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Guidelines the selection of university's majors by newly admitted students: A case study influences on students' choice of major of electronic information at Shanghai University of engineering science in China

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Abstract

Under the impetus of the national strategy to build a technologically advanced country and the implementation of the large-category admission model in universities, the Electronic Information major at Shanghai University of Engineering Science has adopted the large-category admission system since 2021. However, when selecting their majors, students are often overly influenced by their parents and place excessive emphasis on employment prospects, which negatively affects their learning enthusiasm and long-term career development. This study aims to explore the key factors influencing students' choice of the Electronic Information major at the university, providing valuable references for students, parents, and the university in promoting students' all-around development and advancing educational and teaching reforms. Using a sample of 450 first-year students at Shanghai University of Engineering Science, a total of 230 questionnaires were distributed and collected. After data collection, validity and reliability analyses were conducted, and descriptive statistics and factor analysis methods were employed to examine the influencing factors. In addition, five student counselors and five admissions staff were interviewed to further investigate the influencing factors, identify existing problems, and explore effective guidance measures, thereby enriching the research content. Through literature review and empirical analysis, the study found that the major's popularity, employment prospects, personal interests and abilities, university reputation, and geographical location are the main considerations influencing students' major choices. Although family influence is considered secondary, it still shows a significant effect. The research suggests that students should conduct a comprehensive self-assessment, stay informed about industry trends, accumulate practical skills, and make scientifically informed major selections. Simultaneously, parents should receive scientific guidance to avoid blind intervention and support their children in making rational and personalized major choices. The research findings can help the university optimize its admission strategies, strengthen education on professional awareness, improve the curriculum and student guidance systems, and enhance the quality of talent cultivation and the competitiveness of its academic programs. These findings also offer a valuable reference for other engineering majors.

Keywords: Electronic information major, Guidance, Influencing factors, Major choice.

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1. Introduction

In the context of China's active promotion of the strategy of strengthening the country through science and technology, the electronic information industry, as a strategic emerging industry, has become a key driving force in promoting economic and social development. As a result, the demand for talent in this field continues to grow [1]. At the same time, the model of broad-category admissions is being increasingly promoted in universities. It aims to break down traditional disciplinary barriers and provide students with more time and space to better understand different majors and make more informed choices [2]. As a key undergraduate institution in Shanghai, Shanghai University of Engineering Science has implemented large-category enrollment for the electronic information major in its School of Electrical and Electronic Engineering since 2021. However, during the enrollment and teaching process, various problems have been observed in students' major selection. For example, some students are heavily influenced by their parents when choosing a major, lacking consideration of their own interests and abilities. Others place too much emphasis on the current job market prospects of a major, while neglecting their long-term personal development needs [3].

The factors influencing major selection not only affect students' learning motivation and initiative during their time at university but may also have a negative impact on their future career development. Therefore, it is of great practical significance to thoroughly investigate the factors affecting students' choice of the electronic information major and to provide corresponding guidance. This can help students make scientific and well-informed decisions and improve the overall quality of talent cultivation.

The purpose of this study is to identify the key factors influencing students at Shanghai University of Engineering Science in choosing majors in the electronic information category through scientific research methods. It also aims to provide valuable references for students, parents, and universities, thereby promoting students' comprehensive development and supporting educational and teaching reforms.

The significance of this study can be summarized in the following four aspects: First, from the students' perspective, identifying the influencing factors can help them rationally plan their career paths and improve the alignment and satisfaction of their major choices. Second, from the parents' perspective, this study can provide scientific guidance for family education and help alleviate anxiety related to their children's academic decisions. Third, from the perspective of universities, the research findings can assist in optimizing enrollment strategies, enhancing the quality of talent cultivation, and strengthening the competitiveness of academic programs. Fourth, this study can also serve as a valuable reference for other engineering majors, such as mechanical engineering and vehicle engineering.

2. Literature Review

2.1. Current Situation of the Electronic Information Major at Shanghai University of Engineering Science

The electronic information major at Shanghai University of Engineering Science comprises six undergraduate programs: Computer Science and Technology, Automation, Electrical Engineering and Automation, Electronic Information Engineering, Data Science and Big Data Technology, and Artificial Intelligence. Among them, the Computer Science and Technology major has been recognized as a national first-class undergraduate program. The Automation and Electrical Engineering and Automation majors have been approved as first-class undergraduate programs in Shanghai. The Data Science and Big Data Technology major is part of the first batch of such programs launched in Shanghai. In addition, the Computer Science and Technology and Automation majors have passed the China Engineering Education Accreditation. The Electrical Engineering and Automation major, along with the Automation major, has been designated as an applied undergraduate pilot program by the Shanghai Municipal Commission of Education [4].

2.2. Literature Review on Factors Influencing the Choice of Major

The author has collected relevant domestic and international research on the factors influencing students' choice of major. A review of the literature reveals that scholars have studied this issue from various perspectives. Personal interests and academic performance can be shaped by peers, teachers, or parents. In fact, many students determine the general direction of their future major during high school [5].

College success is influenced by a combination of environmental factors, students' personal interests, academic performance, and positive experiences, all of which are common considerations when students choose a science and

technology major [6, 7]. According to Holland's theory of career interest, the alignment between personal interests and career environments plays a crucial role in major selection [8]. Choosing a college major is a pivotal decision, influenced by personal preferences, economic prospects, family expectations, and cultural values [9].

Recent meta-analyses of Holland's theory further affirm the cross-generational validity of personal interests as a predictor of major choice Quadlin [10]. Noted that challenges such as regional development disparities in China, inadequate school enterprise collaboration, and a shortage of "dual-qualified" teachers may influence students' decisions regarding the electronic information major. For instance, vocational colleges in remote areas, constrained by outdated training facilities and misaligned curricula, often see low levels of student identification with their majors. In contrast, institutions in major cities, with strong teaching faculties, robust school–enterprise partnerships, and abundant digital resources, tend to attract more students and enhance their confidence in career planning.

In the study, career planning awareness and employment intention strength were identified as core driving factors. Their findings indicate that students with clear career plans are more likely to choose majors aligned with industry demands. Students with strong employment motivations tend to prioritize fields such as electronic information, which offer high market demand. Additionally, a match between personal capabilities and the perceived employment potential in new technologies reinforces this preference: students skilled in logical reasoning and technological application are more confident in selecting electronic information majors. High-growth potential industries signal attractive salaries and career development prospects, further motivating students. External factors such as internship opportunities and access to employment resources also play supportive roles. Although the importance of employment mindset and the quality of career guidance appear relatively secondary, these elements still indirectly influence students' choices by shaping risk perceptions and job performance expectations.

Chinese scholars Hu Yudong and Yang Huaqing argue that major employment prospects, personal interest, and family financial situation are key factors influencing students' major selection [11, 12]. In a more detailed classification, scholar Fan Mingcheng categorized influencing factors into six major groups: Economic factors (including family income and tuition fees), social factors (such as parental occupations, university location, and suggestions from teachers, friends, and relatives), personal factors (covering academic ability, interests, and physical health), informational factors (which relate to university rankings, major popularity, employment rates, and educational level, etc.), institutional factors (including college entrance policies, admission scores, and the nature of the institution), and school-related factors (such as faculty quality, educational standards, academic atmosphere, library resources, modernity of teaching facilities, opportunities for further education, and employment outcomes) [13].

To summarize, scholars across the globe have conducted in-depth studies on the factors influencing students' major selection. Their analyses span various dimensions, economic, personal, familial, institutional, social, and national and have yielded significant findings. These studies highlight key issues in the decision-making process, reflect on the fairness of educational opportunities, and offer targeted recommendations that are valuable for promoting equity and effectiveness in higher education admissions.

3. Methodology

The literature analysis method involves systematically collecting, organizing, and analyzing existing literature materials (such as journal articles, books, research reports, and archives), extracting relevant information related to the research topic, and thereby forming a scientific understanding of the research issue.

The Questionnaire survey method uses standardized questionnaires as tools to collect data from research subjects in written form, followed by statistical analysis of the collected data. This method is highly standardized and facilitates large-scale data collection and quantitative analysis. By using closed-ended questions, structured data can be quickly obtained, making the process more efficient.

The **s**emi-structured interview method involves the interviewer communicating with the interviewee based on a pre-set framework of questions, while also allowing for flexible adjustments to the content or sequence of the questions depending on the interviewee's responses. This method combines structure with openness, enabling the collection of both expected information and deeper insights into the interviewees' thoughts and subjective experiences. It is particularly suitable for exploring the internal logic of complex issues and for supplementing the limitations of quantitative data.

This study adopts a combination of the literature analysis method, questionnaire survey method, and semi-structured interview method to integrate quantitative and qualitative research approaches, ensuring the complementarity of theoretical and empirical evidence. This methodological framework not only establishes a solid academic foundation through literature analysis but also captures the research subjects from both quantitative and qualitative perspectives through questionnaires and interviews. It is especially suitable for complex topics that require multi-dimensional evidence, thereby making the research conclusions more comprehensive and convincing.

In terms of literature analysis, this study systematically searched and analyzed relevant literature both domestically and internationally to identify theoretical frameworks and research trends related to major selection. Through keyword searches, literature closely related to the research topic was screened from academic databases, policy documents, and industry reports to extract key information. The literature analysis provides a solid theoretical foundation for this study.

The quantitative research adopts the questionnaire survey method. Taking 450 first-year students majoring in electronic information at Shanghai University of Engineering Science as the whole population, the sample size was calculated based on the formula $n = \frac{N}{1 + N \times e^2}$

(n is the sample abilities, N is the overall abilities, and e is the sampling error), which was set to 0.05), which resulted in a theoretical sample size of at least 212. Simple random sampling was used to ensure that each student had the same chance of being sampled, thereby ensuring that the samples were random and representative [14]. The questionnaire will be pre-administered before the formal distribution of the questionnaire, and the data results will be analyzed for reliability and validity first. After confirming the reliability of the questionnaire, it will be formally distributed for data collection. The questionnaire is divided into two parts: basic information and influencing factors. The first part covers basic information such as gender, household type, and parents' education level. The basic information of the respondents in the sample data of 230 recovered questionnaires is shown in Table 1.

Table 1.
Frequency and percentage scale of respondents' information.

Form	Frequency	Percentage
Gender between the sexes		
A male	122	53.04
Females	108	46.96
Type of household registration		
City or town account	142	61.74
Rural household registration	88	38.26
Father's education		
High school and below	50	21.74
University college	66	28.7
University undergraduate course	69	30
Graduate students and above	45	19.57
Mother's education		
High school and below	46	20
University college	78	33.91
University undergraduate course	72	31.3
Graduate students and above	34	14.78
Educational level of the social circle		
High school and below	55	23.91
University college	67	29.13
University undergraduate course	63	27.39
Graduate students and above	45	19.57
Total	230	100

According to Table 1, a total of 230 participants in this study consisted of 122 males (53.04%) and 108 females (46.96%). Among the participants, 142 (61.74%) were from urban areas and 88 (38.26%) were from rural areas. The educational level of fathers among the participants was 50 (21.74%) in high school and below, 66 (28.70%) in college, 69 (30.00%) in undergraduate, and 45 (19.57%) in graduate school and above. The educational level of the participants' mothers was 46 (20.00%) in high school and below, 78 (33.91%) in junior college, 72 (31.30%) in undergraduate, and 34 (14.78%) in graduate and above. The literacy level of relatives and friends that the participants often contacted was 55 (23.91%) in high school and below, 67 (29.13%) in college specialties, 63 (27.39%) in undergraduate programs, and 45 (19.57%) in graduate programs and above. This basic information reflects the group characteristics of the interviewed students and provides a basis for subsequent analysis of the differences in the factors influencing the choice of majors among different groups.

The second part of the questionnaire is the influencing factors section, which is designed with 12 questions across four dimensions: personal, family, major, and institution. It is measured using a 5-point Likert scale, which is employed to collect data related to students' influencing factors in major choice and their decision-making process. Subsequently, descriptive statistical analysis and factor analysis were conducted to derive the study's results. Descriptive statistical analysis primarily examines the mean and standard deviation of the influencing factors' scores, providing an initial understanding of their importance. Following this, data analysis was performed using factor analysis, a common technique for data dimensionality reduction and variable simplification. This method simplifies the structure of complex variables, reveals potential correlations between variables, and uncovers underlying structures. It further clarifies the significance of various influencing factors.

The qualitative study adopted the interview method, selecting five student counselors and five admissions staff to conduct semi-structured interviews. The outline of the interviews centered on the influencing factors of students' major choice, the problems faced by students during the major selection process, and the school's measures in guiding students' major choices. Through in-depth exchanges with counselors and admissions staff, we gained a deeper understanding of their perspectives on the influencing factors of students' major choice, which further enriched the research data and provided more comprehensive support for the research conclusions.

This study achieves innovative breakthroughs on multiple levels, demonstrating both unique academic value and practical significance. In terms of research scope, it innovatively focuses on the selection mechanisms of majors within the

electronic information category, closely aligning with the specific characteristics of the discipline. Methodologically, it adopts a mixed-methods approach that combines quantitative questionnaires with qualitative interviews. Through multi-source data triangulation, the study not only quantifies the weights of influencing factors but also uncovers underlying motivations. Furthermore, factor analysis is employed to construct a comprehensive scoring model, allowing for the quantification of dynamic weights across four dimensions. In terms of practical application, the study establishes an ecological guidance system featuring a three-way interaction among students, parents, and universities, providing targeted recommendations for each stakeholder group.

4. Results and Discussion

The data results of the questionnaire were first analyzed for reliability and validity. This was followed by descriptive statistical analysis and factor analysis to arrive at the study's results.

4.1. Analysis of the Reliability of the Questionnaire

Before conducting the statistical analysis of the questionnaire-based survey research, a pre-survey was carried out. This pre-survey distributed 35 questionnaires, of which 32 were recovered to assess the reliability and validity of the questionnaire. The purpose was to examine the reliability and accuracy of the factors influencing students' choice of major in electronic information. Reliability primarily measures the accuracy, stability, and consistency of the instrument, which refers to the extent of variation caused by random errors during measurement. This study adopts internal consistency as a reliability index; internal consistency reliability indicates the consistency among all items within the questionnaire, typically using Cronbach's alpha coefficient.

According to Table 2, the Cronbach’s alpha of the questionnaire was 0.929. According to the scholar DeVellis [15] the Cronbach's alpha coefficient is greater than 0.7, which indicates that the questionnaire has good internal consistency. In this case, the coefficient is much higher than 0.7, suggesting excellent internal consistency [15].

Table 2.
Reliability statistics scale.

Reliability statistics	
Cronbach's Alpha	**Term number**
0.929	12

According to Table 3, the KMO value was 0.839, and Bartlett’s Test was significant ($p < 0.001$). According to Kaiser (1974), a KMO value greater than 0.5 is suitable for factor analysis, and this questionnaire's KMO value reaches 0.839, which indicates that the questionnaire has good structural validity and is able to reliably and accurately measure the factors influencing students' choice of major [16].

Table 3.
KMO and bartlett's test scale.

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.839
Bartlett's Test of Sphericity	Approx. Chi-Square	213.477
	df	66
	Sig.	0.000

Finally, the results of the factor analysis are shown in Table 4, and all communalities were above 0.5, indicating good construct validity, indicating that the validity of the questionnaire is good.

Table 4.
Scale of variance of the common factor.

Communalities		
	Initial	**Extraction**
Personal interest	1.000	0.659
Personal abilities	1.000	0.522
Economic situation of the family	1.000	0.756
Parental wishes	1.000	0.655
Influence of parents' occupation	1.000	0.660
Educational level of parents	1.000	0.754
Employment forms of the major of electronic information	1.000	0.603
The popularity of the major in electronic information	1.000	0.849
Talent demand	1.000	0.482
University popularity	1.000	0.679
Location of the University	1.000	0.691
All the expenses during university years	1.000	0.550

4.2. Descriptive Statistical Analysis of Questionnaire Results

Investigation on the Influence Factors of Students' Selection of Electronic Information Major. In order to investigate the influence factors of students' selection of the electronic information major, this paper sets 12 indicators: personal interest, personal ability, family's economic situation, parents' willingness, parents' occupational influence, parents' education level, employment form of the major, popularity of the major, demand for talents, popularity of the university and the ranking of the university, tuition fees and living expenses of the university, and the geographical location of the university.

Setting the level of importance of the indicator, as shown in Table 5, where the level of importance is set at five levels of evaluation, namely, very unimportant, relatively unimportant, uncertain, relatively important, and very important (quantifying the levels of evaluation with a score of 1 to 5, respectively).

Table 5.
Indicator importance scale.

Hierarchy	**Importance of influencing factors**
5	Very important
4	More important
3	Inconclusive
2	Comparison is not important
1	Very unimportant.

In the first part of the analysis, two statistical methods were used to present the data: mean score and standard deviation. In this way, we were able to obtain a clear picture of the average level of performance of each factor as well as their range of fluctuation. Specifically, we calculated the mean for each factor, which is the sum of all data points divided by the number of data points, reflecting the central tendency of the factor. Additionally, we calculated the standard deviation, which measures the dispersion of the data points relative to the mean and thus provides information about the data's consistency. Detailed information on the mean scores and standard deviations for all of these factors can be found in the accompanying Figure 2, which details the specific values for each of the factors, allowing the reader to visually compare the differences between the different factors.

As can be seen from Figure 1, in the major factors in the major employment form ($\bar{x} = 4.02$) major heat ($\bar{x} = 3.97$) talent demand ($\bar{x} = 3.91$) major factors of the mean value are relatively high, major factors become the students choose electronic information major is the main consideration of the direction of the major, in the personal factors in the personal interest ($\bar{x} = 3.58$), personal ability ($\bar{x} = 3.61$), the university's popularity and the university's rankings ($\bar{x} = 3.76$) the university's geographic location ($\bar{x} = 3.70$) the university's tuition fees and living expenses such as ($\bar{x} = 3.68$), the personal factors and university factors follow. The mean values of personal and university factors follow closely, with personal interest and ability as core drivers, and university popularity and location as important reference indicators. In contrast, the mean values of family factors such as family's economic situation ($\bar{x} = 3.25$) parents' willingness ($\bar{x} = 3.47$) parents' occupational influence ($\bar{x} = 3.29$) parents' education level ($\bar{x} = 3.33$) family factors are relatively low, and the overall influence is weak, but the standard deviation (1.128, 1.330, 1.210, 1.205) is relatively large, and the individual differences are obvious.

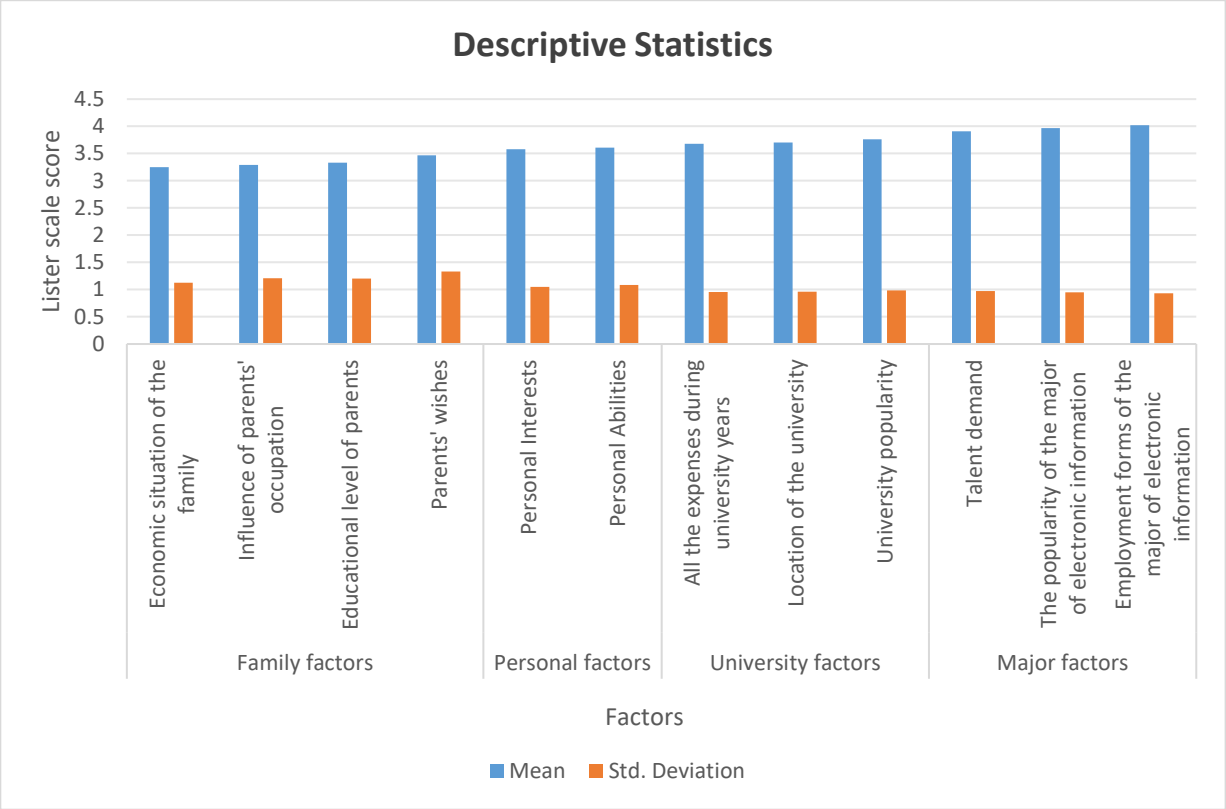

Figure 1.
Descriptive statistics bar chart of students' choice of major in electronic information.

4.3. Factor Analysis of Questionnaire Results

The second part of the study is factor analysis, to use factor analysis, you need to test the data first KMO and Bartlett, KMO test (Kaiser-Meyer-Olkin Test) can determine whether the correlation between the variables is strong enough, usually requires KMO > 0.6 (the higher the value, the better the factor analysis), Bartlett's Test of Sphericity (Bartlett's Test of Sphericity) is used to test whether the correlation coefficient matrix is a unit matrix (i.e., whether the variables are independent). Bartlett's Test of Sphericity (Bartlett's Test of Sphericity) assesses whether the matrix of correlation coefficients is a unit matrix (i.e., whether the variables are independent of each other). If the p-value is < 0.05, the original hypothesis is rejected, which indicates that there is a significant correlation between the variables, and that it is suitable for factor analysis.

As can be seen in Table 6, the observed value of the test statistic is 1819.813, with a significance of 0. Since the P-value is less than 0.05 and the KMO value is 0.829, the original variables can be analyzed using factor analysis according to the KMO metric.

Table 6.
KMO and bartlett's test scale.

KMO and Bartlett's test		
Kaiser-Meyer-Olk in measure of sampling adequacy.		0.829
Bartlett's Test of Sphericity	Approx. Chi-Square	1819.813
	df	66
	Sig.	0.000

In order to study the degree of influence of each factor on college students' choice of major, the various factors are categorized and summarized for subsequent comprehensive analysis.

According to Figure 2, it can be seen that 4 factors have eigenvalues more than 1 and 4 factors are selected for better analysis.

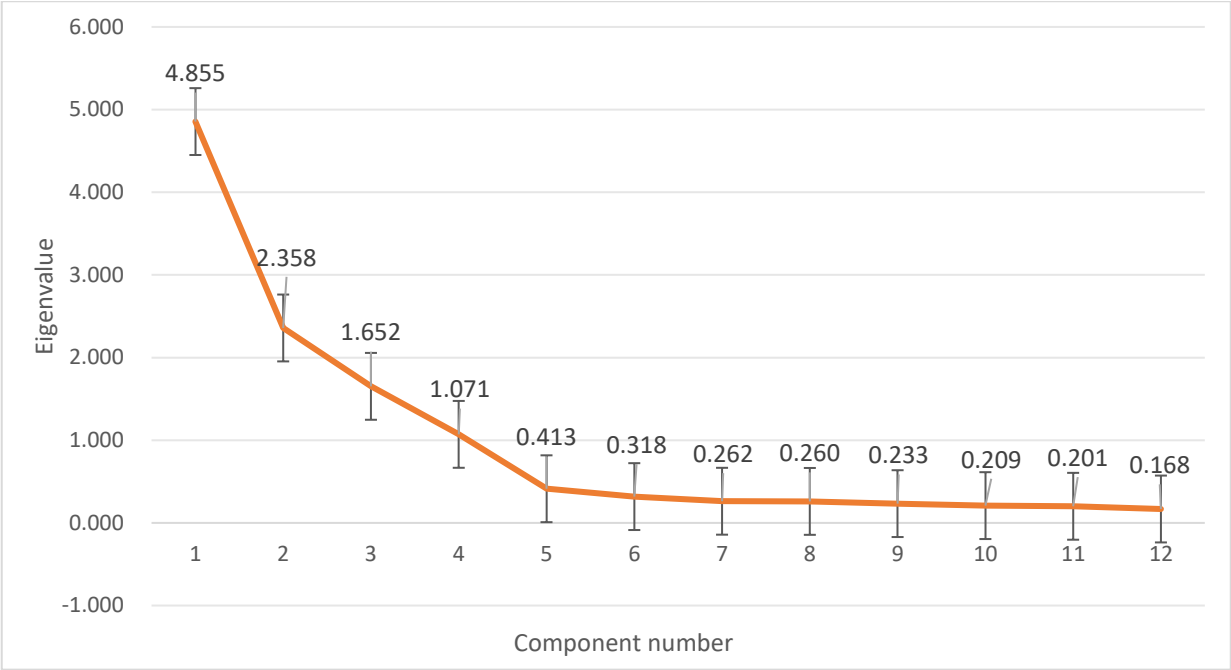

Figure 2.
Line chart of eigenvalues of factors.

In Table 7, it can be seen that the first four characteristic roots have larger values of 4.855, 2.358, 1.652, and 1.071, respectively, while the later characteristic roots are smaller. Meanwhile, in the total variance explained table, it can be observed that the variance explained by the first four factors reached 82.799%. Therefore, four factors are extracted.

Table 7.
Total variance explained scale.

Total Variance Explained			
Component	**Initial Eigenvalues**		
	Total	**% of Variance**	**Cumulative %**
1	4.855	40.461	40.461
2	2.358	19.652	60.113
3	1.652	13.763	73.876
4	1.071	8.923	82.799
5	0.413	3.443	86.242
6	0.318	2.653	88.894
7	0.262	2.181	91.075
8	0.26	2.167	93.242
9	0.233	1.939	95.181
10	0.209	1.743	96.924
11	0.201	1.672	98.596
12	0.168	1.404	100

After analyzing the rotated component matrix in Table 8, it can be seen that the first factor has a higher degree of explanation for the four indicators of family's economic situation (0.901), parents' willingness (0.882), parents' major influence (0.909), and parents' education (0.879), which all belong to the family factors, and therefore can be summarized as "family factor"; the second factor has a higher degree of explanation for the three indicators of major employment form (0.873), major popularity (0.881), and talent demand (0.893). The second factor has a high degree of explanation for the three indicators of the employment form of majors (0.873), the popularity of majors (0.881), and the demand for talents (0.893), which all belong to the major factor, and therefore can be summarized as the "major factor" and denoted as F2. The third factor has a higher degree of explanation for the three indicators of university popularity and ranking (0.839), geographical location of the university (0.872), and the cost of the university (0.820), which are all university factors, and can therefore be categorized as the "University Factor" and denoted as F3; the fourth factor is the "Personal Interest" (0.902), which is a factor of personal interest. The fourth factor has a high degree of explanation for personal interest (0.902) and personal ability (0.883), both of which are personal factors and can therefore be categorized as the "personal factor", denoted as F4.

Table 8.
Rotated component matrix.

Rotated Component Matrix				
	Component			
	1	2	3	4
S1. Personal interest	0.107	0.141	0.197	0.902
S2. Individual abilities	0.122	0.093	0.268	0.883
S3. Economic situation of the family	0.901	0.108	0.082	0.069
S4. Parental wishes	0.882	0.144	0.106	0.036
S5. Influence of parents' occupation	0.909	0.121	0.082	0.108
S6. Parents' level of education	0.897	0.077	0.090	0.100
S7. The popularity of the major in electronic information	0.107	0.873	0.166	0.161
S8. Employment forms of the major of electronic information	0.206	0.881	0.190	0.057
S9. Talent demand	0.087	0.893	0.119	0.061
S10. University popularity	0.142	0.211	0.839	0.169
S11. Location of the University	0.084	0.142	0.872	0.158
S12. All the expenses during university years	0.081	0.121	0.820	0.186

In order to understand the degree to which each influencing factor is influenced by the principal components of the pairs of factors, the factor score coefficients are selected here, and according to Table 9, we can derive a comprehensive score model integrated with the expressions of each factor. We can also deduce:

$$F=0.415\times S1+0.411\times S2+0.197\times S3+0.193\times S4+0.216\times S5+0.202\times S6+0.284\times S7+0.266 \times S8 + 0.240 \times S9 + 0.256 \times S10 + 0.234 \times S11 + 0.233 \times S12 \quad (1)$$

According to Equation 1, it can be seen that all twelve influence indicators are positively correlated with the influence on major selection. The factor scores of the five indicators personal interest (0.415), personal ability (0.411), major heat (0.266), employment forms of the electronic information major (0.284), and university popularity and rankings (0.256) are higher. This indicates that these five factors have a greater influence on students' choice of the Electronic Information major, making it more influential.

Table 9.
Component score coefficient matrix.

Component Score Coefficient Matrix				
	Component			
	1	2	3	4
S1. Personal interest	-0.039	-0.02	-0.134	0.608
S2. Individual abilities	-0.032	-0.054	-0.081	0.578
S3. Economic situation of the family	0.289	-0.037	-0.025	-0.03
S4. Parental wishes	0.281	-0.019	-0.007	-0.062
S5. Influence of parents' occupation	0.289	-0.034	-0.037	-0.002
S6. Parents' level of education	0.288	-0.055	-0.024	-0.007
S7. The popularity of the major in electronic information	-0.054	0.389	-0.073	0.022
S8. Employment forms of the major of electronic information	-0.015	0.388	-0.038	-0.069
S9. Talent demand	-0.054	0.413	-0.077	-0.042
S10. University popularity	-0.018	-0.038	0.416	-0.104
S11. Location of the University	-0.032	-0.072	0.452	-0.114
S12. All the expenses during university years	-0.031	-0.075	0.417	-0.078

Based on the four factors already summarized in Table 7 above, the combined influence factor model can be calculated by dividing the variance contribution of each common factor by the cumulative variance contribution of the common factors, and multiplying by the scores of each common factor separately, which can be obtained from

$$F=0.489F_1+0.237F_2+0.166F_3+0.108F_4 \quad (2)$$

According to Equation 2, It can be concluded that the "family factor" has the greatest influence on students' choice of major, with a correlation coefficient of 0.489. The education level and occupation type of parents also significantly influence students' choice of major. For example, students whose parents are engaged in electronic information-related industries are more likely to be influenced by family factors when choosing their majors [17]. "Specialization factor" has a greater influence, with a correlation coefficient of 0.237, and the employment form, heat, and talent demand of specialties are the focus of students' attention.

In the current background of the rapid development of the electronic information industry, students pay more attention to the trends in major talent demand, salary levels, and employment prospects. With the advancement of science and technology, the market demand for high-skilled personnel in the electronic information sector continues to rise, providing strong support for students' career prospects when choosing to specialize in this field. The "University Factor" has a relatively small influence, with a correlation degree of 0.166. University popularity and geographic location are the main

influencing factors. The influence of the university, such as the level of scientific research, faculty strength, and international cooperation, is closely related to the construction of the university's visibility in the field of electronic information specialization. This offers an international perspective and a macro background for analyzing the influence of the university factor on students' choice of major in electronic information [18]. Meanwhile, Shanghai, as an international metropolis, its superior geographic location and rich resources attract many students to enroll in the electronic information major at Shanghai University of Engineering Science. The "personal factor" has the smallest influence, with a correlation degree of 0.108, and personal interest and ability also play a role in major selection. Further analysis reveals that the factor scores of the five indicators, namely, personal interest, personal ability, popularity of the major, employment forms of the major of electronic information, and the university's popularity, are higher and have a greater impact on students' choice of the major.

4.4. Analysis of Interview Results

The responses from counselors and admissions staff in the semi-structured interviews further corroborated the questionnaire findings. Counselors mentioned that, in their daily work, they observed that the popularity of the major and employment prospects were the main reasons students chose to enroll in the electronic information major. Some students were influenced by their families and social circles when selecting their majors, with parents' opinions often playing a key role in the decision-making process. While some students were able to choose their majors based on their own abilities and interests, others appeared to make choices blindly due to insufficient knowledge about different majors.

From the perspective of enrollment work, admissions staff believed that the university still lacks major-related publicity and guidance for students in their major selection, which needs further improvement. Additionally, they pointed out that family economic conditions also influence students' choices. Students from financially disadvantaged backgrounds tend to prefer majors with better employment prospects and higher expected salaries [19].

4.5. Summary of Research Findings

This study conducted an in-depth analysis of the factors influencing students' choice of the electronic information major through questionnaires and semi-structured interviews. The questionnaire results indicated that professional factors and family factors had relatively significant impacts, with family influence being particularly prominent, while university and personal factors had comparatively less influence. The interview findings further confirmed that the popularity of the major and employment prospects were the primary driving forces behind students' decisions, and family influence remained a significant factor. Some students also demonstrated a certain degree of blindness in their choices. Furthermore, family financial conditions affected students' decisions to some extent.

Overall, students' choice of major is the result of multiple interacting factors, including personal interests, career prospects, university conditions, and family background. Among these, employment potential and family background are especially critical.

5. Conclusion

5.1. Summary of the Study

Based on the above findings, students' choice of major is influenced by a combination of factors, with family and professional considerations playing key roles in the decision-making process. At the same time, issues such as students' limited awareness and biased guidance from families have also been revealed. To optimize the major selection mechanism within the electronic information category and support students in planning their academic and career paths more scientifically, it is essential to establish a collaborative guidance system involving multiple stakeholders. As the core participants in the major selection process, students, parents, and universities each bear distinct responsibilities and functions. Therefore, it is necessary to propose targeted and practical guidance strategies from the perspectives of students, parents, and universities. This approach aims to fully leverage the strengths of each party, effectively address existing issues, and achieve a positive alignment among major selection, talent cultivation, and industry needs.

5.2. Recommendations for guidance

5.2.1. Student level

Students should thoroughly assess their personal interests and strengths and critically evaluate whether they are suitable for the electronic information major, considering the major's requirements in mathematics, physics, and programming. If necessary, they may use career assessment tools, such as the Holland Occupational Interest Test, to better understand their own interests and aptitudes [20]. They should also stay informed about industry trends and employment prospects, learning about popular areas, competition, and academic requirements within the electronic information field through industry lectures and internships, in order to plan their academic and career paths in advance.

In addition, it is important to focus on practical experience and skill development. While learning core theoretical knowledge, students should also actively acquire programming skills in languages such as Python and C++, and participate in electronic design competitions, innovation and entrepreneurship projects, and other practical activities to enhance their professional competencies.

5.2.2. Family Level

Parents should develop a thorough understanding of their children's interests and strengths through daily communication and offer reasonable advice on major selection. It is important to avoid imposing their own preferences and

instead respect their children's choices [21]. Parents can help their children gain a comprehensive understanding of the electronic information major by reviewing relevant information and consulting with professionals to clarify the nature of the major, its curriculum, and career prospects. In addition, when assisting their children in choosing a major, parents should balance economic considerations with the child's individual development. Research indicates that if parents plan their child's academic path solely based on job prospects or short-term returns, it may undermine the child's initiative and even lead to choices that go against their interests [22]. Therefore, parents should work with their children to develop a long-term academic plan, clarify the feasibility of various educational expenses, and, at the same time, encourage rational decision-making based on personal interests and abilities. This approach helps children avoid blindly following popular majors and fosters adaptability and independent decision-making skills.

5.2.3. University Level

Universities should strengthen professional awareness education by offering introductory courses in various fields and inviting industry experts and successful alumni to deliver lectures. This can help students develop an early understanding of emerging technologies and trends in the field of electronic information. Practical activities such as lab visits and enterprise tours should be organized to deepen students' understanding of professional applications.

An entrance assessment system should be implemented to evaluate students' foundational knowledge in mathematics, physics, and other key areas, as well as their overall competencies, thereby enabling personalized major guidance. The curriculum design for the electronic information field should emphasize the systematic cultivation of technical skills, integrating theoretical knowledge with hands-on practice by constructing task-based models and building a technically oriented curriculum system.

Additionally, a comprehensive guidance framework should be established, including a dual-mentor system with both academic and industry mentors to support students in academic research and career planning. A student growth portfolio should be developed to document learning progress and practical achievements. Showcasing successful alumni case studies can also inspire students, improve the alignment between students and their chosen majors, enhance learning motivation, increase employment quality and postgraduate enrollment rates, and strengthen the institution's professional brand.

5.3. Research Limitations and Outlook

This study focused solely on first-year students at Shanghai University of Engineering Science, limiting the scope and generalizability of the findings. In future research, the sample size could be expanded to include students from different regions and institutions, allowing for comparative analysis across groups to obtain more representative results.

Additionally, future studies could explore a wider range of majors to provide a broader reference framework for major selection and university admissions. Longitudinal studies could also be employed to track students with different motivations for choosing the same major, in order to further investigate how initial motivations influence academic and career development. Such research would offer more targeted recommendations for university major education and talent cultivation.

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