The role of social and family factors in women's choice of ICT studies in Paraguay: Findings from FPUNA graduates.

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Abstract

This study analyses social and family expectations that influence the decision of female graduates from Information and Communication Technology (ICT) programs at the Polytechnic Faculty of the National University of Asunción (FPUNA) to pursue this professional field. Based on a questionnaire administered to 63 graduates, three thematic areas were analyzed: attitudes toward women in ICT, gender-related social pressure, and family support and expectations. The results show that the family environment played a largely positive role in career choice, although pressures associated with gender stereotypes and traditional expectations were also identified. The participants reported confidence in their own abilities, while indicating persistent inequalities in opportunities. This work shows that the decision to study ICT does not occur in isolation, but rather within a social and cultural context that can both facilitate and hinder. It concludes that gender-sensitive vocational guidance policies and supportive environments are necessary to encourage women's participation in the technology sector.

Keywords

higher education, women, gender,

1. Introduction

Although significant progress has been made in promoting gender equality in higher education, women remain underrepresented in fields such as engineering, computer science, and emerging technologies. According to UNESCO, only 3% of women in higher education choose ICT-related programs [1]. Moreover, as reported in [2], women in low- and lower-middle-income countries are less likely to possess basic information and communication technology skills. In Latin America, despite the development of inclusion policies, gender stereotypes, social expectations, and family dynamics continue to shape career choices [3,4].

This phenomenon is part of a broader issue affecting STEM disciplines (science, technology, engineering, and mathematics) tied to innovation, digital transformation, and

economic development. Several studies indicate that educational choices are not determined solely by individual abilities or interests, but also by societal expectations of what is considered appropriate for women, as well as by the extent of family support [1–5].

In Paraguay, this gap is also evident. A recent study by Méndez Xavier et al. [6] reported consistently low levels of female participation in ICT programs at the Polytechnic Faculty of the National University of Asunción (FPUNA), showing the need to better understand the social factors influencing these decisions.

This paper aims to provide empirical evidence from the Paraguayan context by presenting the results of a structured questionnaire administered to women who completed ICT programs at FPUNA, on their perceptions of the influence of their social and family environments on their field-of-study choices. Although the instrument covers additional dimensions, this paper focuses specifically on social attitudes toward women in ICT, social pressure linked to traditional gender roles, and the level of support received from their families.

This paper is organized as follows: Section 2 presents the theoretical framework underpinning the study; Section 3 details the methodology; Section 4 provides the analysis of the results; and Section 5 offers the conclusions.

2. Theoretical Framework.

According to UNESCO [1,3], the proportion of women choosing ICT careers in higher education does not exceed 3%, a trend that persists in Latin America. In Paraguay, this gap also appears in institutions such as the Polytechnic Faculty of the National University of Asunción (FPUNA), where the female enrollment and graduation rate in ICT programs remains low [6].

Among the most influential factors contributing to maintaining the gender gap in ICT-related programs are societal expectations about gender roles, which often associate technical or technological fields with traditionally masculine attributes [4,5,7,8,9,10,11,12]. These ideas can act as symbolic barriers, hindering women's identification with fields such as engineering or computer science and constraining their academic and professional aspirations, especially when they lack visible female role models [7,8,9]. In addition to the social environment, the family also plays a key role in decision-making regarding academic futures [4,5,10,11,12]. Family expectations regarding success, the type of career deemed appropriate, and the type of support provided (emotional, economic, or academic) directly impact the choice of and retention in higher education [5].

In Latin American contexts, where family is often important for career decisions, this type of influence is highly relevant, as reported by various studies. For example, according to the report by Women United for Education [4], in Mexico and other countries in the region, the lack of family support or pressure to choose safer or more traditional careers remains a limiting factor for women's participation in ICT. Similarly, research conducted in El Salvador [10] indicates that vocational decisions in STEM fields are not solely based on personal interests, but also on socially constructed gender expectations, the availability of family support, material conditions, and the exposure to or absence of female role models. Consistent with these findings, [11] points out that gender stereotypes and cultural perceptions about STEM careers influence women from their earliest life experiences, shaping how women see themselves in relation to fields such as computer science. Besides, [12] noted that the unequal distribution of domestic duties and the lack of female role models in computer science are structural barriers that limit girls' academic and professional trajectories in technological fields.

3. Methodology.

This study adopts a quantitative, descriptive, and cross-sectional design. Data were collected through a structured questionnaire administered once through a self-administered digital form. The objective was to describe the perceptions of female graduates of the Computer Engineering program at the Polytechnic Faculty of the National University of Asunción (FPUNA) regarding the influence of their social, family, and educational environment on their decision to enroll in the program.

The target population was of 85 graduates, while 63 valid responses were collected, i.e., a participation rate of 72.9%, considered high for this type of study.

The survey was distributed using formal institutional channels and graduate networks of the ICT programs at FPUNA between April and May of 2025. Participation was voluntary and anonymous. Informed consent was obtained at the beginning of the questionnaire.

3.1.   Data collection instrument

As part of a broader research project on the sociocultural factors influencing women's low participation in ICT careers at FPUNA an extensive structured questionnaire was developed. The instrument covers dimensions related to gender stereotypes, educational and work experiences, and various types of barriers, among others. However, this paper focuses exclusively on the responses of graduates of the Computer Engineering (Informatics) program to questions about how social, family, and educational expectations influence women's decision to choose ICT programs at FPUN.

The included questions are organized into three thematic blocks: attitudes toward women in ICT, gender-related social pressure, and family support and expectations, as shown in Table 1. Among the selected items are those that directly address the decision to pursue an ICT career (B5, B6, and block C), focusing on the influence of family and social environments. Besides, contextual questions were also included. While these did not explicitly address the moment of the choice, they provided relevant information about the sociocultural environment and the supportive or constraining conditions surrounding that decision. In general, the questions were formulated using five-point Likert scales. These items enabled the exploration of graduates' perceptions of how their social and family environments influenced their decision to study ICT.

3.2.   Data analysis

Data processing and analysis were carried out using Microsoft Excel and Python scripts. Descriptive frequency analyses (absolute and relative) were applied to each question. No additional data-cleaning procedures were applied, as only complete responses were included. Internal consistency (Cronbach's alpha) was assessed for the groups of selected items within each thematic block. Overall, the results indicated moderate internal consistency, but not high enough to justify treating the items as a single homogeneous scale. Therefore, the results are presented and analyzed item-by-item to identify specific perception patterns without aggregating the data into composite indices.

Table 1

Dimensions and questionnaire items.

Dimensions		Questions
Attitudes toward women in ICT	A1	Women possess the same capacity as men to develop ICT skills
	A2	Women have the same opportunities as men to develop ICT skills
Gender-related social pressure	B1	How would you compare the likelihood of success of a project led by a woman versus one led by a man?
	B2	It is natural and positive for women to hold leadership roles in ICT projects.
	B3	Women face more challenges than men when leading ICT projects.
	B4	Society sees women as just as capable as men of working in technology careers.
	B5	Other people's opinions about what women should do influence their decisions to study technology careers.
	B6	Ideas that certain jobs are "for men" or "for women" affect women's opportunities in the technology sector.
Family support and expectations	C1	How important was your family's support and advice in your decision to study ICT?
	C2	Before you began your studies, did your family consider an ICT degree to be an appropriate choice for you?
	C3	To what extent did the predominant ideas and values in your family influence your decision to study ICT?
	C4	Do you agree that the opinions of people around you (family or friends) influenced your decision to study ICT?
	C5	Do you agree that you feel pressure to conform to traditional gender roles?

4. Analysis of Results

4.1. Attitudes toward women in ICT

Figure 1 presents the results of this section, which examines graduates' perceptions of equality in capabilities and opportunities between women and men in the field of Information and Communication Technologies (ICT). For question A1, "How much do you agree with the following statement: Women possess the same capacity as men to develop ICT skills?" there was a high level of agreement: 87.3% of participants (55 out of 63) selected "Strongly agree", and 9.5% (6 responses) selected "Agree". Only two graduates chose "Strongly disagree", and none selected the intermediate categories. These results indicate a widely shared perception of equality in technical abilities between women and men in the ICT field.

Question A2, "How much do you agree with the following statement: Women have the same opportunities as men to develop ICT skills?" shows the follows: 65.1% answered favorably (14 "Strongly agree" and 27 "Agree"), 23.8% disagreed (12 "Disagree" and 3 "Strongly disagree"), and 11.1% selected the neutral option. These answers suggest that, although the graduates perceive themselves, in general, as equally capable, they acknowledge that they do not have the same opportunities for equitable access to development in the field.
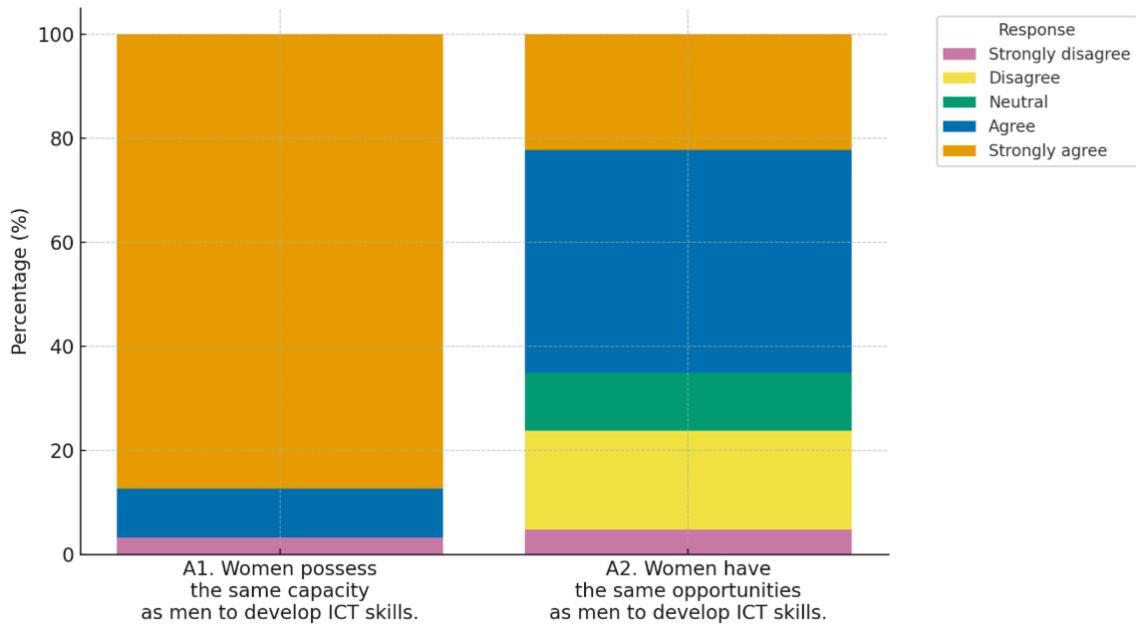
Figure 1: Perceptions regarding women's capabilities and opportunities in ICT.

## 4.2. Gender-related social pressure

In question B1, which examines whether a project led by a woman has the same likelihood of success as one led by a man, 65.1% of respondents selected "Equal", 20.6% chose "Greater", and 12.7% "Much greater", while only 1.6% considered the chances to be "Lower". The results, shown in Figure 2, that despite the majority recognize the same level of expected performance, a considerable proportion of respondents also perceive advantages in female leadership. This may reflect positive experiences or an ideological orientation supportive of gender equity. This finding highlights the need for further analysis of how these differentiated perceptions are formed within the professional ICT environment.
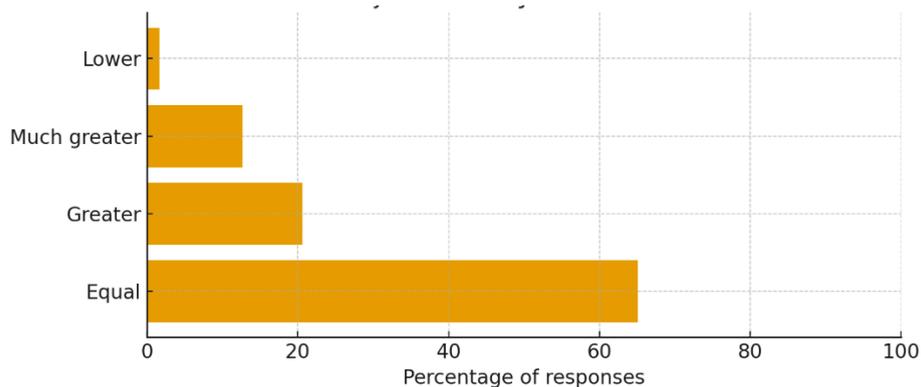
Questions B2, B3, and B4, whose results are grouped in Figure 3, examine perceptions and barriers related to leadership. Regarding question B2, "It is natural and positive for women to hold leadership roles in ICT projects", responses reflect a highly favorable view: 63.5% of participants selected "Strongly agree" and 22.2% "Agree". Only 14.2% chose neutral or disagreeing options, indicating a general positive perception of women's presence in technological leadership roles.

For question B3, "Women face more challenges than men when leading ICT projects", the results reveal widespread awareness of structural inequalities: 57.1% selected "Strongly agree" and 23.8% selected "Agree", while only 9.5% selected "Disagree". These findings suggest that although female leadership is positively valued, respondents recognize that women encounter greater obstacles when exercising leadership on equal terms.

In question B4, "Society sees women as just as capable as men of working in technology careers", responses were as follows: 41.3% "Strongly agree", 25.4% "Agree", 23.8% the neutral option, and 9.5% selected "Disagree". These results suggest that participants perceive the existence of social stereotypes that still question women's capabilities in the technology field.
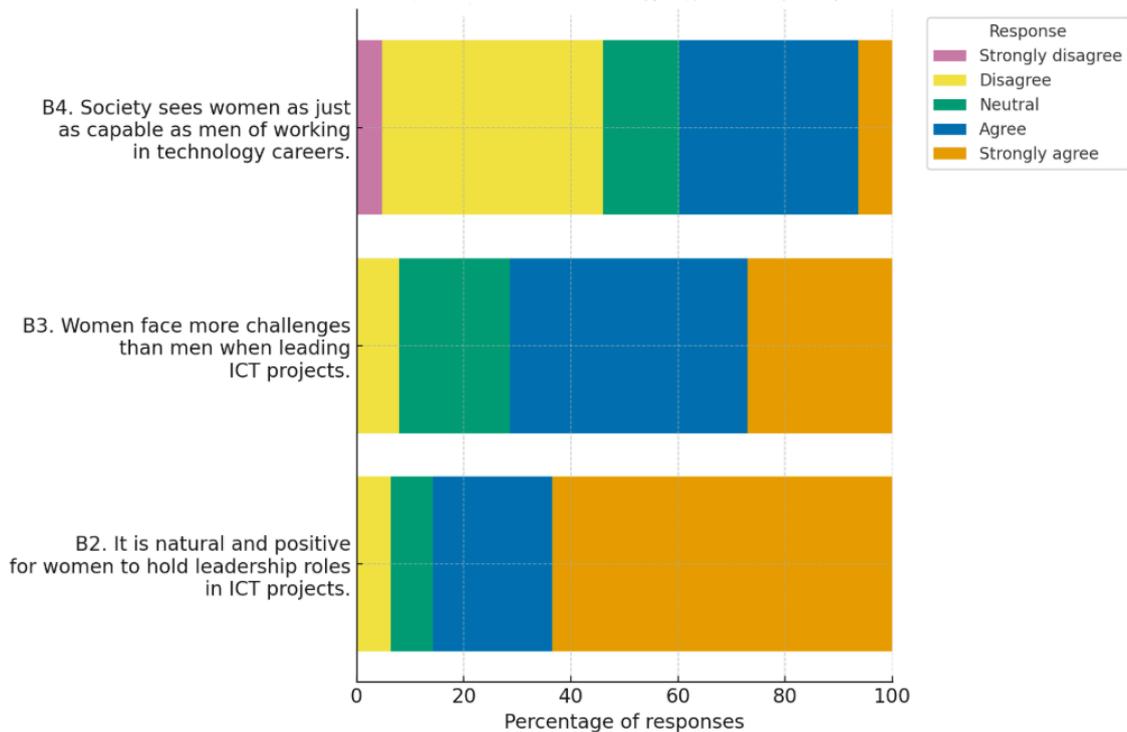
Figure 3: Responses to questions B2, B3, and B4 on perceptions and barriers related to women's leadership.

Questions B5 and B6, whose results are presented in Figure 4, examine the influence of social factors on women's vocational decisions and their opportunities in the technology field. In B5, "Other people's opinions about what women should do influence their decisions to pursue careers in technology", 38.1% of respondents selected "Agree", 28.6% chose the neutral option, and 11.1% selected "Strongly agree". In comparison, 22.2% expressed some level of disagreement. These findings indicate that, although there is no absolute consensus, a large proportion of graduates acknowledge that social pressure can influence women's career choices.

In B6, "The belief that certain jobs are 'for men' or 'for women' affects women's opportunities in technology", responses were more decisive. Only 6.4% expressed any level of disagreement, whereas 55.6% selected "Strongly agree" and 27% selected "Agree", resulting in 82.6% recognition that gender stereotypes have an impact on opportunities. These results reinforce the view that cultural conditioning remains a barrier to women's participation in the technology sector.
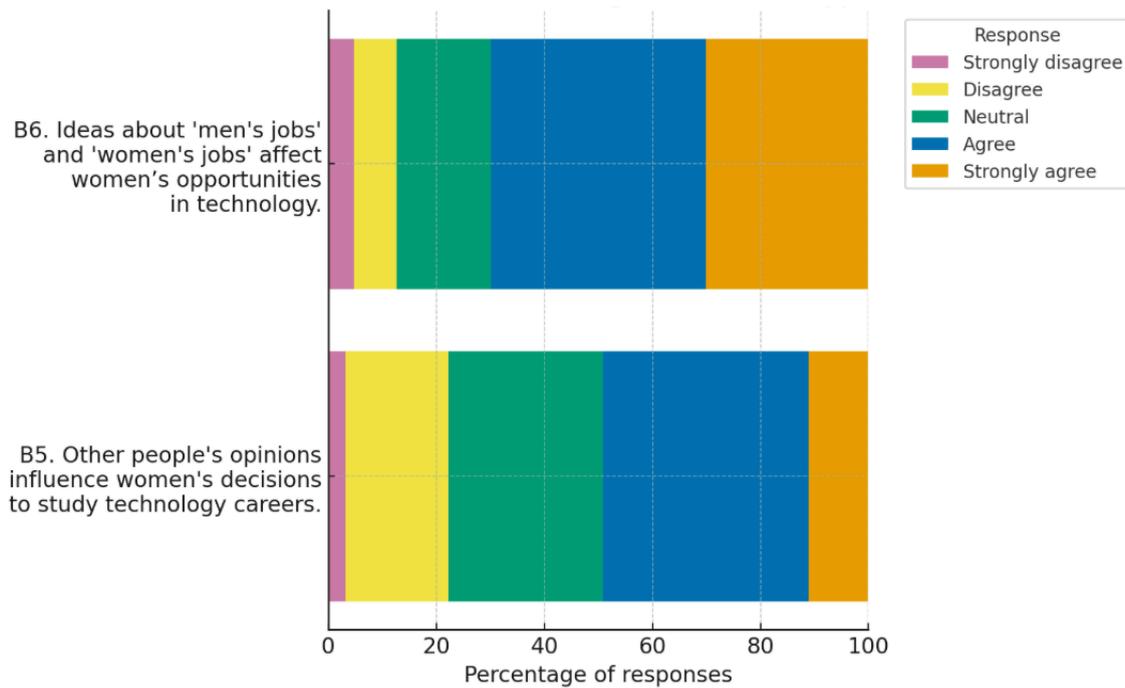
Figure 4: Responses on the influence of social factors on vocational decisions and on women's opportunities in technology.

4.3. Family support and expectations

For question C1, "How important was your family's support and advice in your decision to study ICT?", 49.2% of respondents indicated that it was "Very important", and 19% reported it was "Extremely important". Only 11.1% downplayed this influence, selecting "Not at all important" or "Not very important". These results suggest that, for most graduates, family guidance played a meaningful role in their decision to pursue an ICT degree.

In question C2, "Before you began your studies, did your family consider an ICT degree to be an appropriate choice for you?", 47.6% responded "Appropriate" and 22.2% "Completely appropriate". Although these figures reflect generally positive family perceptions, 15.9% expressed a neutral view ("Neither appropriate nor inappropriate"), and 14.3% reported that their family regarded the degree as "Inappropriate" or "Completely inappropriate". This indicates that, while the family environment is typically supportive, certain misconceptions or a lack of familiarity with the ICT field persist.

For question C3, "To what extent did the predominant ideas and values in your family influence your decision to study ICT?", 38.1% of respondents reported a "Strong influence", and 15.9% indicated a "Very strong influence". Altogether, more than half of the participants identified a substantial family influence on their vocational decision, whereas only 12.7% stated that their family environment did not influence at all.
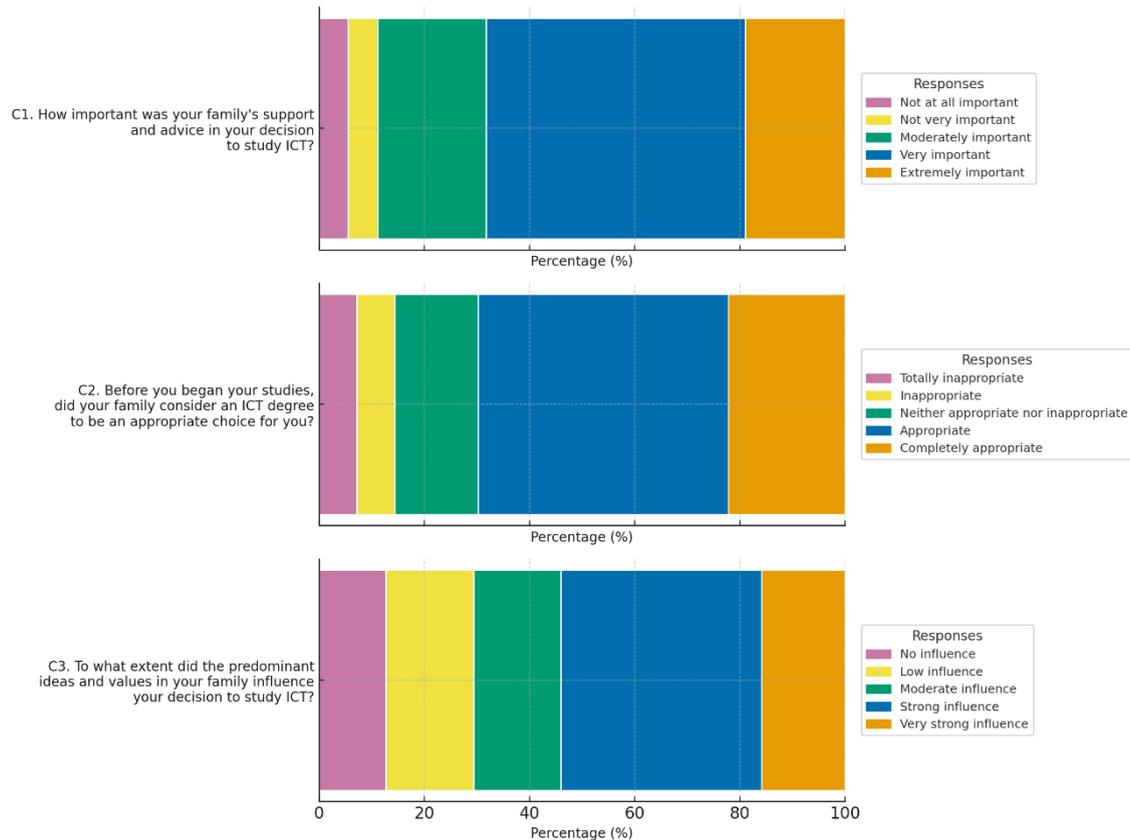
In question C4, "The opinions of those around me (family, friends) influenced my decision to study ICT", 22.2% of graduates "Agree" with this statement. Only 6.3% "Strongly Agree", while 27% "Disagree", 20.6% "Strongly Disagree", and 23.8% remained neutral. These results show that, for many graduates, the social environment was not a decisive factor in their choice, or they did not perceive it as such. The low level of consensus suggests varied experiences and possibly an indirect or implicit influence of opinions from those around them.

Finally, in question C5, "I feel pressure to conform to traditional gender roles", most responses indicated negative options, with 41.3% "Strongly Disagree" and 30.2% "Disagree". Only 7.9% agreed, and 11.1% chose the neutral option. This distribution indicates that most graduates did not feel pressured by gender stereotypes when choosing their careers or during their studies. However, a small group acknowledged experiencing such pressure. The low level of agreement with the statement about pressure from gender roles could be influenced by the fact that these are graduates who are likely to have more supportive environments or developed personal strategies to cope with gender stereotypes.

5. Conclusions

This study presents results on the influence of social and family expectations on the career choices of women who graduated with Computer Engineering degrees from FPUNA. Based on an analysis of 63 valid responses, this work considered three dimensions to understand the complexity of the vocational choice process in this context.
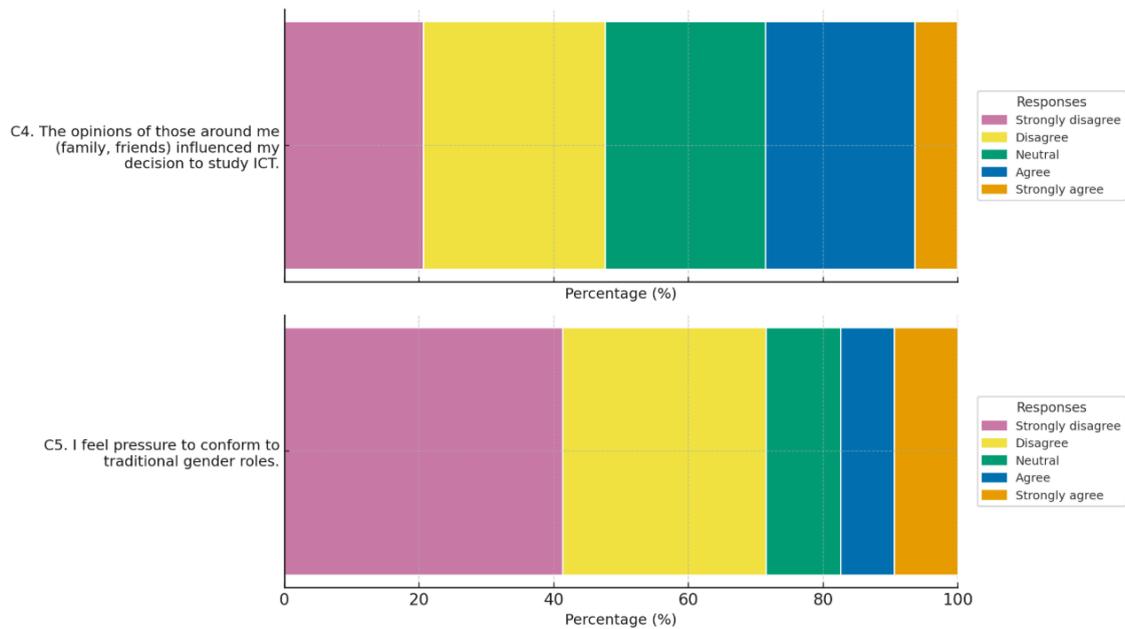
Figure 6: Responses on how opinions from the social environment influence decisions

The results presented highlight some perceptions of women who graduated with ICT degrees from FPUNA regarding the influence of their social and family environment on their career choices. While the equality of technical abilities between women and men is widely recognized, interviewees report that perceived differences persist in opportunities and structural barriers that affect professional development in the technological field. Likewise, the family is a relevant factor, both in terms of support and normative influence, although experiences vary across individual contexts.

Considering that this study is based solely on quantitative data and focuses on a specific population (graduates of a single degree program), its results should be considered as an initial approximation. These findings will need to be complemented with qualitative techniques that allow for a deeper exploration of personal experiences and a richer, more interpretive reconstruction of decision-making processes. Furthermore, future research could incorporate the complete set of dimensions from the original instrument, enabling a more comprehensive analysis of the sociocultural factors contributing to women's low participation in ICT careers.

However, even though we consider this work preliminary, we emphasize that the findings reinforce the importance of developing gender-sensitive institutional policies and vocational guidance programs that highlight ICT as a valid option for all people, regardless of gender, and that strengthen family and community support networks. We also highlight the need for further research into these dynamics within the Paraguayan context, where studies on gender and technology education remain scarce.

Acknowledgments

Declaration on Generative AI

AI is used to translate texts and reformulate sentences and improve clarity.

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