



Factors Influencing Women's Career Choice in STEM: A Case Study of Batam State Polytechnic Alumni

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ABSTRACT

This study aims to determine the factors influencing women's career choices and the most dominant factor among female alumni from the Department of Mechanical and Electrical Engineering at Batam State Polytechnic, particularly in the field of STEM (Science, Technology, Engineering, and Mathematics) engineering. This study uses a quantitative approach with the factor analysis method and a sample of 100 respondent alumni selected via the saturated sampling technique. The results showed that the most dominant factor in women's career choices in STEM engineering is the personality factor. This study confirms that, although personality emerged as the dominant factor, the financial reward factor and family environment factor also influence women's career decisions. In this study, 11 variables were reduced to three key factors driving women's career choices in engineering: personality, financial rewards, and family environment. The practical implication of this study is the need for mentorship programs, increased information about the prospects of financial rewards, and more intensive family support to encourage more women to pursue careers in engineering. This research makes a theoretical contribution to understanding women's career motivations in STEM fields and can serve as a basis for promotion to prospective students.

Keywords:

Women Career;

STEM;

Factor analysis method

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INTRODUCTION

Nowadays, people face a situation in which career planning is a major aspect essential for fulfilling life's primary, secondary, and tertiary needs. To meet these needs, individuals must make wise career choices. For adults, work is not merely a daily activity; it is a vital domain that consumes most of life's time and demands dedication of thoughts and emotions. In today's era of globalization, competition for career success is fierce, so achieving life goals through a career requires significant commitment of time and effort.

However, traditional roles long associated with gender differences in societal history significantly impact women's career choices (Acker, 2020; Sian et al., 2021). Inherent stereotypes—especially the perception that STEM Engineering fields are more suitable for men—can create discomfort and psychological hurdles for women aspiring to enter these domains (Cech & Waidzun, 2020; Cheryan et al., 2017). These views not only erect psychological barriers but also hinder women's interest and confidence in pursuing studies and careers in STEM Engineering (Else-Quest et al., 2021; Moss-Racusin et al., 2018). Addressing these gender-based stereotypes requires systematic interventions at multiple levels: from educational curricula that challenge gendered assumptions about technical capabilities (Bian et al., 2020; Carlone & Johnson, 2020), to workplace policies that actively promote gender equity,

to broader cultural shifts that recognize women's contributions to STEM fields (Binns, 2021; Roberts et al., 2021).

International evidence suggests that countries with stronger gender equality policies demonstrate higher rates of women's participation and retention in STEM careers (Baird, 2018), indicating that structural changes, rather than individual adjustments alone, are necessary for meaningful progress. Efforts to transform perspectives and raise awareness about the importance of gender inclusion in professional spheres are essential for creating environments that support advancement and equality for all individuals.

In the world of work, success depends on high-quality human resources. The learning process is the main key to producing such resources, as a person is considered to have learned if they demonstrate changes in behavior. Currently, learning occurs through various channels, including higher education. Individuals can learn anywhere and anytime whether in their surrounding environment or in formal institutions such as polytechnics.

In this research, the study focuses solely on engineering alumni. The data reveal a significant disparity between the number of male and female alumni, with fewer female graduates than male graduates. This disparity necessitates further investigation into the career sustainability of female graduates in STEM fields.

On the private sector side, measures include offering flexible working hours, building networks between male champions and women's study groups, providing digital access, and organizing business training to support women entrepreneurs. Thus, the government and private sector can collaborate to create an enabling environment for gender equality in the workforce.

Motivation to pursue a career in STEM (Science, Technology, Engineering, and Mathematics) is influenced by factors divided into three main aspects: personality factors, financial reward factors, and family factors. Personality factors strongly drive individuals drawn to STEM fields. Characteristics such as high curiosity, analytical ability, and creativity are often linked to interest in exploring scientific and technical concepts. Individuals with these traits tend to pursue careers demanding deep understanding and application of scientific principles.

According to ThuGiang (2022), personal interest exerts the strongest influence on career choice, followed by financial benefits. This study examines the factors influencing women's career choices, including indicators such as extraversion, agreeableness, conscientiousness, emotional stability, and openness to experience (SOCIAL, 2014); salary, bonuses, allowances, and pension funds (Arismutia, 2017); and family support and economic conditions (Friedman, 2014).

Previous research on women's STEM career choices has primarily focused on Western contexts, examining psychological, educational, and workplace barriers, with limited empirical investigation in Indonesian vocational education. International studies highlight key factors: ThuGiang (2022) identified personal interest and financial benefits as primary drivers, aligning with self-determination theory's emphasis on intrinsic and extrinsic motivation. Furthermore, McKinney, Chang, and Glassmeyer (2021) showed that personality traits, particularly openness and conscientiousness, significantly predict STEM major selection and persistence among women in the United States.

Environmental factors also play a critical role, as Iroaganachi, Babalola, and Soyemi (2021) demonstrated in Nigeria, where teachers, role models, and parental support significantly shape girls' STEM career intentions. Complementing this, Iscan (2025) emphasized financial pragmatism, finding that women from lower socioeconomic backgrounds often prioritize high-earning potential in choosing STEM majors. In contrast, Indonesian research by Sulistyowati (2021) and Sari et al. (2021) has addressed gender equality broadly but not specifically the career choice factors for female polytechnic engineering graduates, revealing a significant contextual gap.

This study employs the Big Five personality framework—encompassing extraversion, agreeableness, conscientiousness, emotional stability, and openness to experience—as its theoretical foundation, as these dimensions predict vocational preferences and satisfaction (Friedman & Kern, 2014). The operational framework integrates this with financial reward indicators (Arismutia, 2017) and family environment factors (Friedman, 2014) to assess multifaceted influences on career choice.

Several critical research gaps persist. Most international studies focus on university-level STEM, not polytechnic vocational education with its distinct pedagogical and career pathways. Few studies comprehensively analyze the relative importance and interrelationships among personality, financial, and family factors using factor analytic approaches within a single cohort. Existing Indonesian research often examines access barriers rather than motivational factors for women successful in STEM fields, and Batam's unique industrial context remains underexplored.

The novelty of this research lies in four contributions: it provides the first systematic empirical examination of career choice factors among female Indonesian polytechnic engineering alumni; it employs confirmatory factor analysis to model the structure and relative importance of these influences; it studies successful professionals to identify facilitative factors; and it generates context-specific knowledge for Indonesia's industrial and gender equality goals, offering practical insights for educators, policymakers, and employers.

The purpose of this study is to identify and analyze the factors influencing women's careers in STEM fields. The benefits are expected to be both theoretical and practical: it offers practical value by providing literacy and insights for developing programs, learning curricula, and initiatives to increase women's participation in STEM fields, especially in vocational higher education such as polytechnics.

METHOD

The method used in this study was quantitative with factor analysis. Factor analysis is a statistical method used to identify relationships between related variables in a set of data. This method aims to determine the factors that influence women's career choices in STEM fields, particularly in engineering.

Based on this research, because the population was no more than 100 respondents, the author took 100% of the total population in the data of female alumni graduates who are already working in the STEM field. Thus, using the entire population without having to take a research sample as an observation unit is called a census technique. The sample was taken using a saturated sampling technique (census sample). The number of research samples was 100 female

alumni respondents from the mechanical engineering and electrical engineering departments who graduated in 2023.

Table 1. Number of female alumni of Batam State Polytechnic

Major	Study Program	Number of Alumni	
		Male	Female
Electrical Engineering	Manufacturing Electronics Engineering (D3)	37	16
	Instrumentation Engineering (D3)	18	9
	Electronics Engineering (D3)	22	10
	Mechatronics Engineering (D4)	49	12
	Robotics Engineering (D4)	34	9
	Energy Generation Engineering Technology (D4)	36	26
Mechanical Engineering	Mechanical Engineering (D3)	85	5
	Aircraft Maintenance Engineering (D3)	46	13

Source: Batam State Polytechnic

The type and source of data collected in this study is primary data, which is data collected directly from questionnaires distributed to female alumni who graduated in 2023. Female alumni who are already working and pursuing careers in STEM fields.

The data analysis technique in this study uses two main approaches, namely descriptive statistics and inferential statistics with the factor analysis method. Descriptive statistics are used to provide an initial overview of the research data obtained from respondents. The data analysis technique used next is Confirmatory Factor Analysis (CFA), the purpose of this analysis is to simplify several variables into smaller factors by combining several variables into one factor, so that dominant factors are formed. In this study using Confirmatory Factor Analysis (CFA), according to Santoso (2018) the following are the stages in carrying out factor analysis, namely calculating the Correlation Matrix. In this case the tests that must be carried out include:

a. Barlett's Test of Sphericity

The results of the Barlett's Test of Sphericity (Sig.) are used to indicate the extent to which the variables are correlated, and the value must be <0.05 .

b. Kaiser-Mayer-Olkin (KMO) Test

The KMO test is the most widely used statistical test to determine sample adequacy.

c. Measure of Sampling Adequency (MSA) Test

The MSA test is used to measure the degree of correlation between each variable using the following criteria:

1) MSA value = 1, the variable can be predicted without error from other variables.

2) MSA value > 0.5 , the variable can still be predicted and analyzed further.

3) MSA value < 0.5 , the variable cannot be predicted and cannot be analyzed further.

d. Anti-image Correlation Test

Based on the Anti-image Matrix Table, specifically the Anti-image Correlation section, a number of numbers form a diagonal line marked "a" which indicates the MSA value of a variable

1) Communalities Estimation

This stage aims to determine whether the selected variable values are able to explain the factors, by checking for an extraction value > 0.50 in the Communalities table.

The method used is principal component analysis to predict the number of factors that will be generated.

2). Determining the Number of Factors and Rotation

A number of variables that meet the requirements can proceed to the core process of factor analysis. At this stage, an extraction (factoring) process will be carried out, a method used to reduce data from several indicators into fewer factors that can explain the correlation between the indicators being studied. The determination of the number of factors is based on the magnitude of the eigenvalue, which must be greater than 1 (>1)

3). Factor Interpretation

After obtaining a number of valid factors, interpretation is required by grouping variables with high factor loadings into these factors.

RESULTS AND DISCUSSION

Graduates of Batam State Polytechnic contribute to the field of STEM (Science, Technology, Engineering, Mathematics) through practical vocational skills, particularly in the fields of electronics and mechanical engineering, producing graduates who are ready to work in STEM fields. Polibatam graduates are human resources, both men and women, who are capable of working in STEM fields. The Batam State Polytechnic contributes to producing and training female graduates in STEM (Science, Technology, Engineering, and Mathematics) fields. Polibatam plays a role in increasing the number of women working in STEM fields in Indonesia. As a vocational education institution, Batam State Polytechnic encourages female participation in STEM fields by offering open and inclusive engineering programmes for both men and women, with a project-based curriculum designed in collaboration with industry to facilitate the involvement of male and female students in engineering projects. This curriculum is a practical initiative to increase the involvement of both men and women from the outset so that they play a balanced role in STEM fields, which is expected to have an impact on economic growth and innovation.

Respondent Characteristics

The descriptive statistics of the respondents' characteristics are as follows:

Tabel 2. Respondent Characteristics Based on Study Programme Alumni

Study Programme	Frequency	Percentage
Electronics Manufacturing Engineering (D3)	16	16%
Instrumentation Engineering (D3)	9	9%
Mechatronics Engineering (D4)	12	12%
Robotics Engineering (D4)	9	9%
Electronics Engineering Technology (D4)	10	10%
Energy Generation Engineering Technology (D4)	26	26%
Mechanical Engineering (D3)	5	5%
Aircraft Maintenance Engineering (D3)	13	13%

The data in Table 2 shows the distribution of alumni respondents and the percentage of various engineering study programmes. The study programme with the highest number of

respondents was Energy Generation Engineering Technology (D4) with 26 respondents or 26% of the total respondents. This was followed by Manufacturing Electronics Engineering (D3) with 16 respondents (16%), Aircraft Maintenance Engineering (D3) with 13 respondents (13%), Mechatronics Engineering (D4) with 12 respondents (12%), Electronic Engineering Technology (D4) with 10 respondents (10%), Robotics Engineering (D4) with 9 respondents (9%), and Instrumentation Engineering (D3) with 9 respondents (9%).

Table 3. Characteristics based on age

Age	frequency	percentage
18-22 years old	39	39%
22-26 years old	42	42%
26-30 years old	16	16%
30-34 years old	3	3%
>35 years old	0	0%

Based on Table 3, the characteristics of respondents based on age show that the age range of respondents is from 18 to over 35 years old. Of the 100 respondents, 42 of them are aged 22-26 years old with a percentage of 42%, which is the largest age group. There were 39 respondents aged 18-22 years, representing 39% of the total, making this the second largest age group. Meanwhile, there were 16 respondents aged 26-30 years, representing 16% of the total, and 3 respondents aged 30-34 years, representing 3% of the total. There were no respondents over the age of 35. This shows that the majority of respondents were women of productive age who still had the opportunity to pursue a career in STEM and were graduates of vocational education with a major in STEM, namely engineering.

Table 4. Respondent Characteristics Based on Major

Department	frequency	percentage
Department of Electrical Engineering	65	65%
Department of Mechanical Engineering	35	35%
Total	100	100%

Based on Table 4, the characteristics of respondents by department show the following distribution: 65 respondents or 65% came from alumni of the Department of Electrical Engineering, while 35 respondents or the remaining 35% came from alumni of the Department of Mechanical Engineering. This shows that the majority of respondents in this study came from the Department of Electrical Engineering, while the Department of Mechanical Engineering had fewer respondents but the number was still significant.

Table 5. Reasons for choosing to study engineering at Batam State Polytechnic

Options	Frequency	Percentage
a. Due to family factors	16	16%
b. Because of the opportunities to work in large industries	35	35%
c. Because career opportunities in engineering are vast	40	40%
d. Because of friends or because of the environment since school	13	13%

e. Karena minat (passion) yang disenangi	54	54%
Total	100	100%

Based on Table 5, it can be concluded that the majority of respondents (54%) chose engineering because of their interest or passion for the field. This shows that internal factors such as personal interest play a significant role in their decision to enter this field. In addition, most respondents also noted the great opportunities to work in large industries (35%) and broad career opportunities in engineering (40%) as important reasons for their choice. Family factors (16%) and the influence of friends or the environment since school (13%) also influenced a small proportion of respondents in choosing this field. This data illustrates the complexity of factors that influence career choices in the engineering field, where personal interest dominates but is also balanced by external considerations such as career opportunities and family influence.

Table 6. Producing works or Outputs in the field of engineering

Options	frequency	percentage
a. Products	49	49%
b. Tools	43	43%
c. Systems	46	46%
d. Others	6	6%
Total	100	100%

Based on the data in Table 6, the majority of respondents, 49%, successfully produced products during their studies at Batam State Polytechnic. This reflects the ability of female alumni to apply the theoretical knowledge they have learned to create real-world products. Furthermore, 43% of respondents also successfully produced tools, indicating that during their time as students they were able to apply technical skills to create tools that may be relevant to their studies or projects. Forty-six percent of respondents successfully produced systems, reflecting the application of knowledge and developing innovative technological solutions. Although in smaller proportions, 6% of respondents reported producing other types of work during their studies at Batam State Polytechnic. The ability to produce work is a crucial asset for careers in STEM fields. These data indicate that the curriculum and learning environment at Batam State Polytechnic provide opportunities for students to participate in practical projects relevant to their fields of study, preparing them with the skills they will need in the real world upon graduation.

Table 7. Respondents' confidence in continuing their career in STEM in the next 5 years

Options	frequency	percentage
Yes, I remain confident and plan to continue pursuing a career in STEM Engineering.	77	80,20%
I am still considering my options.	18	18,20%
No, I plan to switch to another field	1	1%
Total	100	100%

Based on data from Table 7, 80.2% of respondents expressed confidence in continuing their careers in STEM Engineering in the next 1-5 years. This shows a strong commitment from the majority of respondents to develop careers in science, technology, engineering, and mathematics (STEM), particularly in the context of engineering.

On the other hand, 18.2% of respondents are still considering their options, reflecting some deliberation or perhaps a desire to explore other career options in the future. Only 1% of respondents plan to switch to another field, indicating that this change is a minority choice among those who have chosen the STEM Engineering path. This data illustrates that the majority of respondents have a strong commitment to a career in Engineering STEM, with little variation in their level of certainty about the future.

Table 8. There are inspirational role models of women who have careers in STEM Fields

Options	Frequency	Percentage
Alumni working in STEM-engineering fields in industry	52	52%
profile of female role models who have careers in STEM fields	48	48%
Total	100	100%

Based on data from Table 8, respondents' confidence in pursuing a career in STEM-Engineering is influenced by the presence of inspirational figures or role models who are women working in the field. As many as 52% of respondents feel more confident about pursuing a career in STEM-Engineering because they have female seniors working in related fields. In addition, 48% of respondents are inspired by female role models whom they know to have careers in STEM-Engineering.

This data shows that successful female role models in STEM-Engineering play a significant role in building respondents' confidence and motivation to pursue a career in this field. The presence of successful women in this industry, either through direct interaction with senior female students or through knowledge about successful female profiles, has a positive impact on respondents' careers.

Table 9. Support and opportunities from the company Continue your career in STEM

Options	Frequency	Percentage
Yes	75	75%
Not enough	7	7%
Enough	15	15%
None	3	3%
Total	100	100%

Based on data from Table 9, most respondents, namely 75%, indicated that they received sufficient support and opportunities to work and pursue a career in STEM-Engineering at their current workplace. A total of 15% of respondents felt that they received sufficient support, while 7% felt that they did not receive enough support. Only 3% of respondents stated that they did not receive any support at all.

This data shows that the majority of respondents feel that their company or workplace provides adequate support for career development in STEM-Engineering. However, the fact that a small number of respondents feel they receive insufficient or no support indicates that

there is still room for improvement in providing fair opportunities and consistent support for all employees, especially in fields that require high technical skills such as STEM-Engineering.

Classical Assumption Test

This study uses a classic assumption test to determine whether the regression model used to measure the influence of personality, financial rewards and family environment is feasible. There are three stages in the classic assumption test, namely:

Normality Test

This test is used to determine whether the residual confounding variable regression model has a normal distribution. Normal distribution will produce a straight diagonal line and the residual data plot will be compared to the diagonal line. If the distribution of residual data is normal, the line will follow the diagonal line and provide a picture. P-plots and histogram graphs are used to test for normality.

Table 10. Normal P-P Plot

One-Sample Kolmogorov-Smirnov Test			
			Unstandardized Residual
N			100
Normal Parameters ^{a, b}	Mean		.0000000
	Std. Deviation		1.49988426
Most Extreme Differences	Absolute		.053
	Positive		.053
	Negative		-.034
Test Statistic			.053
Asymp. Sig. (2-tailed) ^c			.200
Monte Carlo Sig. (2-tailed) ^d	Sig.		.705
	99% Confidence Interval	Lower Bound	.693
		Upper Bound	.717

a. Test distribution is Normal.

b. Calculated from data.

c. Lilliefors Significance Correction.

d. This is a lower bound of the true significance.

Source: SPSS Data Processing

Based on table 10, Kolmogorov-Smirnov above shows that the significance value in the Kolmogorov-Smirnov Test is greater than > 0.05 . The results show $0.200 > 0.05$, so it can be concluded that the data tested is normally distributed. And can be continued for other classic assumption tests.

Multicollinearity Test

The multicollinearity test is done by observing the VIF and tolerance values. If $VIF < 10$ and tolerance value > 0.1 , it means there is no multicollinearity. The calculation results of the VIF and tolerance values are as below:

The results of the data test that has been carried out, the tolerance value of the X1 variable is 0.530, X2 is 0.442 and X3 is 0.715 of the 3 variables, the overall Tolerance value is higher than > 0.10 and the VIF value for the 3 variables is 1.886, 2.263, and 1.399 lower than

<10. This can be interpreted that there is no sign of multicollinearity, therefore it can be concluded that the regression model used has no sign of multicollinearity.

Heteroscedasticity Test (Glejser Heteros Test)

The Glejser test is used by researchers to determine whether there is heteroscedasticity or not. It is used to determine whether there is heteroscedasticity if the Sig. value of all explanatory variables is not statistically sig. ($p > 0.05$). With the data test that has been carried out, it shows that there is no sign of heteroscedasticity in this study, because all variables have a sig value of >0.05 .

Factor Analysis Results

KMO Test and Bartlett's Test.

Factor Analysis with the aim of simplifying several variables into a smaller number of factors by combining several variables into one factor, so that dominant factors are formed. The following table shows the KMO and Bartlett's Test values.

Table 11. KMO and Bartlett's Test.

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.	0,620
Bartlett's Test of Sphericity	Approx. Chi-Square
	94,190
	df
	3
	Sig.
	0,000

Source: SPSS Data Processing

Based on Table 11, it can be seen that the Kaiser-Meyer-Olkin (KMO) value is 0.620 (>0.5) with a Bartlett's Test significance level of 0.000. This means that the sample is very adequate for further analysis, or 89.6% of the variance can be explained by the factor. With a very good KMO value and Bartlett's Test results that significant, all indicators can be further analyzed using factor analysis.

Measure of Sampling Adequacy (MSA) Test

Table 12. Measure of Sampling Adequacy (MSA) Test Results

Item	Measure of Sampling Adequacy (MSA)
Extraversion	0,913
Friendliness	0,901
Caution	0,911
Emotional stability	0,891
Openness to Experience	0,911
Salary	0,933
Bonus	0,852
Benefits	0,904
Pension Fund	0,940
Family Support	0,795
Family Economic Condition	0,796

Source: SPSS Data Processing

Based on Table 12 regarding Measure of Sampling Adequacy (MSA), it can be explained that all indicators tested have MSA values above 0.5, which indicates that each indicator is adequate to be included in factor analysis. The highest MSA value is 0.940 in the Pension Fund indicator, which indicates that this indicator is very adequate. The lowest MSA value was 0.795 on the Family Support indicator, but still above the minimum limit set. Overall, the MSA values obtained indicate that the data has an adequate correlation for each variable. Thus, all indicators in this study can be further analyzed using factor analysis, as they met the necessary sample adequacy requirements.

Communalities Estimation Test

Table 13. Communalities

	Initial	Extraction
Extraversion	1,000	0,936
Friendliness	1,000	0,920
Caution	1,000	0,919
Emotional Stability	1,000	0,679
Openness to Experience	1,000	0,937
Salary	1,000	0,890
Bonus	1,000	0,925
Benefits	1,000	0,908
Pension Fund	1,000	0,919
Family Support	1,000	0,860
Family Economic Condition	1,000	0,865

Source: SPSS Data Processing

Communalities are the total variance explained by the extracted factors. In confirmatory factor analysis, only the common variance is extracted, so it is not wrong if the common variance value is less than one. The following is presented SPSS version 29 output on communalities.

The initial communalities value for all indicators is 1.000, indicating the total variance before factor extraction. After the extraction process, the communalities value changes, indicating the variance that can be explained by the factors formed. Overall, high communalities values such as in the indicators Openness to experience (0.937) and Extraversion (0.936) indicate that the factors formed are able to explain most of the variance of these indicators

Table 14. Total Variance Explained

	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	7,037	63,976	63,976	7,037	63,976	63,976
2	1,668	15,163	79,139	1,668	15,163	79,139
3	1,052	9,560	88,699	1,052	9,560	88,699
4	0,493	4,478	93,177			
5	0,172	1,568	94,744			

6	0,153	1,391	96,136
7	0,124	1,126	97,262
8	0,107	0,976	98,238
9	0,086	0,783	99,020
10	0,057	0,520	99,540
11	0,051	0,460	100,00

Source: SPSS Data Processing

Table 14 shows that 3 items are formed, because with one item the eigen values are still above 1, with two indicators the eigen values are still above 1, with three factors the numbers are still above 1, therefore only limited to 3 items.

Component Matrix (a)

Table 15. Component Matrix (a)

	Component		
	1	2	3
Extraversion	0,890	-0,301	0,231
Friendliness	0,886	-0,194	0,312
Caution	0,864	-0,279	0,308
Emotional Stability	0,430	-0,680	-0,177
Openness to Experience	0,890	-0,260	0,278
Salary	0,873	0,108	-0,341
Bonus	0,807	0,206	-0,481
Benefits	0,882	0,086	-0,350
Pension Fund	0,913	0,093	-0,277
Family Support	0,601	0,646	0,284
Family Economic Condition	0,592	0,667	0,264

Source: SPSS Data Processing

After knowing that three factors are the most optimal number, the component matrix table shows the distribution of the 11 variables on the three factors formed. The numbers in the table are factor loadings, which show the amount of correlation of a variable with factor 1, factor 2, and factor 3. The process of determining which variables will enter which factor is done by comparing the amount of correlation in each row.

Once it is known that each variable has a different distribution on the three factors formed, it shows how these variables correlate with the factors. The Component Matrix shows the distribution of the variables with the factors formed, and the numbers in the Component Matrix table are Factor Loading which shows the amount of correlation between a variable and the factors.

Rotated Component Matrix Test

Table 16. Rotated Component Matrix

Component	1	2	3
Extraversion	0.890	0.364	0.104
Friendliness	0.874	0.319	0.231
Caution	0.900	0.294	0.151
Emotional Stability	0.555	0.297	-0.531

Openness to Experience	0.893	0.336	0.161
Salary	0.382	0.842	0.188
Bonus	0.215	0.918	0.188

Source: SPSS Data Processing

By using the Varimax rotation method and going through the factor rotation process until it converges in 11 iterations. The rotation results are said to be stable and can be interpreted well. From the table mentioned earlier, there are three factors formed, where each variable has a value referred to as factor loadings. This value shows the correlation to each factor. Accordingly, the variables can be grouped into factors 1, 2 or 3.

Table 17. Factor Interpretation

Factor Interpretation					
Factor	Variables	Description	Loading	% of variance	Cumulative %
Factor 1	X1.3	Caution	0,900	63.976	63.976
	X1.5	Openness to experience	0,893		
	X1.1	Extraversion	0,890		
	X1.2	Friendliness	0,874		
	X1.4	Emotional Stability	0,555		
Factor 2	X2.2	Bonus	0,918	15.163	79.139
	X2.3	Benefits	0,851		
	X2.1	Salary	0,842		
	X2.4	Pension fund	0,819		
Factor 3	X3.2	Family Economic Condition	0,852	9.560	88,699
	X3.1	Family Support	0,846		

Source: SPSS Data Processing

Based on the values in table 17, the factors formed can be interpreted as follows:

Factor 1: Personality

This factor includes variables with high loadings, namely conscientiousness (0.900), Openness to experience (0.893), Extraversion (0.890), Friendliness (0.874), and Emotional Stability (0.555). This factor explains 63.976% of the total variance, indicating that individual characteristics influence interest and motivation in pursuing an engineering career.

Factor 2: Financial Rewards

This factor includes the variables Family Economic Condition (0.918), Allowance (0.851), Salary (0.842) and Pension Fund (0.819). With a percentage of variance of 15.163%, it shows that these financial factors play a role in influencing women's career decisions in STEM engineering.

Factor 3: Family Environment

This factor includes the variables Family Economic Condition (0.852), and Family Support (0.846). This factor explained 9.560% of the total variance, emphasizing the importance of family support and family economic conditions to women's career choices in STEM engineering.

Based on the results of this study, it can be seen that of the 11 indicators studied, there are three factors that can be formed and influence women's career choices in STEM engineering

at Batam State Polytechnic. These factors include Personality, Financial Rewards, and Family Environment. Confirmatory factor analysis shows that these three factors indicate women's career preferences in STEM fields.

1. **Personality:** This factor includes personality indicators such as extraversion, sociability, conscientiousness, emotional stability, openness to experience affecting career choices in STEM engineering.
2. **Financial Rewards:** This factor includes consideration of the salary, bonuses, benefits, pensions earned from a career in STEM engineering, which also influences women's career decisions.
3. **Family Environment:** This factor includes family support and family economic conditions for women's career choices in STEM engineering.

This study confirms that although Personality, Financial Rewards and Family Environment emerged as the main factors, the interrelationships between the three factors form a complex framework that significantly influences women's career decisions. The results of this study provide valuable insights for policy makers, educational institutions, and related organizations to develop interventions, programs, and resources that support women's participation in STEM fields, not only within Batam State Polytechnic but also more broadly.

Family Environment emerge as the main factors, the reciprocal relationship between these three factors forms a complex framework that tends to influence women's career decisions in STEM fields. The results of this study provide valuable insights for policymakers, educational institutions, and related organisations to develop interventions, programmes, and resources that support women's participation in STEM fields. The low number of women in STEM fields is caused by cumulative factors, including stereotypes that begin in childhood and continue into professional life. (Alawi & Al Mubarak, 2019)

One factor that discourages women from pursuing careers in STEM is the negative views held by men towards women in this field, as well as the persistence of gender stereotypes. One of the reasons why women hesitate to choose a career in STEM is because of prejudices in teaching materials, curricula, and strong stereotypes in society that assume that women are not suited to STEM fields. Inspiring and supportive efforts are needed to increase women's interest in pursuing a career in STEM. In addition, the lack of female role models in the family who work in STEM and other prominent female role models in STEM makes many women reluctant to explore this field. Across the globe, an ongoing issue pertains to the unequal representation of men and women earning degrees in the fields of science, technology, engineering, and mathematics (STEM). To promote fairer involvement in STEM academic programs, it's crucial to determine the reasons and mechanisms behind these inequalities.

1) Personality factors affecting career choices in STEM fields

Personality factors are the most dominant factor in the career choices of female alumni in the field of engineering. The results of this study indicate that personality factors significantly influence the career choices of female graduates in STEM fields, particularly those majoring in electrical engineering and mechanical engineering. Thus, it can be simply concluded that female graduates in electrical engineering and mechanical engineering at Batam State Polytechnic who possess certain personality types tend to be more interested and motivated to pursue careers in engineering. Personality is a collection of characteristics and traits that influence the way

individuals think, feel, and behave. In the context of career choices for women in STEM fields, particularly in the electrical engineering and mechanical engineering departments at Batam State Polytechnic, personality plays an important role in determining future career interests and decisions.

These results are supported by the theory proposed (Vicario et al., n.d.) which states that personality factors are one of the determining factors that have the potential to influence individual behaviour in certain situations or conditions. According to Holland's theory, individual personalities can be categorised into six main types (RIASEC), and each personality type tends to be attracted to certain work environments that match their characteristics. The compatibility between personality type and chosen work environment has a significant effect on a person's satisfaction and career success. This theory emphasises that understanding an individual's personality can help predict the most suitable and satisfying career choices.

Based on the Component Matrix results, it is stated that personality factors have indicator results of X1.1 (0.892), X1.2 (0.889), X1.3 (0.866), and X1.5 (0.893). These values exceed the threshold of 0.5, indicating that personality factors influence the career choices of female STEM graduates in the electrical engineering and mechanical engineering departments at Batam State Polytechnic.

2) Financial rewards as a factor in career choices in STEM fields

Financial reward factors also play a very important role in career choice in the field of engineering. The results of this study indicate that the variable of financial reward preference influences women's career choices in STEM fields. Thus, it can be simply concluded that female alumni in the electrical engineering and mechanical engineering departments at Batam State Polytechnic who have certain personality types tend to be more interested and motivated to pursue careers in engineering due to the attractive financial rewards that can be obtained from jobs in STEM engineering fields.

Financial rewards include compensation or material rewards that a person receives from their work, such as salaries, bonuses, allowances, and pension funds. According to Wijayanti (dalam Arianti & Maharani, 2023) salary rewards or financial rewards are factors that students consider when choosing a career. Humans basically prefer something that can provide them with appropriate or even high rewards.

Based on the results of the Component Matrix, it is stated that financial rewards have indicators X1.1 (0.874), X1.2 (0.809), X1.3 (0.885), and X1.4 (0.915). These values exceed the threshold of 0.5, which indicates that financial rewards are a factor that influences women's career choices in the STEM field, especially female alumni majoring in electrical engineering and mechanical engineering. In this context, the higher the income offered, the greater the interest of women in pursuing a career in STEM engineering. In this context, higher offered salaries increase interest in pursuing careers in engineering. In line with Iscan, B. (2025) the results of this study, it is clear that women who choose STEM majors prioritize high-earning potential as much, if not more, than men when deciding on a major.

3) Family environment factors affecting career choices in STEM fields

Family environment is the third factor influencing women's career choices in STEM engineering. This study shows that family environment factors influence women's career choices

in STEM fields. This environment encompasses family support and the individual's economic situation.

Research (Santoso, 2014) found that the family environment has a significant positive influence on accounting students' interest in becoming public accountants. This study found that family economic conditions also play an important role in career choice (Bryant et al., 2006). This study found that family economic conditions also play an important role in career choice. Alumni from families with better economic conditions have greater access to educational resources and broader career opportunities, which in turn influence students' career choices.

Based on the Component Matrix results, it is stated that the family environment has indicator results of X1.1 (0.605) and X1.2 (0.596). These values exceed the threshold of 0.5, indicating that the family environment is a factor influencing women's career choices in STEM fields. Overall, a positive family environment and supportive economic conditions can provide a solid foundation for women to achieve their career goals in STEM engineering field.

Based on the results of this study, which aims to determine what factors influence women's career choices and what factors are most dominant in women's career choices in the STEM engineering field. It can be concluded that the research shows that certain personality types such as Extraversion, Friendliness, Conscientiousness, Emotional Stability, Openness to Experience are very important in encouraging career choice in engineering. In line with the research Mercy A. Iroaganachi et.al (2021) findings that teachers, role models, and parents significantly influence the intention to choose a STEM career path.

Although personality is the most dominant factor, the interrelationships between all factors should not be overlooked, forming a complex framework that influences women's career decisions in STEM fields. These findings provide valuable guidance for policymakers, educational institutions, and related organisations, offering avenues for designing interventions, programmes, and resources that encourage women's participation in STEM fields.

CONCLUSION

This study concludes that personality, financial reward, and family environment factors significantly shape female polytechnic alumni's career choices in *STEM* fields, with personality factors proving most dominant. To boost women's participation, a comprehensive approach is needed: strengthen mentoring by successful female engineers to build confidence, expand financial incentives like scholarships and paid internships, reinforce family support via parent engagement programs highlighting engineering's prospects, ensure equal *STEM* access through inclusive vocational environments, and foster sustained policy-industry collaborations. For future research, longitudinal studies tracking these alumni over a decade could assess long-term career retention and the evolving impact of interventions in Indonesia's industrial hubs like Batam.

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