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## Promoting Financial Competence in Information Technology: Challenges and Global Standardization in the Bachelor of Computer Engineering Programs at Costa Rican Universities in 2024

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### Abstract

This article examines the financial management competence of information technology and computing professionals in Costa Rica, compares their training to global standards, evaluates the educational offerings, and analyzes the impact of sociodemographic attributes. The purpose is to gain a deeper understanding of their ability to effectively manage finances within the technological context. A quantitative approach is applied through a survey, and a multiple linear regression model is used to explore the relationship between education and financial management in technology, highlighting the influence of variables such as educational offerings and sociodemographic attributes.

The results reveal a significant deficiency in the financial education of these professionals, with only 14% achieving correct answers. Additionally, factors such as gender and geographic location are found to impact financial competence. Current academic programs lack a proper focus on financial aspects in technology, limiting graduates' ability to perform in financially demanding environments.

Limitations include sample representativeness and the homogeneity of educational quality, which may affect the generalizability of the findings.

This article provides a new perspective on the need to integrate financial management into technological training and proposes curricular improvements to develop a well-rounded professional profile.

**Keywords:** Financial Competence, Financial Management in Technology, Financial Education

### Introduction

Financial management in information technology plays a critical role in bridging the gap between the strategic contributions of the information and communication technology (ICT) sector and its financial impact on organizations. By implementing robust financial management practices in technology, professionals in Information Technology and Computer Science can effectively allocate resources, optimize spending, and quantify the financial value of their investments. This enables them to demonstrate expertise and control within organizational entities.

In this regard, Tuffour et al. (2022) demonstrate a positive effect of financial education on business performance and recommend capacity-building programs to enhance financial literacy within companies [1]. In today's dynamic business

landscape, the ICT sector is closely intertwined with organizational performance, requiring IT and Computer Science professionals to define and articulate the activities and services they provide, increasingly aligning them with business outcomes.

However, despite the growing importance of ICT in the business sector, most IT and Computer Science professionals frequently face the challenge of communicating with audiences that do not always understand technical jargon. Additionally, they often struggle to convey concepts outside the realm of technology. Consequently, the lack of basic financial knowledge or financial education highlights significant challenges in making effective decisions and demonstrating the financial value of ICT during budgeting processes, particularly when justifying their investments.

From Garay (2020) perspective, a financially educated professional possesses the minimum conceptual and procedural tools necessary to understand the economic landscape and interpret events that directly or indirectly affect them, enabling informed decision-making in daily life [2]. Common challenges faced by IT and Computer Science professionals include mandatory budget cuts, difficulties in securing necessary funding for their operations, and even challenges in advancing their position within organizations.

According to Le et al. (2022), every graduate from a technical program, regardless of their specialization, should possess expertise in their field of study [3]. Additionally, they must acquire three essential 21st-century skills: learning skills, information literacy, and life skills. Among the information literacy skills are competencies related to understanding numbers, statistics, and data.

According to the Organisation for Economic Co-operation and Development (OECD) (2020), assessing levels of financial education is a crucial step in creating a successful national strategy [4]. The OECD defines financial education as the combination of financial awareness, knowledge, skills, attitudes, and behaviors necessary for sound decision-making, enabling individuals to achieve financial well-being. In 2023, the organization highlighted a research conducted across 39 countries, including several in Latin America, which revealed a significant weakness in the application of basic financial skills. These deficiencies may be insufficient for making informed financial decisions in today's challenging economic contexts.

In 2019, Costa Rica issued an executive decree declaring financial education for citizens to be of public and strategic importance. It also established a multisectoral working group comprising public and private strategic partners, including banks, credit unions, asset management companies, and universities, among others, to develop the Financial Education Strategy (FES). This initiative aims to support the efforts coordinated through this framework.

Universities represent one of the main pillars of society, fostering communities dedicated to learning and the personal development of their members. Through research, creation, application, and evaluation of new knowledge, they make significant contributions to societal improvement. In this context, universities must develop comprehensive programs that include courses aimed at strengthening students' financial skills and capacities. These programs should consider the most suitable pedagogical model for the targeted educational level.

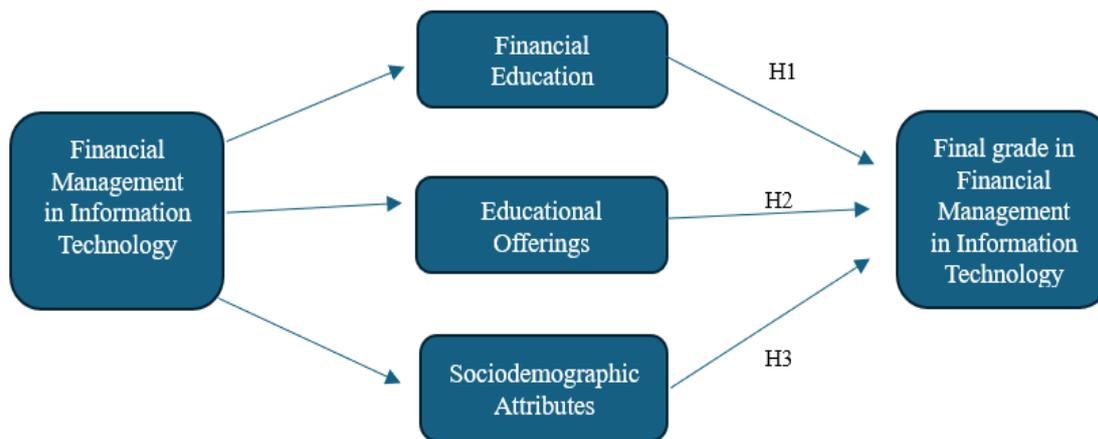
According to Amar et al. (2023), individuals benefit from financial education by gaining vital and relevant information that enables them to professionally manage resources. One of the primary objectives of financial education is to teach individuals critical concepts such as budgeting, planning, and financial management.

The main objective of this research is to analyze the profile of Information Technology and Computer Science professionals in relation to their knowledge and training in financial management within information technology. Additionally, the following specific objectives are outlined:

- To compare the level of financial education of Information Technology and Computer Science professionals in Costa Rica with the minimum global standards established by the OECD, in order to determine its impact on financial management in information technology.
- To evaluate the educational offerings in the Bachelor's degree in Computer Engineering at universities in Costa Rica, in order to determine their impact on financial management in information technology.
- To identify the sociodemographic attributes that significantly influence the financial management of information technology among Information Technology and Computer Science professionals.

The research identifies three independent variables: financial education, educational offerings, and sociodemographic attributes. It also analyzes their impact on the dependent variable, which is identified as financial management in information technology.

In line with this, these factors are used to develop the proposed hypothesis and form the basis of the research model, which is presented in Figure 1 for evaluating the research's objectives.



**Figure 1: Conceptual Model**

This research investigates the statistical relationship between three independent variables and one dependent variable. It also examines the following hypotheses in light of the outlined objectives and the proposed conceptual model:

### Main Hypothesis

HP: Information Technology and Computer Science professionals in Costa Rica have a level of knowledge and training in financial education and planning that is below the minimum standard recommended by the OECD, influenced by a lack of emphasis on these topics within the university educational offerings and by specific sociodemographic factors.

### Specific Hypotheses

- **HE1:** The level of financial management among Information Technology and Computer Science professionals in Costa Rica is below the minimum standards established by the OECD due to the limited financial education provided by universities.
- **HE2:** The educational offerings in Costa Rican universities, specifically in the Bachelor's degree in Computer Engineering, do not place significant emphasis on financial management training.
- **HE3:** Sociodemographic attributes, such as age, gender, and academic degree, significantly influence the level of financial management among Information Technology and Computer Science professionals in Costa Rica.

### Literature Review

#### Financial Education: A Concept in Transformation

From Mena-Campoverde (2022) perspective, financial literacy is defined as the process through which consumers and investors enhance their understanding of financial products [5]. This understanding encompasses awareness of risks, advice, opportunities, and the necessary and responsible decision-making that contribute to improving the lives of individuals within this discipline.

Additionally, Velasco (2022) uses the term financial education to refer to financial literacy applied to the specific educational realities [6]. In this regard, Plata and Caballero (2020) define financial literacy as the minimum ability to read and write in financial terms, understanding its application and striving for economic well-being in material realities [7].

This is why the present research focuses on the topic of financial education and its impact on the educational framework. On the other hand, Garay (2020) states that financial education has an impact in such a way that, throughout life, individuals need to make basic decisions regarding consumption, investment, savings, and money protection [2]. This understanding allows them to make crucial and informed decisions, taking into account their context and needs.

According to Antonio-Anderson (2020), the importance of financial education lies in the fact that this type of educational literacy provides the opportunity to gain benefits such as understanding the significance of savings, proper credit management, and other elements [8]. Similarly, García Mata et al. (2021) argue that financial education is not only based on understanding the value of money but also on how individuals act from and toward it [9]. These authors recognize that the importance of this concept also arises from its impact on individuals' well-being and the prominent role it plays in the development of societies.

On the other hand, authors such as Rodríguez and Martínez (2022) determine that financial education has been recognized as important in academia, businesses, and governments. This importance stems from its recognized impact on short- and long-term budgeting decisions. Furthermore, García-Santillán et al. (2024) state that financial education is understood from the significance of making financial decisions based on conceptual and applied knowledge of this discipline [10]. According to Hernández et al. (2022), the relevance of financial education today represents a transformative process, generating skills and abilities aimed at addressing human, social, and cultural needs [11].

From this perspective, Khan et al. (2024) envision that the ability to manage money is identified as a vital skill, in which financial education plays an extremely important role [12]. Behaviors such as compulsive buying, materialism, and a tendency toward doubt are issues that current generations suffer from, affecting various aspects of human life.

On the other hand, García Mata et al. (2021) suggest that one way to estimate this educational reality in the population is through three specific dimensions: attitude, behavior, and knowledge [9]. Additionally, authors such as Dogra and Sharma (2023) reaffirm these dimensions, while identifying a strong relationship between attitude and financial knowledge, so that financial education is recognized as vital for the success and economic growth of a nation [13].

From a conceptual perspective, Plata and Caballero (2020) detail these concepts as follows [7]. First, financial attitude is understood as the self-efficacy and motivation needed to apply a determined stance in various contexts. Second, financial behavior is defined as the way individuals react to various situations that involve managing money. Finally, financial knowledge is conceptualized as the information people possess to develop an attitude or skill related to financial realities.

However, authors such as Tuffour et al. (2022) highlight three similar but not exact concepts associated with these dimensions: awareness, attitude, and knowledge [1]. It is important to mention that authors like Solevar and Harris (2020) explicitly state that there is a clear gap in financial education between men and women within societies [14]. In response, the authors acknowledge the need to promote financial education programs for women, an issue that should be of greater interest in developing countries with a broader agenda of needs.

On the other hand, authors like Johri and Kamal (2023) recognize a close relationship between financial education and programs aimed at raising awareness about financial education [15]. That is, the lack of interest from authorities in financial education also has a tangible influence on the financial decline of individuals and societies. In response, Corsini and Gianneli (2021) explain the great relevance of financial education, emphasizing the strict need for such literacy to be offered obligatorily to young people, particularly in populations with a significant current and future impact on society, such as university populations [16].

#### Financial Education in Information Technology Students

Financial education has become an essential component in the training of professionals across various disciplines, including computer science and information technology. Numerous studies have shown that financial education is crucial for making informed economic decisions and for personal and professional financial planning. According to Ferrera et al. (2019) and Fallo and Sconti (2024) the belief that better financial education enables individuals to make better decisions has sparked significant interest in this field in recent years, both in international organizations (such as the OECD) and in many countries worldwide [17,18].

Despite the relevance of this discipline, the effectiveness of financial education programs has been the subject of debate. Authors such as Paraboni and Da Costa (2021), Kasozi and Makina (2021), and Klapper and Lusardi (2019) suggest that students who receive financial training tend to achieve better results in resource management and decision-making in their professional careers [19-21]. Others argue that applying these skills practically in the professional world remains a challenge.

According to Caeiro-Rodríguez et al. (2021), financial education in Latin America has been considered insufficient, and the technical and scientific fields are no exception [22]. The integration of financial content into technology education programs has historically been limited, resulting in a significant gap in the financial competencies of these professionals. The lack of integration between finance and technology in academic programs has led to inadequate preparation for facing the economic and financial challenges in the labor market. In Costa Rica, this issue is even more pronounced, as the majority of university programs in computer science and information technology do not include finance courses as part of their curriculum.

#### Financial Planning in Information Technology Professionals

According to Mgunda (2019), proper financial planning is key to the success of technological projects and the financial sustainability of organizations [23]. However, authors such as West et al. (2019) and Cull (2019) emphasize that the level of financial planning preparation among information technology (IT) professionals is limited, making it difficult to implement effective financial strategies in the corporate environment [24,25].

On a global scale, financial planning in IT has evolved significantly over the past few decades. Initially, it focused primarily on cost management and operational efficiency. However, Rodríguez et al. (2019) and Dave (2023) acknowledge that strategic financial planning, which includes risk management and optimal resource allocation, has been shown to enhance technological innovation and improve the competitiveness of companies [26,27].

#### Financial Management in Information Technology

Financial management in technology, which includes allocating financial resources for technological projects, is a critical component for the success of organizations in the digital age, where technologies are used daily across companies,

industries, and sectors. However, there is little consensus on the best way to manage these technologies and resources [28].

According to Castellanos-Meza et al. (2022), proper financial management is understood as one of the main functional areas, as it enables decision-making and actions related to the business and global context [29]. However, the lack of financial competencies among technology professionals can lead to inefficient resource management and ineffective communication with other areas of the organization, such as finance and administration.

Almutairi (2023) identified that integrating financial knowledge into financial management in technology improves interdepartmental communication and helps align technological objectives with financial goals [30]. Additionally, involving IT professionals in financial decision-making has proven to be a key factor in creating value and ensuring the success of technological projects. In Latin America, financial management in technology is a challenge due to the lack of financial training among IT professionals.

This educational gap has led to poor communication between technology and finance departments, which in turn has impacted the implementation and success of technological projects. In Costa Rica, the situation is similar, and although efforts are being made to improve financial education for citizens, the study programs for professionals in Computer Science and Information Technology show a lack of integration between these areas, which constitutes a significant obstacle.

## **Research Methodology**

### **Methodological Approach**

The methodology of this research is based on the approach proposed by Hernández Sampieri and Mendoza (2020), who state that the approach can be defined as qualitative, quantitative, or mixed [31]. In this case, the nature of the research is recognized as quantitative, meaning its focus is on numerical counts and mathematical methods to test hypotheses or assumptions.

### **Primary Data**

The primary data source comes from an on-line survey distributed among professionals in computer science and information technology who work directly in the information technology sector, but are not necessarily members of the College of Computer Science and Information Technology Professionals (CCIP). The survey includes a total of 33 questions, of which 4 are sociodemographic, 28 are designed to assess knowledge and practices related to financial education (FE) (7), financial planning (FP) (7), financial management in technology (FT) (7), and effective communication in the workplace (EC) (7). Finally, 1 question is an open-ended response.

The research specifically focuses on the dimension of financial management in technology, understanding its impact on the research context and the final result, which reflects the level of knowledge demonstrated by the selected sample.

### **Study Population**

Hernández Sampieri and Mendoza (2020) define the study population as the set of data that aligns with a series of specifications [31]. According to information provided by the CCIP, the college has a total of 9,395 active members representing professionals in computer science and information technology in Costa Rica, of which 77% are men and 33% are women. Regarding academic level, 4 hold a doctoral degree, 606 have a master's degree, 2,864 have an university's degree, and 5,921 hold a bachelor's degree, which is the minimum qualification for membership. In terms of residence location, 90% live in the Greater Metropolitan Area, while the remaining 10% reside in other parts of the country.

### **Study Sample**

The sample is defined by Hernández Sampieri and Mendoza (2020) as the subgroup of the population that allows for the generalization of the research [31]. To determine the sample size for this research, a sample size calculator was used with a 95% confidence level and a 5% margin of error.

$$\text{Sample size} = Z^2 * (p) * (1-p) / c^2.$$

Where:

Z = 95% confidence level

p = 0.5

C = Margin of error (.05 = ±5%).

According to the calculations, a sample of 370 participants is required, ensuring that the results are statistically representative of the total population. This size allows for drawing reliable conclusions about the studied population and minimizing the margin of error in the estimation of parameters. However, due to contextual limitations, it is deemed necessary to reduce the sample size to 100 participants, which will provide meaningful and crucial sociodemographic information relevant to the topic under study.

## Analysis Method

The analysis method is based on the use of Microsoft Excel tools to systematize the survey data obtained from Microsoft Forms applied to the selected sample. This survey focuses on questions related to financial management in information technology. For the analysis, Python is used as the main statistical tool due to its versatility and power in handling and analyzing large datasets. Additionally, specialized functions are employed to adjust the regression model, enabling efficient data processing and accurate estimations.

## Results

### Financial Education

In terms of the results regarding the financial education (FE) variable from the survey, only 14% of the participants met the minimum threshold, defined as answering at least five out of seven questions correctly.

Regarding financial knowledge, around 54% of participants understand the definition of inflation. However, only 31% on average can apply the concept of the time value of money and simple interest calculations to their own savings.

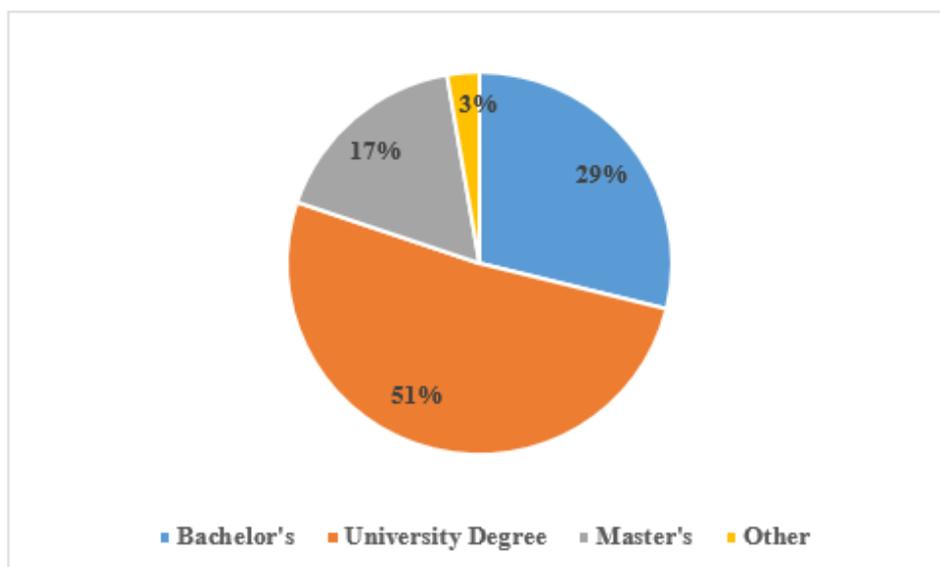
Furthermore, the findings show that about 59% of participants understand the relationship between risk and reward. However, it can be stated that only 36% of participants can correctly answer a question on compound interest calculations. Moreover, only 39% of participants answered the question related to calculating the interest on a loan correctly.

### Sociodemographic Data

The sociodemographic characteristics of the surveyed population are summarized as follows: 32.4% identify as women, 60.4% as men, and 7.2% as other. Regarding age ranges, the distribution shows different groups, with the majority of respondents being between 18 and 44 years old (77.5%), followed by those aged over 45 (22.5%).

As for the geographical location of the respondents, 90% are concentrated in the Greater Metropolitan Area (including 32% in the province of San José, 18% in Heredia, 23% in Alajuela, 17% in Cartago), while the remaining 10% reside in other parts of the country (in the provinces of Guanacaste, Limón, and Puntarenas).

Continuing with relevant data from the research, and as part of the objective to investigate the academic degree of the respondents, the detailed results are shown in Figure 1.



**Figure 1: Academic Degree of the Respondents**

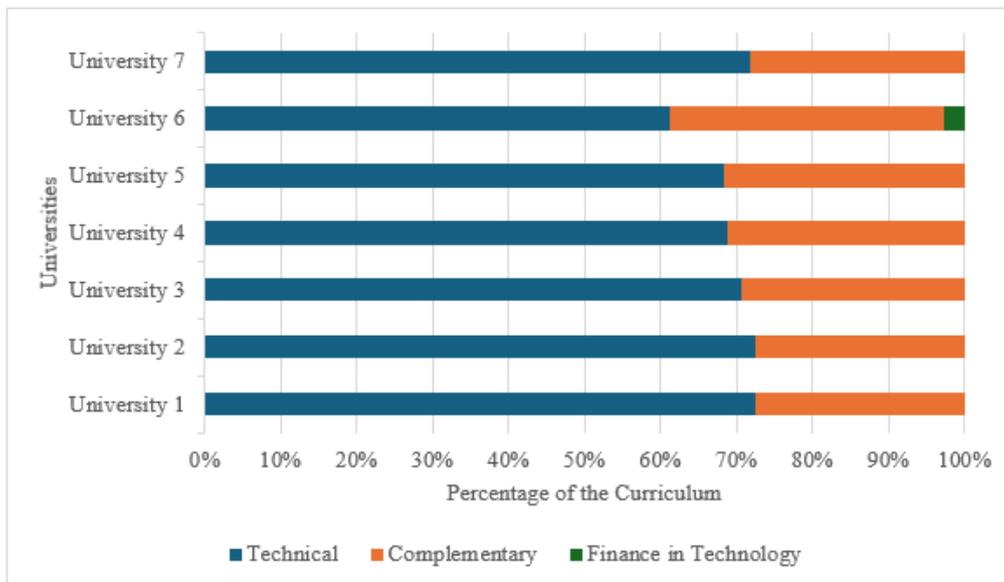
**Source:** Prepared by the author based on the collected data, 2024.

As observed, the group with an University's degree is the most representative, accounting for 51% of the total, followed by those with a Bachelor's degree at 29%. The remaining 20% consists of participants with a Master's degree or other qualifications.

### Bachelor's Degree Programs in Computer Engineering

Among the seven universities selected, which have accredited programs by SINAES (the National Higher Education Accreditation System), it is found that 57% are public universities and 43% are private universities.

As shown in Figure 2, the analysis of the study programs reveals that the distribution of areas is approximately 71% in technical fields and 29% in complementary areas.



**Figure 2: Percentage Distribution of Areas in the Bachelor's Degree Programs in Computer Engineering, Costa Rica, 2024**

**Source:** Prepared by the author based on the collected data, 2024.

In all the universities analyzed, the common subjects present in the Bachelor's degree programs in Computer Engineering as part of the technical area include: programming, data structures, and databases.

On the other hand, in the complementary area, common courses such as English and project management stand out. In this same area, University 4 includes a finance course, University 5 offers an accounting course, and University 6 includes a course in accounting, cost accounting, human resource management, and information technology planning and strategies.

It is noteworthy that University 6 is the only one that includes a finance course in technology. Therefore, it stands out with a distribution of 61% in the technical area, 36% in the complementary area, and 3% in the area of finance in technology.

### Multiple Linear Regression Model

Finally, Table 1 shows the results of the multiple linear regression model used to evaluate the relationship between the total final grade (TFG) of the survey results and the sociodemographic variables, including gender, academic level, and province of residence, as well as the final grade in technology finance (FGTF).

OLS Regression Results						
Dep. Variable:	Total Final Grade	R-squared:	0.761			
Model:	OLS	Adj. R-squared:	0.752			
Method:	Least Squares	F-statistic:	81.40			
Date:	Wed, 21 Aug 2024	Prob (F-statistic):	7.19e-31			
Time:	23:11:47	Log-Likelihood:	132.95			
No. Observations:	107	AIC:	-255.9			
Df Residuals:	102	BIC:	-242.5			
Df Model:	4					
Covariance Type:	nonrobust					
	coef	std err	t	P>  t	[0.025	0.975]
const	0.4246	0.015	29.213	0.000	0.396	0.453
Woman	-0.0381	0.015	-2.568	0.012	-0.068	-0.009
Bachelor	0.0511	0.016	3.295	0.001	0.020	0.082
Cartago	0.0546	0.018	2.994	0.003	0.018	0.091
Final Grade Finance in Technology	0.4938	0.028	17.536	0.000	0.438	0.550

Omnibus:	4.420	Durbin-Watson:	1.829
Prob (Omnibus):	0.110	Jarque-Bera (JB):	2.499
Skew:	-0.123	Prob (JB):	0.287
Kurtosis:	2.293	Cond. No.	5.25
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Notes:			
[1] Standard Errors assume that the covariance matrix of the errors is correctly specified.			

**Source:** prepared by the author through the use of Python.

**Table 1: Results of the R Model: Multiple Linear Regression**

### Regression Model

The regression model explains 76.1% of the variability observed in the Total Final Grade (TFG) ( $R^2 = 0.761$ ). The model is statistically significant ( $F(4,102) = 81.78, p < 0.001$ ), indicating that at least one of the predictor variables has a significant effect on the dependent variable.

### Regression Coefficients

The constant ( $\beta = 0.14246, p < 0.001$ ) of the model is positive and statistically significant, suggesting that the average TFG is 0.4246 for a reference individual (male, with an educational level higher than a Bachelor's degree, and residing in a province other than Cartago), assuming that the Final Grade in Technology Finance (FGTF) is zero.

The gender coefficient ( $\beta = -0.0831, p = 0.010$ ) associated with being female is negative and significant, indicating that, on average, women have an TFG that is 0.0831 points lower than men, holding all other variables constant.

The educational level coefficient (*Bachelor's degree*,  $\beta = 0.0511, p = 0.066$ ) possessing only a Bachelor's degree is positive, but not significant at the conventional level ( $p > 0.05$ ). This suggests that having only a Bachelor's degree may be associated with an increase in TFG, however, this association is not strong enough to be considered definitive. Furthermore, residing in Cartago (*Cartago*,  $\beta = 0.0546, p = 0.003$ ) is significantly associated with an average increase of 0.0546 points in the TFG compared to residing in other provinces.

The FGTF ( $\beta = 0.4938, p < 0.001$ ) has a positive and highly significant effect on the TFG with an average increase of 0.4938 points in the TFG for each additional point in the FGTF. This coefficient is highly significant, representing the strongest effect among the predictor variables.

The Durbin-Watson statistic of 1.892 suggests that there is no significant autocorrelation in the residuals. Furthermore, normality tests (Omnibus and Jarque-Bera) do not indicate severe deviations from normality in the residuals.

## Discussion

### Financial Education Among IT and Computer Science Professionals

In 2023, according to the OECD, an individual is considered to have basic financial literacy if they answer at least five out of seven questions correctly from the OECD/INFE 2022 toolkit, which establishes the minimum score required to demonstrate adequate financial understanding. This research developed a survey that incorporates this toolkit and includes a section on financial education (FE). The purpose is to support Specific Objective No. 1, aimed at comparing the financial literacy levels of IT and Computer Science professionals in Costa Rica with the global minimum standards set by the OECD. In this context, only 14% of respondents achieved the minimum required score, reflecting low financial literacy levels relative to the surveyed population.

These findings align with previous studies by Klapper and Lusardi (2019b), which emphasize low financial literacy worldwide, including research conducted in Peru by Wong and Burneo (2019) and in Greece by Philippas and Avdoulas (2019) [21,32,33]. However, the results contrast with high financial literacy levels observed in countries such as China, Germany, and Estonia, which rank highest in financial literacy globally. These insights are derived from the third global financial literacy exercise conducted by the OECD in 2023.

### Academic Programs in Computer Engineering in Costa Rica

As part of Specific Objective No. 2, which aims to evaluate the educational offerings for the Bachelor's degree in Computer Engineering at universities in Costa Rica, it was observed that only University 6 includes a course on technology finance, along with other complementary courses in general accounting, cost accounting, human resources, and strategic planning. This contrasts with the other six universities, none of which offer courses related to finance or technology finance. This finding aligns with Caeiro-Rodríguez et al. (2021), who emphasize that the integration of financial content into technology education programs has historically been limited, creating a significant gap in financial competencies among professionals in this field [22].

Meanwhile, authors such as Thomas and Subhashree (2020), Andreea and Bucur (2020), Corsini and Giannelli (2021), Vortman et al. (2022), Agasisti et al. (2023), and García-Santillán et al. (2023b), have highlighted efforts in countries

such as the United States, Italy, Greece, India, and Romania to incorporate financial modules into university curricula [16,34-36]. These efforts, spanning disciplines like law, nursing, tourism, and engineering, have demonstrated positive outcomes as part of a more comprehensive approach to professional education.

### **Sociodemographic Factors**

Specific objective n.º 3 of this research focuses on identifying the sociodemographic attributes that significantly influence knowledge of financial management in information technology among Computer Science professionals.

#### **Gender**

According to the findings of this research, none of the variables in the age category were statistically significant. However, Restrepo et al. (2023) highlight that teaching topics related to financial education is advisable and relevant for children and adolescents, as it helps improve the financial knowledge and behaviors they adopt in adulthood [37]. Similarly, Carrillo and Mondragón (2021) suggest that imparting financial education knowledge from an early age provides long-term benefits across the population, fostering better decision-making at both micro and macroeconomic levels [38].

On the other hand, Lusardi (2019) notes that in a survey conducted among Americans aged 50 and older, only half could correctly answer basic questions about interest rates and inflation [39]. Similarly, in Switzerland, only 45% of individuals under the age of 35 were able to respond to these fundamental questions.

#### **Academic Degree**

The findings of this research highlight the differential importance of educational attainment in the final survey score. Specifically, the results indicate that completing a high school degree plays a critical role in improving outcomes. Unlike higher academic degrees, such as bachelor's or master's degrees, which do not show a statistically significant correlation with final scores, having completed high school is positively associated with better performance, as evidenced by a coefficient of 0.0511.

This observation suggests that the competencies and knowledge acquired at this level are fundamental and may be sufficient to significantly impact the final survey score.

On the other hand, Walter (2019) notes in his research that graduate students surveyed demonstrate an education level ranging from fair to poor in financial literacy [40]. In another research, Sarango et al. (2023) argue that achieving a high level of financial literacy requires pursuing a graduate degree, as well as demonstrating high scores in attitude, behavior, developmental skills, and financial knowledge, assigning a probability of 0.375.

#### **Geographic Location**

The research results suggest that participants' geographic location can influence their performance on the tests. However, none of the seven provinces studied showed a negative impact on performance, indicating that belonging to any province does not detrimentally affect participants' scores. Similarly, the evidence indicates that residing in the province of Cartago is significantly associated with better test outcomes, with an increase of 0.0546 in scores compared to other provinces. This effect is statistically significant at the 95% confidence level, highlighting Cartago as a notable exception in the research.

This finding aligns with Meza (2021), who asserts that living in an urban area positively impacts the acquisition of high levels of financial knowledge compared to rural inhabitants [41]. Furthermore, Abad et al. (2022) emphasize the importance of geographic factors and their relationship with individuals' socioeconomic and cultural characteristics [42]. They also highlight aspects such as the attraction and retention of faculty, educational resources, and professional isolation.

#### **Technology Finance**

To evaluate the direct impact of specific competencies in technology finance, the variable "Final Grade in Technology Finance (FGTF)" was introduced. This revealed a positive and significant relationship with overall survey performance. This finding empirically validates the direct influence of education in technology finance on the global financial performance of survey participants.

The results indicate that each additional point in the FGTF is associated with a significant increase of 0.4938 points in the Total Final Grade (TFG). This insight highlights the importance of robust, specialized training in technology finance, suggesting that such education not only complements but directly enhances the general financial skills of professionals in the fields of Computer Science and Information Technology.

Aprilinda et al. (2019b) emphasize that various frameworks and standards in IT governance—such as COBIT, the International Organization for Standardization (ISO), the IT Infrastructure Library (ITIL), and the Committee of Sponsoring Organizations of the Treadway Commission (COSO)—aim to align corporate missions with the efficient and effective use of technology [43]. These frameworks focus on critical aspects such as quality, security, risk reduction, service continuity, and cost management. Notably, financial management in technology emerges as a key area that

supports and intersects with objectives related to profitability, asset utilization, business growth, and organizational flexibility.

Additionally, authors like Dharmawati et al. (2022) and Cobit (2019), emphasize that the APO 06 budgeting and cost management process aligns technology financial management with an organization's strategic goals [44]. This alignment ensures maximum value from technology investments and contributes to better financial performance, customer satisfaction, compliance, and operational excellence. Fuentes (2023) further underscores that this framework serves as an essential tool for evaluating and diagnosing technological processes within organizations [45]. It not only meets current needs but also optimizes organizational management and generates value.

## Conclusions

This research evaluates the level of financial education, financial management in technology, and the sociodemographic attributes of Information and Computer Technology professionals in Costa Rica. The findings not only reflect the current state of financial education within this sector but also provide a concise perspective on how academic training and sociodemographic factors directly influence the financial competence of these professionals.

The research was designed to address three specific objectives, each focused on exploring different dimensions of financial management in information technologies. First, regarding the comparison with OECD global standards, the findings reveal a concerning gap between the current level of financial education among Information and Computer Technology professionals and the standards recommended by the OECD.

In general, these professionals fail to meet the minimum standards. This aligns with Costa Rica's low financial knowledge scores in the Latin American region within the same category. Only 14% of respondents achieved the minimum score required to be deemed competent according to these standards. This result highlights a critical deficiency in the ability of these professionals to effectively manage both personal and professional finances—skills that are essential for informed decision-making and the efficient management of projects and resources in the technology sector.

Second, regarding the influence of sociodemographic attributes on this topic, the research highlighted that factors such as gender, geographic location, and academic degree significantly impact financial knowledge. Specifically, men and residents of the province of Cartago performed better and achieved higher scores on financial knowledge assessments. This finding suggests that strategies to improve financial education should take these sociodemographic differences into account and adopt a more personalized approach to be more effective.

Lastly, concerning the evaluation of the educational offerings, it is important to note that both public and private Costa Rican universities were assessed, particularly bachelor's degree programs in computer engineering. Among these, only one university includes a course on finance in technology. However, most programs are predominantly focused on technical areas, with insufficient emphasis on education and financial management in technology. This imbalance may limit graduates' ability to apply financial knowledge in technological contexts, adversely affecting their effectiveness and efficiency.

The research's limitations include the representativeness of the sample, which may not fully capture the variability among all IT and Computing professionals in the country, as well as potential variability in the quality of financial education provided by different educational institutions. Additionally, the low rate of correct responses may indicate limitations in the survey methodology or challenges in participants' interpretation of the questions.

Finally, the regression model developed is descriptive in nature, making it excellent for explaining variable behaviors within the surveyed population. However, it is less suited for forecasting outcomes for populations that have not yet taken the survey, as a predictive model would.

## Recommendations

Addressing the gaps in financial education and management in technology observed among IT and computing professionals in Costa Rica is essential. Effectively integrating financial knowledge into bachelor's degree programs not only equips future professionals with vital skills for managing the economic aspects of technological projects but also enhances the competitiveness of the national tech industry. In a global market that demands advanced financial and economic understanding, this approach fosters the development of a more robust, innovative, and economically sustainable tech sector.

The following strategic recommendations aim to tackle the challenges in financial education and management in technology, with the dual purpose of improving individual financial skills and strengthening the technological environment in the country:

Firstly, it is recommended to implement a comprehensive improvement in education and financial management. Thus, universities in Costa Rica should reassess and potentially reform their curricula to effectively integrate financial education and management in technology within the computer engineering programs. This should not only include

courses on technology finance but also specific modules addressing financial management in technological projects, the evaluation of technological investments, financial strategic planning, and the application of frameworks and standards in information technology governance. These changes would enable professionals to align the corporate mission with the efficient and effective use of technology.

As a second aspect, it is considered essential to develop personalized programs that address the sociodemographic gaps in academic degree, location, and gender. Initiatives should be proposed that focus on providing additional resources along with specific support to these populations.

From a third perspective, the inclusion of finance in technology is necessary. In this regard, it is recommended that universities in the country implement courses that merge finance and technology, incorporating regulatory frameworks and IT governance standards. This would equip students with the necessary competencies to optimize financial resources in IT projects, maximize the value of technological innovations, and align technological objectives with corporate goals in an efficient and effective manner.

From a fourth perspective, it is essential to expand research on education and financial management in technology to better understand its deficiencies and how they relate to institutional, cultural, business, and economic factors. Additionally, it is crucial to develop more complex predictive models with a larger number of regressors to accurately forecast academic and professional outcomes, overcoming the limitations of the current model, which, although statistically valid for describing existing relationships, lacks the capacity to make effective predictions about new populations.

As a final recommendation, it is considered necessary for universities to proactively seek collaborations with the technology industry and companies to ensure that the education and financial management in technology provided are relevant and applicable. Such collaborations facilitate the continuous updating of curricula and ensure that students acquire the necessary skills to navigate the current and future job market.

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