	X	X	X	X	X
Technical consultant	X	X	X		
General or nontechnical consultant (incl. management consultant)	X	X	X	X	
Managerial role with personnel responsibility		X			
Trainee/graduate program	X	X	X		

4.2.1. Perceived confidence in relation to study result

The companies were asked about how they view knowledge/study results versus perceived self-confidence in mathematics and technology among female engineering students. The companies' answers differed in this matter where some argued how study results are the fairest way to compare candidates applying for a job as it is the most objective one. One of the companies said, "*..., I experienced a fairly clear connection between study results and self-confidence*". Another one mentions how they focus on the skillset when looking for the right candidate. Together this collects a majority of companies viewing knowledge or study results as a better indicator to find the right candidate. However, one of the companies sees high study results as a foundation but are more interested in a candidate's full range of aspects.

To compare the companies with the students they were also asked the question "How do you think female engineering students perceive their self-confidence?". Overall they considered this a hard question due to the individuality of self-confidence and that there is a distribution from high to low. One of the companies thinks women are more likely to underestimate their ability which could result in lower self-confidence. An aspect mentioned by another company is how they think confidence increases over time. While a third company thinks that women tend to award high study results instead of self-confidence.

4.2.2. Importance of aspects when applying for first job

The students were asked to rank aspects that are considered when applying for a job, in table 7 it can be seen that all of the aspects are offered by the represented companies. Although not all companies offer them all. The companies were also asked to rank the aspects in the order they think female students would rank them in terms of importance. Only four of the companies participated in this rating, see the result in table 8. It is clear that they think "Work environment and colleagues" is the most important one. "Possibility to rotate between different positions" only got bottom ratings and could therefore be seen as the suggested least important aspect.

Table 7. The companies offer a different set of aspects to the students applying to job, it is display in this table.

Aspects to consider / Company	A	B	C	D	E
Possibility of a steep development curve	X	X	X	X	X
Rotations between different positions	X	X	X		
Continuous feedback from managers	X	X		X	X
Level of technical competence required	X	X		X	
Salary and other benefits	X	X		X	X
Working environment and good colleagues	X	X	X	X	X
Possibility of remote work and flexible working hours	X	X	X	X	X

Table 8. Four of the companies were able to rank the aspects in the order they think a female engineering student would choose. The most chosen aspect on each rating is marked in bold.

Times ranked as number / Aspects to choose between	Possibility of a steep development curve	Possibility to rotate between different positions	Continuous feedback from supervisors and managers	Level of required technical competence	Salary and other benefits	Work environment and colleagues	Possibility to flexible work hours and remote work
Ranked 1	1	0	0	0	0	**3**	0
Ranked 2	1	0	1	0	0	1	1
Ranked 3	0	0	1	1	**2**	0	0
Ranked 4	1	0	1	0	0	0	**2**
Ranked 5	0	1	0	**3**	0	0	0
Ranked 6	0	1	1	0	**2**	0	0

Ranked 7	1	**2**	0	0	0	0	1

4.3. Comparison between companies and students

As part of the aim is to uncover barriers between female engineering students and recruiting companies their answers will be compared in this section. These barriers could ultimately conclude if there is a potential gap. The two sides of participants in this study got asked similar questions to enable comparison and further analysis.

The most common study program among the respondents was Industrial engineering and management, as seen in fig. 2. Only companies A, C, and D offer jobs to students from this program, see table 5. When in general comparing the students' answers to the companies it might mislead to an extent due to this reason. However, all of the study programs are represented by at least one of the companies meaning it is possible to compare the answers.

Another factor needed to fit to be able to compare the answers is the desired job positions by the students and the companies offered job positions. The participating companies offer all job positions although it is only the two engineering positions all companies offer, see table 6. The most common choices of desired job positions are general or nontechnical consultant as seen in table 3. This position is offered by four companies (A, B, C, and D). However, the second most desired job position is trainee/graduate program which is only offered by three of the companies (A, B, and C).

Overall the companies match the students' backgrounds and future desires which enables the following comparison in self-confidence and ranking aspects when applying for a job.

4.3.1. Students' self-perceived confidence compared to the companies' preconceptions

A majority of the companies valued study results and knowledge higher than the perceived confidence. One of the companies mentioned how an underestimation of an individual's knowledge could lead to low self-confidence. In the final survey question to the students, they were asked to describe their thoughts or concerns about applying for a first job. A total of 15 students

did in some way describe it in a way that can be summarized as doubt in themselves. This doubt is both in terms of not knowing what they want when applying for a job but also in their knowledge and experiences. To give the reader insight into the answers a few examples are shared:

> *That I am unsure of what role/job I want. And also of course, impostor syndrome*, that I am not good enough.*
>
> - A graduated engineer since one year, ranked her confidence 3 in mathematics, and 3 in technology.
>
> *(Impostor syndrome means "the feeling that your achievements are not real or that you do not deserve praise or success" [Cambridge Dictionary, n.d.]).

> *That I shouldn't be competent or smart enough for the profession I want to apply for*
>
> - Student year 4, ranked her confidence 4 in mathematics, and 3 in technology.

> *It feels a bit scary, mainly because it feels like I will have to have a lot of knowledge prior to starting the job to be able to do it well (even though I've heard this usually isn't the case)*
>
> - Student year 4, ranked her confidence 3 in mathematics, and 3 in technology.

The fact that 32 percent of the students raised concerns about doubts when applying for jobs set the rankings of confidence in perspective. Most of them ranked it 3-4 in both mathematics and technology. As two of the companies said the judgment of confidence is individual and will therefore have a distribution from low to high. Although none of the students ranked their confidence as 1 in either mathematics or technology.

4.3.2. Did the students and companies rank the same aspects as important when searching for the first job?

To compare the students' answers with the companies' answers a list from 1-7 by the compounded answers has been put together. The answers can be compared since the companies were asked to rank the aspects based on how they thought female engineering students would rank them. The composition is done by taking tables 4 and 8 to create a new table 9, see below. Some of the aspects are repeated in several rankings, the reason for this is that it was the most chosen aspect in multiple rankings by the respondents.

The only aspect with the same ranking by both students and companies is “Work environment and colleagues”, ranked as number one. This is already an aspect worth looking at since it is ranked number seven by the students. While the companies only ranked it as number one or two, see table 9. Otherwise, all other aspects are ranked at different levels of importance by the students and companies.

Table 9. Composition of the students' and companies' rankings of job aspects in order of importance when applying for a first job. It is the student’s own perception and the company's preconceived image of how they think the students have responded.

Ranking / Ranked by	**Students**			**Companies**			
Ranked 1	Work environment and colleagues			Work environment and colleagues			
Ranked 2	Possibility to rotate between different positions	Level of required technical competence	Salary and other benefits	Possibility of a steep developme nt curve	Continuo us feedback from superviso rs and managers	Work environ ment and colleagu es	Possibility to flexible work hours and remote work
Ranked 3	Continuous feedback from supervisors and managers			Salary and other benefits			
Ranked 4	Possibility of a steep development curve	Continuous feedback from supervisors and managers	Salary and other benefits	Possibility to flexible work hours and remote work			
Ranked 5	Salary and other benefits			Level of required technical competence			
Ranked 6	Possibility of a steep development curve			Salary and other benefits			
Ranked 7	Work environment and colleagues			Possibility to rotate between different positions			

5. Discussion

To set the above result in context the following discussion will analyze it based on the insights in the literature study. First, the stated hypotheses will be declared as true or false. Secondly, an analysis will be done based on the results from the comparison between the responses from the students and companies. This analysis is meant to identify barriers to the recruiting of female engineering students.

5.1. Level of confidence affecting students' choice of a first job

There are many reasons that contribute to the gender imbalance within engineering. One of the factors is based on the self-confidence people have where women tend to prioritize their abilities in mathematics and science when deciding about their future careers (Powell et al., 2012). Meaning that if they have a high level of confidence within these two fields the probability to apply to a technical job position will be higher. In order to determine if there is a correlation between a student's level of confidence in mathematics and technology and their choice of a first job, they were asked to rank themselves in how they perceive their self-confidence within these fields and also what their potential future job position is. The results from the data collection will help us to determine if the stated hypotheses in section 3.4. are correct or not.

A merge of the data collection from figure 3 and table 3 has been conducted to see if the two variables have a relation, see table 10. It shows that eleven of the participants that rated their confidence as 4 in mathematics have applied or will apply in the future to more technical positions, which include; Engineer with responsibility for ONLY technical tasks, Engineer with responsibility for BOTH technical and administrative tasks, and Technical consultant. Whereas seven of the participants answer that they would prefer a job that is not as technically oriented, which are; General or nontechnical consultant (incl. management consultant), Managerial role with personnel responsibility, or trainee/graduate program. People with the highest confidence in mathematics (scored as 5) have only chosen non-technical job positions. The result is showing that the part regarding confidence in mathematics in hypothesis 1 is not true as a larger proportion of respondents answering this question would rather apply for a non-technical job position. However,

this can be based on the fact that most of the respondents are studying Industrial Engineering and Management which is a broad education that includes a combination of both technical and non-technical subjects. Another factor that should be considered when analyzing the results is that the trainee/graduate program was not defined and explained to which industry the program is located.

In addition, we found that young women with high confidence in technology will apply for jobs that are more technical-oriented, see table 10. The data collection shows that nine respondents with confidence level 4 will prefer technical positions and seven will prefer non-technical. This implies that the confidence of science for hypothesis 1 is correct.

Table 10. A merge of the results from fig. 3 and table 3 to see if the level of rated confidence affects the choice of first job position.

Job position / Confidence area	**Mathematics**					**Technology**				
Rated confidence	**5**	**4**	**3**	**2**	**1**	**5**	**4**	**3**	**2**	**1**
Engineer with responsibility for ONLY technical tasks	0	2	4	0	0	0	3	3	0	0
Engineer with responsibility for BOTH technical and administrative tasks	0	**6**	1	0	0	0	**5**	1	1	0
Technical consultant	0	3	1	1	0	0	1	4	0	0
General or nontechnical consultant (incl. management consultant)	3	2	4	3	0	0	4	5	3	0
Managerial role with personnel responsibility	0	2	0	0	0	0	0	2	0	0
Trainee/graduate program	**4**	3	3	0	0	**2**	1	**7**	0	0
Not sure	0	4	0	0	0	0	3	1	0	0

5.2. Relation students' educational background and choice of first job

To determine if hypothesis 2 can be supported or not the female engineering students' answer about their first job position is used. Based on the data collection presented in table 3, it shows that 12 out of 46 participants tended to prefer general or non-technical consultant (including

management consultant) job positions, while only seven chose engineers with both technical and administrative tasks. The respondents that chose general or non-technical consultants were all studying the program Industrial Engineering and Management, which could have an influence on the results as students studying this program may have been exposed to a wider range of career options and may have developed an interest in both technical and non-technical roles. Further on, students studying Biotechnology and Chemical Engineering, which can be considered a technical education, tend to prefer technical job positions. From this aspect, it shows that students tend to choose their first job based on their educational background and aspirations, which supports hypothesis 2.

However, for the other programs, the results are not supporting the hypothesis which could be due to the younger generation preferring workplaces with a higher job rotation instead of job positions that are related to the educational background (Zaharee et al., 2018). This can also explain why the trainee/graduate program, which typically involves rotating through different roles or departments within a company, was the second most popular choice among the survey participants chosen by 10 out of 46 in the survey. This insight aligns with current research and trends of the engineering career of the younger generation where they see their first job as the first step to other opportunities and are open to transitions and exploring different career opportunities (Itani & Srour, 2016). Understanding the trends and what students are interested in can assist companies in addressing the barriers of recruiting young female engineering students by better adapting their recruitment strategies to better match the expectations and desires of the students.

5.3. Do barriers and a gap exist between students and companies in the recruitment situation?

The reason why it is important to find out if there is a gap in the Swedish market between students and companies is because a potential gap affects students by increasing their stress when applying for jobs without fully knowing if their expectations will be fulfilled (Rizwan et al., 2018). In the student survey, they shared how doubts about themselves as well as worries about not matching expectations. The following answer summarizes the concerns about expectations:

> *General thought I would say are concerning the navigation between different companies and positions to find the one that excite and hopefully fits me best. Concerns are (not very surprisingly) not performing well enough in the recruitment process, since I find the acquired level of case-training to be quite stressful beforehand.*
>
> - Student year 4.

Barriers and a potential gap is, in this study, examined mainly through two factors self-confidence and deciding aspects when looking for a first job. The industries where the participating companies operate match all the students' backgrounds in terms of study programs. Although, not all of them recruit Industrial engineering and management students, this will affect the possibility to draw a conclusion about a potential gap.

Firstly, by looking at the self-confidence aspect that Powell et al. (2012) declare is a decisive factor for which future job position a student chooses and hence, a factor with a shared perception of by students and companies. An united specific answer was not given by the companies, they guarded themselves by giving comprehensive answers that there is a distribution of confidence levels among female engineering students. This could although be a good answer because the students ranked their confidence from 2-5, see fig. 2. Concluding that a potential gap in terms of self-confidence cannot be found.

On the other hand, there might still exist a barrier between the companies and students in terms of self-confidence. This study is only directed at female engineering students and the result for the self-confidence question might have looked different if both women and men were participating. The reason why it could have turned out differently can be explained by the study by Patrick et al. (2012), where men were more confident in applying for technical jobs while women more confidently choose jobs with soft skills. In this study the female students raised concerns about doubt in themselves, some mentioning the phenomenon of Imposter syndrome. Doubts that might not have been found among male students. However, the students raising doubts still ranked their confidence as 3 or higher, which is on the top part of the Likert scale. The duality of the student's self-confidence, raising doubts but still ranking it high, creates a barrier for the companies to take into consideration regarding confidence although there is no gap. Due to the duality, it is positive that companies let study results and knowledge be the focus when recruiting instead of

self-confidence. However, they must have this duality in mind when communicating with the students so they will not choose to not apply for the job.

Further on, when turning to the importance of aspects when applying for a first job there is a difference between the students' and the companies' answers. Only one of the aspects was ranked at a similar spot "Work environment and colleagues", see table 9. But as nine students ranked it as the least important aspect, compared to the 18 that ranked it as number one, it is difficult to conclude if the companies have a realistic view of the ranking only by looking at this. However, in the survey by Academic Work (2022) of Swedish young professionals half of the respondents ranked it as a top ten aspect and a fifth of the respondents ranked it as number one. When including this survey it is more distinct that the companies' view is realistic.

However, none of the other aspects were ranked at similar spots by the students and companies. A mentionable one is "Possibility to rotate between different positions", ranked as the second most important one by the students and the least important one by the companies. This could be a result of having ten students desiring a job rotation program as their first job, but none of the students that ranked this aspect as second chose the job rotation program alternative. The aspect of quick rotations at the workplace was a finding from the study by Zaharee et al. (2018) where they compared the generations. It was the youngest generation striving for quick rotations and therefore this dissonance could be a result of the companies not understanding the difference between the generations.

With the findings of this study, it can be determined that both a gap and multiple barriers exists between female engineering students and companies in how they perceive different factors of a recruitment situation. The gap is not wide open since the companies understand how students perceive their self-confidence in mathematics and technology. But the factor regarding aspects students see as important when applying for a first job creates it. The companies do not have a delusional view of the situation but they have to rethink the importance of some of the job aspects to understand their target group better.

6. Conclusions

Despite efforts by engineering companies to promote and recruit more women, achieving gender equality in the workplace still remains a challenge. In previous research multiple factors have been raised as potential barriers to recruit female engineering students (Magarian and Seering, 2022, Powell et al., 2012), and Rizwan et al. (2018, 2021) concludes that there is a gap between the companies and students. In this study barriers were found that prevent companies from successfully recruiting female engineering students which creates a gap between them.

The results revealed that students with higher confidence in technology are more likely to apply for jobs that are more technical-oriented. Furthermore, the study shows that the students' educational backgrounds, as suspected, have a significant impact on the choice of their first job. In addition is that the younger generation tends to prefer jobs with rotation, for example, trainee/graduate programs. Therefore, companies can use this information to adapt the recruitment and focus on specific groups of women who are more likely to be interested in their positions, to achieve gender equality in the workplace. Further development of the Womengineer Day concept could therefore be to have themes for them, to better align the students' and companies' interests.

Further on, the study reveals a good understanding by the companies when describing the distribution of how female engineering students perceive their self-confidence in mathematics and technology. There is no gap regarding self-confidence but there is still a barrier for the companies as they have to be aware of the duality in female engineering students' confidence, having doubts but still ranking it high and to use thoughtful communication in this aspect.

However, a gap could be identified between the students and companies in terms of students ranking aspects by importance when applying for a first job. The gap concerns how the aspects students consider important when applying for their first job do not conform to what the companies expected. Attending events such as Womengineer Day, and understanding students' priorities and values when they apply for a first job can therefore help companies to reform and adapt their recruitment to better attract women with the right qualifications and preferences for their open positions.

7. Recommendations for further research

In this study, barriers to recruiting female engineers have been investigated. The results have shown an impact on the recruitment process by students' self-confidence in math and science, educational background, and employers' understanding of what students value when applying for a job. The research was based on a survey of students and interviews with a relatively small number of companies. Therefore, these findings and conclusions cannot be seen as comprehensive enough to bring insights of the entire engineering industry. However, this research can be seen as an initial analysis. We, therefore, recommend further research, using a larger sample group, to gain a deeper understanding of the barriers to hiring female engineers. Future research could also aim to understand the underlying causes of the barriers and gap between female engineering students and companies in their perceptions of the recruitment process, and investigate potential solutions for closing the gap.

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Appendix A:

Questionnaire for the survey to the female students:

1. I am a...
    a. Student year 4
    b. Student year 5
    c. Graduated engineer since 1 year
    d. Graduated engineer since 2 years
    e. Graduated engineer since 3 years
2. How old are you?
    a. -18
    b. 18-24
    c. 25-34
    d. 35-44
    e. 45-
3. Which engineering program do you study? (Choose the best fit)
    a. Biotechnology and Chemical Engineering
    b. Data Science
    c. Design and Product Development
    d. Electrical Engineering
    e. Environmental and Energy Systems
    f. Medical Technology
    g. Industrial Engineering and Management
    h. Information Technology (IT)
    i. Mechanical Engineering
    j. Civil Engineering
    k. Technical Design
    l. Technical Physics or Mathematics
    m. Other
4. How confident would you describe yourself in mathematics?
    a. Rate 1-5.
5. How confident would you describe yourself in technology?
    a. Rate 1-5.
6. What do you think your first job will be? or what was it? (Choose one)
    a. Engineer (ONLY technical tasks)
    b. Engineer (BOTH technical and administrative tasks)
    c. Technical consultant
    d. General or Nontechnical consultant (incl. Management consultant)
    e. Position involving management or supervisory training
    f. A job rotation program (e.g. Trainee or graduate program)
    g. Not sure

7. Comment why you choose the previous answer?
    a. Free text answer.
8. Which are the most important aspects when choosing a first job?
   Rank them in the order of how important the factor is where 1 is most important, one at each ranking.
    a. Possibility of a steep development curve
    b. Possibility to rotate between different positions
    c. Continuous feedback from supervisors and managers
    d. Level of required technical competence
    e. Salary and other benefits
    f. Work environment and colleagues
    g. Possibility to flexible work hours and remote work
9. What are your general thoughts or concerns of applying for a first job?
    a. Free text answer.

Appendix B:

Questionnaire for the interviews with the companies:

Initial questions:

1. What industry do you operate in? Which engineering programs match your company best?
2. What does the gender distribution look like at your company? Both in terms of the entire company and just the engineering staff.
3. Are there certain departments that are more male dominated? (Consider if there is a difference between study background, etc.)
4. Which of the following roles can an engineer apply for with you?
    a. Engineer with responsibility for technical tasks only
    b. Engineer with responsibility for both technical and administrative tasks
    c. Technical consultant
    d. General or non-technical consultant (incl. management consultant)
    e. Managerial role with personnel responsibility
    f. Trainee/graduate program

Thematic questions:

1. How do you view knowledge versus self-confidence in mathematics and technology among female students?
2. How do you think the female students perceive their self-confidence in mathematics and technology?
3. Which of the following qualities do you have in the roles you offer newly graduated engineering students?
4. What factors do you as a company think the female students find important when looking for their first job? Rank 1-9.
    a. Possibility of a steep development curve
    b. Rotations between different positions
    c. Continuous feedback from managers
    d. Level of technical competence required
    e. Salary and other benefits
    f. Working environment and good colleagues
    g. Possibility of remote work and flexible working hours

Final question:

1. How do you actively work to recruit more female engineers straight from their studies?
2. Other thoughts and comments?