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ARTICLE

Motivated or Inhibited? – An analysis of the Predisposition to Adopt Technological Implements in Personal Financial Planning

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ABSTRACT

The adoption of technology in Personal Financial Planning (PFP) is permeated by motivating and inhibiting factors, with the predisposition to adoption being strongly influenced by personal traits. The present paper analyzed this predisposition among 366 higher education students in the city of São Paulo, Brazil. Using primary data and applying Logit and Probit regression models with Maximum Likelihood estimators, the study combined sociodemographic variables with constructs from a validated psychometric scale, assessing individuals in relation to their adoption of financial technology tools. Contrary to the notion that people avoid technology tools due to insecurity, the results showed that the inhibitors "Discomfort" and "Insecurity" did not play a relevant role in the intention to use technology in the PFP. The motivators "Optimism" and "Innovativeness" are considered statistically significant in the intention of use. Those who don't use it are quite disinterested and unconvinced of the benefits, therefore averse to technology, while those who use it highlight the benefits of technology in the PFP.

KEYWORD

Personal Financial Planning, Financial education, Technology Readiness Index (TRI).

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Motivados ou inibidos? – uma análise da predisposição para adoção de ferramentas tecnológicas no Planejamento Financeiro Pessoal

RESUMO

A adoção de tecnologia no Planejamento Financeiro Pessoal (PFP) é permeada por fatores motivadores e inibidores, sendo a predisposição à adoção fortemente influenciada por percepções pessoais. O trabalho analisou essa predisposição em 366 alunos de ensino superior da cidade de São Paulo. Utilizando dados primários e aplicando modelos de regressão Logit e Probit com estimadores de Máxima Verossimilhança, o estudo combinou variáveis sociodemográficas com construtos de uma escala psicométrica validada, avaliando os indivíduos em relação à adoção de ferramentas de tecnologia financeira. Contrariando a noção de que as pessoas evitam ferramentas de tecnologia por insegurança, os resultados apontaram que os inibidores "Desconforto" e "Insegurança" não tiveram papel relevante na intenção de uso de tecnologia no PFP. Já os motivadores "Otimismo" e "Inovatividade" se mostraram estatisticamente significantes na intenção de uso. Aqueles que não fazem uso da tecnologia no PFP são, na verdade, desinteressados, e não estão convencidos dos benefícios, sendo avessos a ela, enquanto aqueles que a utilizam destacam os seus benefícios no PFP.

PALAVRA-CHAVE

Planejamento Financeiro Pessoal, Educação Financeira, Índice de Prontidão para Uso de Tecnologia (TRI).

1. INTRODUCTION

While classic mid-twentieth-century studies such as those by Markowitz (1952) and Modigliani and Miller (1958) gave a strong boost to the area of investment and corporate finance, such lines of research were not accompanied, at the time, by advances in the area of personal finances, which were relegated to a secondary field, explored without greater depth in studies of behavioral finance, as in Downs' theory of rational choices (1957) or in applications in household economics (Becker, 1965). However, more recently, technological innovations have given rise to personal financial planning tools with disruptive potential (Jaksic & Marinc, 2019).

Kaye et al. (2014) showed that even people who make intensive use of technology in everyday activities can be affected by emotional factors when using it to deal with their finances. Analyzing individuals close to retirement, Maqbool and Munteanu (2018) found the use of notebooks, calendars, diaries, agendas, sticky notes, and even individuals who declared using only mental processes in the preparation of the PFP.

Understanding the motivating and inhibiting factors for the use of technology in a historical context in which technology is imposed in practically all daily activities becomes quite relevant, even more so when applied to the context of personal finance in Brazil, where the average level of financial literacy of the population is remarkably low (Klapper et al., 2015). Using primary research data, the present study employed a theoretical model of the Technology Readiness Index (TRI), developed by Parasuraman and Colby (2014) - to which sociodemographic variables were added that allow better identification and segmentation of the researched public to assess whether the constructs proposed by the TRI, formed by two motivating constructs – optimism and innovativeness – and by two inhibitors – discomfort and insecurity – are suitable for studying the adoption of technology as a PFP tool.

2. PERSONAL FINANCIAL PLANNING

The PFP, first of all, maps revenues and expenses, but it also requires the definition of objectives, budget, cash flow control, and investment and financing planning.

According to Altfest (2016), the level of financial education of individuals has not grown in the same proportion as the complexity of the PFP. Lusardi and Mitchell (2011) researched financial education and planning and its implications for retirement and concluded that individuals routinely fail to understand basic financial concepts. Scheresberg et al. (2014) pointed out impacts on the financial future of young Americans who, even with high levels of formal education, spend more than they earn. In emerging countries, low levels of financial education, shortsighted vision, and precarious PFP of a large part of the population negatively impact retirement financial planning (Klapper et al., 2015).

Despite researchers being virtually unanimous in stating that the PFP should be started in youth, a survey by the National Confederation of Store Managers – Confederação Nacional de Dirigentes Lojistas, CNDL (SPC Brasil, 2019, n.p.) pointed out that 47% of young people born in Brazil between 1995 and 2010 do not carry out any financial control, despite having access to a large amount of information and technological resources.

2.1. Financial technology as a tool for PFP

Lewis and Perry (2019) addressed personal finance management in the digital world, pointing out that the use of financial technology grows mainly due to the imposition of financial agents and when new services are adopted. It is important to emphasize, however, that the adoption of financial technology to support the PFP still depends on other factors, some cultural, such as the constant fear of fraud and scams with the use of technology. Other factors are linked to aspects of convenience and usability (Zimmermann & Gerber, 2020), difficulty of use (Fonseca et al., 2017) and slow assimilation of products and innovative solutions that are being developed using artificial intelligence (Fichman et al., 2014).

2.2. Technology Readiness Model - TRI

For Pires and Costa (2008), the growth of the processing power of the devices and the offer of financial technology tools should result in a better coexistence of the consumer with PFP. However, this experience does not always provide satisfaction, with frequent frustrations in the use of these products and services.

The first theoretical models on the behavior of individuals in the face of technology adoption emerged with the Theory of Reasoned Action (TRA) (Ajzen & Fishbein, 1980). As an extension to TRA, the Theory of Planned Behavior (TPB) emerged, which included the control of perceived behavior (Ajzen, 1985). The Technology Acceptance Model (TAM) reflects the combined TRA and TPB models (Davis et al., 1989). These models have psychometric properties applicable to studies in several areas, evaluating factors such as attitude, subjective norms, desire, propensity, optimism, risk and compulsion.

A more recent model, the Technology Readiness Index – TRI, has been used in different contexts, such as mobile payments (Wiese & Humbani, 2019), business mobile services (Hallikainen et al., 2019), blockchain (Kamble et al., 2019), self-service checkout via mobile apps (Mukerjee et al., 2019), positive and negative dimensions in relation to fintechs (Lima et al., 2019) and differences in willingness to use e-commerce services (Ramírez-Correa et al., 2019)

The TRI was developed by Parasuraman (2000) as a psychometric scale model that allows measuring the propensity of individuals to adopt and use new technologies. The index is based

on a construct divided into two categories: factors that motivate and factors that inhibit the adoption of technology, as shown in Figure 1.

In Brazil, Pires and Costa (2008) used the TRI and found that it can contribute to the distinction between users and non-users of internet banking and can be used to predict the adoption of this type of technological solution.

The TRI model is divided into four dimensions:

a) Optimism: a positive view of technology and belief that it offers better control, flexibility, and efficiency;

b) Innovativeness: the tendency to be an early adopter and influencer in the adoption of technology;

c) Discomfort: the perception of lack of control over technology and the feeling of being overwhelmed by it;

d) Insecurity: distrust of technology and the consequences arising from its use.

The constructs Optimism and Innovativeness are motivating factors, contributing to greater readiness to adopt technology, while the constructs Discomfort and Insecurity are inhibitors, restricting adoption. It should be noted that an individual may have a combination of motivating and inhibiting traits, and that the scale of the TRI model reflects a set of beliefs related to the adoption of technology and not the individual competence in using it (Parasuraman & Colby, 2014). It should be noted that "Innovativeness" is a neologism for the individual's propensity to recognize and actively pursue innovation opportunities (Tyson, 2019).

The scale used in this study was the TRI 2.0 version proposed by Parasuraman and Colby (2014) with 16 statements, four statements for each aforementioned construct, anchored on a five-point Likert scale. Version 2.0 is an adapted version of the original version of the 36-item TRI scale, making it more suitable for capturing topics related to current technology, while

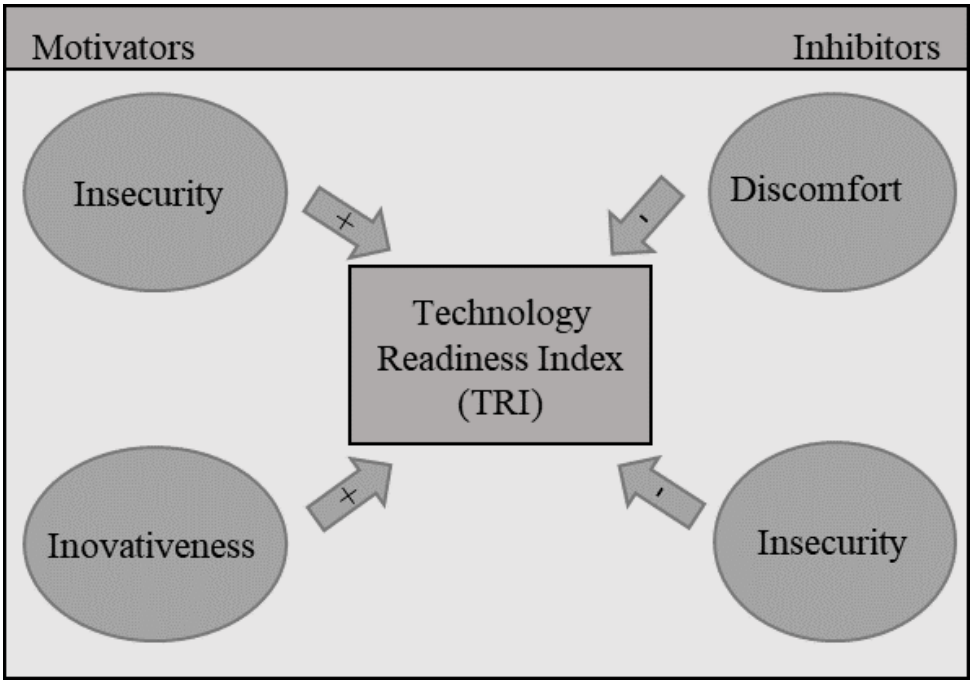

Figure 1. TRI Model – Technology Readiness Index.
Source: Prepared by the authors.

maintaining its predictive capacity. To assess the intention to adopt technology tools as a PFP instrument, we propose the following research hypotheses:

- **H1:** The Optimism factor positively influences the intention to use financial technology tools;
- **H2:** The Innovativeness factor positively influences the intention to use financial technology tools;
- **H3:** The Discomfort factor negatively influences the intention to use financial technology tools;
- **H4:** The Insecurity factor negatively influences the intention to use financial technology tools.

Data analysis was designed to assess technological segmentation, classifying observations using the segmentation model proposed by Parasuraman and Colby (2014), grouping them by average TRI indices into five segments: explorers (high motivation, low resistance to technology adoption), pioneers (strong positive or negative beliefs about technology), skepticals (less extreme beliefs, positive and negative, about technology), hesitant (low level of Innovativeness) and avoiders (high resistance and low motivation).

The technological segmentation suggested by Parasuraman and Colby (2014) employs the Latent Class Analysis (LCA) technique, a statistical procedure that segments individuals into homogeneous subgroups. This technique is robust when dealing with different types of measurements, including the Likert scale, and adopts a less arbitrary segmentation criterion (Vermunt & Magidson, 2002).

3. METHODOLOGY

The study was carried out with primary data collected in research with undergraduate, lato-sensu graduate and master's students from an educational institution in the city of São Paulo. The collection took place via an online questionnaire, divided into three blocks of questions, applied in the classroom with the in-person supervision of the researcher between September 18th and October.08thin 2019, on the three campuses of the institution. We obtained 366 validated responses. The use of primary data was, per se, a source of innovation in our research, as the data thus obtained, due to its inherent originality, had never been previously analyzed. The validity of primary data sources is also potentially greater than that of secondary or tertiary sources, in view of the lower probability of transcription errors, fraud and possible omissions resulting from organizer bias, problems that can occur in any compilation of databases. Finally, it should be noted that the collection of primary data allows for great specification and focus on the researcher's needs.

The work used the TRI 2.0 model to which we added sociodemographic variables and other specific variables on the research topic. Data were analyzed qualitatively and quantitatively, identifying which constructs exert the greatest influence on the adoption, or not, of technology as a PFP tool.

The first block of the questionnaire addressed sociodemographic information. The variable "Enrollment" was included to avoid more than one answer per respondent. The second block was built based on the most current version of the technology readiness model (TRI 2.0). The model was translated from the original English version into Portuguese, based on the work of Gonçalves and Silva (2019) and has the list of attributes detailed in Table 1. For this block, the Likert scale of agreement was used, ranging from "I totally agree " to "Strongly Disagree".

The third and last block obtained information about the respondents' personal financial planning habits, later used as dependent variables in the regression models.

The TRI index was calculated as follows:

a) The consistency of data collected from all respondents was verified. No respondent failed to answer the questions due to the configuration used in the construction of the questionnaire;

b) The average was calculated for each of the four dimensions: Optimism and Innovativeness (motivators) and Insecurity and Discomfort (inhibitors);

c) The total TRI score was calculated, first inverting the dimensions of Insecurity and Discomfort, and calculating the average of the dimensions:

$$\text{TRI 2.0} = (\text{Innovativeness} + \text{Optimism} + (6 - \text{Insecurity}) + (6 - \text{Discomfort})) / 4$$

d) Scores range from 1.0 to 5.0. A higher score means greater technology readiness.

The quality of the questionnaire was analyzed using Cronbach's α of the TRI psychometric scale constructs, in addition to cluster analysis that allowed classifying respondents into five categories representing the segmentation of the pattern of beliefs about technology. Then, non-linear regression techniques were used with Logit and Probit models. The results were compared to the results obtained using the linear regression model by OLS.

4. PRESENTATION AND ANALYSIS OF RESULTS

Table 1 presents the relative frequency of the sociodemographic variables of the sample analyzed in the present study.

Table 1
Descriptive Statistics – sociodemographic variables.

Gender	**Case Number**	**Frequency**
Male	169	46%
Female	197	54%
Total	**366**	**100%**
Marital Status		
Single	264	72%
Married	82	22%
Common law marriage	10	3%
Separated/Divorced	10	3%
Total	**366**	**100%**
Schooling Level		
Undergraduation	168	46%
Graduation	159	43%
Master's	39	11%
Total	**366**	**100%**
Occupational Situation		
Doesn't work, only studies	43	12%
Out of work	14	4%
Freelancer or Entrepreneur	15	4%
Private company employee	276	75%
Public company employee	16	4%
Retired	2	1%
Total	**366**	**100%**

Table 1
Cont.

Income	Case Number	Frequency
No income	47	13%
Up to 1 minimum wage (up to R$ 998.00)	16	4%
From 1 to 3 minimum wages (R$ 998.01 to R$ 2,994.00)	122	33%
From 3 to 6 minimum wages (R$ 2,994.01 to R$ 5,988.00)	89	24%
From 6 to 9 minimum wages (R$ 5,988.01 to R$ 8,982.00)	45	12%
From 9 to 12 minimum wages (R$ 8,982.01 to R$ 11,976.00)	23	6%
From 12 to 15 minimum wages (R$ 11,976.01 to R$ 14,970.00)	2	1%
More than 15 minimum wages per month (above R$ 14,970.01)	22	6%
Total	**366**	**100%**

Source: Research data.

The average age of respondents was approximately 27 years old and the mode 21 years old. The frequency distribution can be seen in Figure 2.

Among the 366 respondents, 267 (73%) declared that they carry out PFP with the definition of objectives, control of income, and expenses and investment strategy. Of these, 227 (85%) reported using financial technology tools in the PFP, against 40 (15%) who do not use such tools.

With regard to the personal budget, only 44% of the respondents stated that they prepared a personal financial budget with a forecast of revenues, expenses, and investments for six months ahead. Segmenting the observations between those who use and those who do not use technology tools in the PFP, it was observed that 90% of those individuals who prepare budgets do so using technology tools.

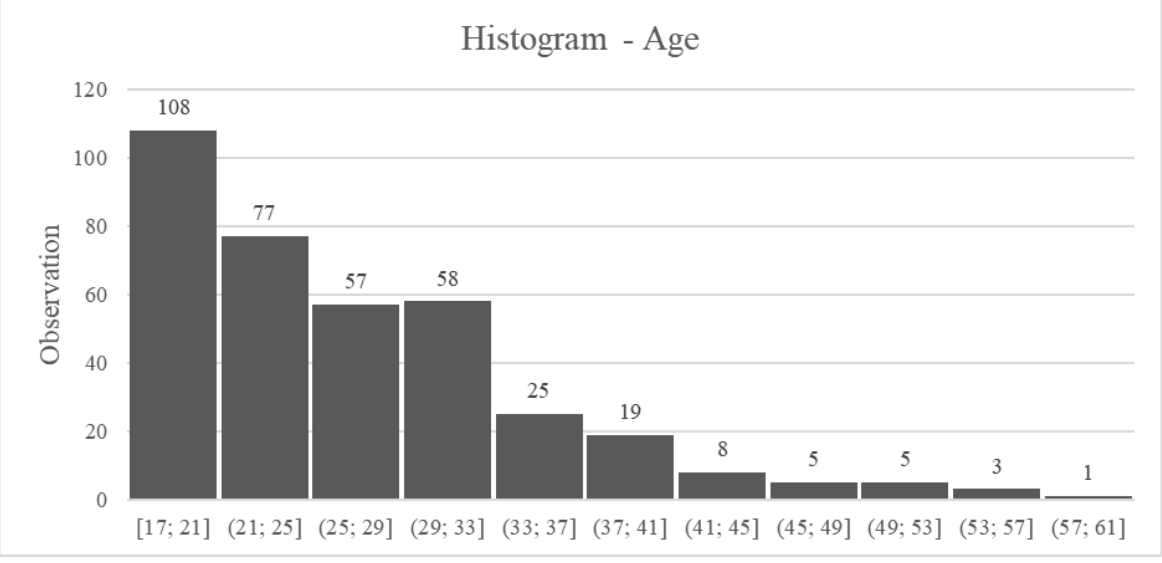

Figure 2. Histogram – age frequencies.
Source: Prepared by the authors.

It is interesting to note that of the 206 individuals who reported not preparing a personal financial budget, 118 reported preparing their PFP. It is possible to infer that part of the respondents are unaware of the definition of PFP, given that PFP assumes that the individual prepares a financial budget, even a basic one, with a forecast of expenses and income six months in advance.

Evaluating the reliability of the research instrument, studies on multivariate data analysis techniques (Hair et al., 2019) indicate a minimum Cronbach's α between 0.5 and 0.7 as a measure of reliability. The internal reliability of the constructs used in the research instrument for Optimism, Innovativeness, Discomfort and Insecurity was 0.62, therefore acceptable for continuing data analysis (Table 2).

Table 2
Reliability of Constructs and Cronbach's Alpha analysis.

Constructs	Cronbach's alpha
Optimism and Innovativeness	0.68
Discomfort and Insecurity	0.62
Cronbach's α combined from the TRI scale	0.62

Source: Prepared by the authors.

The average TRI was calculated according to the metric detailed in Chapter 3. Evaluating the sample's TRI and comparing it with the result obtained with the average reported by Parasuraman and Colby (2014), we found that the average (3.27) is very close to the average reported by those researchers (3.2).

Table 3 shows descriptive statistics os the main variables used in the following analysis. Table 4 presents stratifications of the main analysis constructs.

Table 3
Descriptive statistics – TRI.

Descriptive statistics - TRI							
	N	Interval	Minimum	Maximum	Average		Standard deviation
					Coeff.	Error	
OPT average	366	3.25	1.75	5.00	4.108	0.030	0.57006
INN average	366	3.50	1.50	5.00	3.258	0.040	0.77367
DIS average	366	4.00	1.00	5.00	2.699	0,.042	0.81063
INS average	366	3.25	1.75	5.00	3.573	0.033	0.63539
Average TRI	366	2.63	2.06	4.69	3.274	0.021	0.39981

Source: Prepared by the authors.

Female subjects showed lower Optimism and Innovativeness than the male subjects. Segmenting the analysis by level of education, it is observed that the averages of the four constructs in the Graduation group were higher than the averages in the Undergraduation group.

Individuals who use technology tools in the PFP obtained higher averages for the Optimism and Innovation factors and for the TRI, denoting a positive view of technology. The averages of Discomfort and Insecurity of individuals who do not use financial technology tools were higher than those who use them.

To verify whether these differences between the averages of the TRI of the groups are statistically significant, the t-student test was used (Table 5).

Table 4

TRI scale constructs related to other research instrument variables.

	Sample	Gender		Schooling level		Planning		IT tools	
		Female	Male	Undergraduation	Graduation	Plan	Do not plan	Use technology	Do not use technology
Optimism	4.11	4.07	4.15	4.10	4.11	4.13	4.05	4.15	3.97
Innovativeness	3.26	3.05	3.50	3.15	3.35	3.36	2.98	3.33	3.02
Discomfort	2.70	2.68	2.73	2.66	2.73	2.73	2.63	2.69	2.73
Insecurity	3.57	3.64	3.49	3.56	3.59	3.58	3.55	3.55	3.64
TRI	3.27	3.20	3.36	3.26	3.29	3.30	3.21	3.31	3.16

Source: Prepared by the authors.

Table 5

Comparison between the differences in the TRI averages between the groups.

TRI average differences between groups	Gender		Schooling level		Financial planning		Use IT in planning?	
	Female	Male	Undergraduation	Lato-sensu/Master's	Plan	Do not plan	Use	Do not use
Female	–	**0.00024*****	0.11385	**0.00513*****	**0.00794*****	0.7876	0.00172	0.35958
Male	–	–	**0.00929*****	0.30715	0.14198	**0.00513*****	0.24346	**0.00035*****
Undergraduation	–	–	–	**0.02353****	0.19909	0.36333	**0.07748***	**0.04659****
Graduation	–	–	–	–	**0.07642***	**0.01050****	0.10481	**0.00223*****
Plan	–	–	–	–	–	**0.07335***	0.68718	**0.00634*****
Do not plan	–	–	–	–	–	–	**0.03350****	0.31334
Do not use technology	–	–	–	–	–	–	–	**0.00246*****
Use technology	–	–	–	–	–	–	–	–

Source: Prepared by the authors.

To assess the TRI scale constructs that most affected respondents, class segmentation was carried out, grouping individuals with similar characteristics. The analysis classified respondents into five categories based on their pattern of beliefs about technology: Skepticals, Explorers, Avoiders, Pioneers, and Hesitant. To obtain greater robustness in this cluster analysis, latent class analysis (LCA) was used via a proprietary algorithm and a normative comparison was performed with the TRI reported by Parasuraman and Colby (2014) (Table 6).

Skepticals (34% of the sample) exhibit greater indifference to technology, with less extreme positive and negative beliefs; Explorers (26%) denote a high level of motivation and a low degree of resistance to technology adoption; Pioneers (22%) tend to have strong opinions, positive or negative, about technology; Hesitant individuals (14%) stand out for their low degree of adoption of innovation, while Avoiders (3%) denote a lot of resistance and a low degree of motivation in adopting technology.

Explorers scored highest on Optimism and lowest on Discomfort and Insecurity. Avoiders, on the other hand, are at the extreme opposite, scoring lower on the constructs Optimism and Innovativeness and presenting the highest score on Insecurity. Explorers adopt new technologies easily and quickly ("early adopters"), while Avoiders are the last to adopt a new technology product or service.

The Pioneers, Skeptics, and Hesitant segments in between combine sometimes contradictory beliefs about technology. Pioneers, for example, score high on Optimism along with a high score on Insecurity.

Evaluating the demographic characteristics of the sample, taking the Explorers as an example, the segment with the highest TR scores, we observed a strong predominance of male individuals, single, graduate students, who work and have an income of up to three minimum wages (Table 7).

Table 8 presents the correlation matrix between the TRI scale constructs. Contrary to expectations, the correlations between the constructs Discomfort and Optimism, as well as Discomfort and Innovativeness, although very close to zero, were still positive.

A second stage of the research used regression analysis to assess two relationships: (1) the execution of financial planning in view of sociodemographic variables and the constructs of the TRI scale; and (2) the use of software in relation to the same sociodemographic variables and the TRI scale constructs. The regressions used the dummy variables "personal financial planning" (1 if the respondent performs the PFP and 0 otherwise) and "software tool" (1 if the PFP software is used and 0 otherwise, with the PFP performed using a notepad, agenda, calendars and others).

The Logit model was used, suitable for individual data with a qualitative variable and measuring the variation of probabilities. It is a non-linear estimation model that uses the cumulative distribution function (FDA) of the logistic type using the Maximum Likelihood estimation, allowing one to observe the probability of the response where the log of the odds ratio is linearly related to xi. The nonlinear regression model was defined by Equation 1:

$$Prob\ (y=1|x) = G(\alpha + \beta_1.gender + \beta_2.age + \beta_3.age^2 + \beta_4.marital\ status + \beta_5.schooling\ level + \beta_6.occupation + \beta_7.income + \beta_8.OPT + \beta_9.INN + \beta_{10}.DIS + \beta_{11}.INS) + u_i \quad (1$$

where y in the first model is the dummy variable "personal financial planning" and in the second model it is the dummy variable "software tools", as previously described. In Equation 1, α and β_i are the estimated parameters and G(.) represents the cumulative distribution function; the sociodemographic explanatory variables and the TRI scale constructs are described in Table 9. In turn, Table 10 presents the results of the corresponding econometric estimations.

Table 6
Classification by technological segmentation using TRI 2.0.

Technological Segmentation Classification	No. of observations	Sample percentage	Averages					TRI 2014
			Optimism	Innovativeness	Discomfort	Insecurity	Total TRI	
Explorers	95	26%	4.52	3.74	2.15	3.12	3.75	18%
Pioneers	81	22%	4.35	3.85	3.55	3.89	3.19	16%
Skepticals	125	34%	3.75	3.03	2.47	3.58	3.18	38%
Hesitant	53	14%	4.16	2.27	2.90	3.74	2.95	13%
Avoiders	12	3%	2.67	2.13	2.81	4.17	2.45	16%

Source: Prepared by the authors.

Table 7
Demographic characteristics of the technology readiness index (TRI).

Segmentation	Gender		Marital Status		Schooling Level		Occupation		Income	
	Male	Female	Single	Married	Undergraduation	Graduation	Work	Do not work	Up to 3 min. wages	More than 3 min. wages
Explorers	66%	34%	68%	32%	39%	61%	84%	16%	51%	49%
Pioneers	47%	53%	79%	21%	44%	56%	93%	7%	48%	52%
Skepticals	35%	65%	73%	27%	52%	48%	82%	18%	50%	50%
Hesitant	30%	70%	66%	34%	49%	51%	79%	21%	60%	40%
Avoiders	67%	33%	75%	25%	33%	67%	67%	33%	33%	67%

Source: Prepared by the authors.

Table 8
Correlation matrix between the TRI scale constructs.

	Correlation coefficients between TRI constructs			
	Optimism	Innovativeness	Discomfort	Insecurity
Optimism	1;00	–	–	–
Innovativeness	0.37	1.00	–	–
Discomfort	0.08	0.12	1.00	–
Insecurity	-0.09	-0.05	0.35	1.00

Note. All coefficients were statistically significant at 1% ($p < 0.01$).
Source: Prepared by the authors.

Table 9
Variables used in the econometric non-linear regression model.

Dependent Variable	Scale	Attributes	
Planning	Nominal Qualitative	1 = Plan; 0 = Does not plan	first regression
Planning tool	Nominal Qualitative	1 = software tool, 0 = organizers, notepads, calendar, other	second regression
Explanatory Variables	**Scale**	**Attributes**	
Gender	Nominal Qualitative	1 = Women; 0 =Men	-
Age	Discrete Quantitative	number of years since birth	+
Age²	Discrete Quantitative	square of the variable "age"	-
Marital Status	Nominal Qualitative	1 = Single; 0 = Married	-
Schooling Level	Nominal Qualitative	1 = Graduate and Masters; 0 = Undergraduate	+
Occupation	Nominal Qualitative	1 = Employed; 0 = Not employed	+
Income	Nominal Qualitative	1 = Above 3 minimum wages.; 0 = Up to 3 minimum wages	+
OPT	Continuous Quantitative	values between 1 and 5 - Optimism construct of the TRI scale (average)	+
INN	Continuous Quantitative	values between 1 and 5 - Innovation construct of the TRI scale (average)	+
DIS	Continuous Quantitative	values between 1 and 5 - Discomfort construct of the TRI scale (average)	-
INS	Continuous Quantitative	values between 1 and 5 - Insecurity construct of the TRI scale (average)	-

Source: Prepared by the authors.

Seeking greater robustness for the results, we opted for three estimation methods. The Logit model was used as a primary reference in the evaluation of the results and allowed observing the probability variation of the variables used in the regression model. The Probit model, also widely used in analyzes where the dependent variable is binary, used a normal cumulative distribution function. The results obtained with the Probit model are comparable to those of the Logit model in relation to the individual statistical significance of the coefficients of the variables, allowing the comparison of the signs of the coefficients obtained in the two models as a robustness test. Finally, linear regression by OLS was used to evaluate the results from a purely qualitative point of view, providing an additional level of robustness to the results.

The set of variables was incorporated into the econometric model in a linear fashion, with the exception of the Age variable, which was incorporated with a quadratic term, in addition to the linear term. This quadratic term tests a possible non-linearity of the variable, where younger and older individuals would eventually be less likely to plan or use software tools when compared to individuals of intermediate ages. A similar approach was used by Potrich et al. (2014).

The results obtained by the Logit and Probit estimators were qualitatively similar, so that the results of the Logit Model will be predominantly discussed. The variables Age and Age² had coefficients of -0.33 and 0.004, significant at 1%. The observed signs, contrary to expectations, indicate that younger individuals were 6.1% less likely to prepare PFP when compared to older individuals, keeping all other variables constant. The results of the econometric estimations are presented in Tables 10 and 11 below. While the first table shows the results of specifications containing the dependent variable "personal financial planning", the second table presents results containing the variable "use of financial technology tools." Broadly speaking, the goal of both tables is to provide robust econometric results.

Table 10
"Personal financial planning" variable dependent regression.

Explanatory Variables	Expected Signal	MQO	Logit		Probit	
		Coefficients	Coefficients	Variation of Probability	Coefficients	Variation of Probability
Constant		**1.119** ***	**3.661** * **[1.695]**	–	**2.434** * **[1.909]**	–
Gender	-	-0.023	-0.081 [-0.0308]	-0.015	-0.069 [-0.447]	-0.021
Age	+	**-0.054** ***	**-0.330** *** **[-3.023]**	-0.061	**-0.204** *** **[-3.172]**	-0.065
Age²	-	**0.0007** ***	**0.004** *** **[2.898]**	–	**0.002** *** **[3.075]**	–
Marital Status	-	**-0.120** **	**-0.706** * **[-1.960]**	-0.119	**-0.414** ** **[-2.000]**	-0.122
Schooling Level	+	**0.128** *	**0.674** * **[1.725]**	0.126	**0.417** * **[1.774]**	0.133
Occupation	+	**0.181** **	**0.898** *** **[2.646]**	0.189	**0.555** *** **[2.686]**	0.195
Income	+	0.001	0.012 [0.036]	0.002	0.011 [0.055]	0.003
OPT	+	-0.014	-0.086 [-0.369]	-0.016	-0.057 [-0.411]	-0.018
INN	+	**0.109** ***	**0,637** *** **[3.230]**	0.118	**0.367** *** **[3.240]**	0.117
DIS	-	0.017	0.102 [0.605]	0.019	0.045 [0.462]	0.014
INS	-	0.014	0.079 [0.373]	0.014	0.040 [0.323]	0.012
R^2 McFadden		0.096 (R^2)	0.085		0.085	
Likelihood log		-203.942	-195.409		-195.313	
Schwarz criterion		478.716	461.649		461.4580	
Number of correctly predicted cases		–	263 (71.9%)		263 (71.9%)	
No. of sample observations		366	366		366	

Source: Prepared by the authors.

The marital status variable had a negative sign (-0.706) and was significant at 10%, denoting that single individuals are less likely to plan financially than married individuals. Keeping the other variables constant, these single individuals were 11.9% less likely to plan than married individuals. Similarly, Agunsoye et al. (2022) found a correlation between marital status and spending control habits, financial planning and greater propensity to save money.

The schooling level variable had a positive sign (0.674) and was significant at 10%, denoting that individuals with higher levels of education were 12.6% more likely to develop financial planning when compared to individuals with lower levels of education. Studies in the area of financial literacy and financial behavior point to similar results, such as Scheresberg (2013).

The occupation variable had a positive sign (0.898) in line with expectations and was strongly significant. Individuals who work were 18.9% more likely to plan when compared to individuals

who are outside the labor market. The result is in line with studies that point to a strong correlation between work and financial knowledge (Bucher-Koenen & Lusardi, 2011).

It should be noted that of the four variables that represent the TRI scale constructs, only the Innovativeness variable was significant and presented the expected sign. Individuals with higher levels of Innovativeness were 11.8% more likely to plan, keeping other variables constant. The variables Optimism, Discomfort, and Insecurity showed opposite signs to those expected and were not significant. The gender and income variables, even showing the expected signs, did not show statistical significance.

The second regression, the main object of this study, was performed to explain the dependence of the variable related to the "use of technology in personal financial planning" and was modeled to capture the use of financial technology tools used in the PFP. A dummy variable was used in it, where 1 represents the use of tools such as spreadsheets, mobile applications, cloud-based applications, and contracted services from specialized companies, while 0 represents the use of notepads, agendas, calendars and others. The model employed the same set of explanatory variables used in the previous regression. The results obtained are shown in Table 10.

Analogously to the regression that analyzed the PFP, the MQO, Logit and Probit were also used here. The results were quantitatively similar, and the coefficients showed the same signs in the three regressions. The results of the Logit model and, occasionally, of the other models will be discussed.

The schooling level coefficient showed the expected signal (0.803), in addition to being statistically significant at 10%, indicating that individuals who attend undergraduate courses are 12.8% more likely to use financial technology tools in planning when compared to graduate students, keeping the other variables constant. The results are in line with several studies that analyzed sociodemographic variables and their relationships with technology use and finance knowledge (Lusardi & Mitchell, 2011), where researchers point out that low knowledge of finance concepts among younger individuals reduces the propensity to plan and to employ technology in planning.

The occupation variable had a sign in line with the expected sign (0.682) with statistical significance at 5%. Bivariate analyses between the variables age and occupation, and age and financial planning indicate that older individuals, who work and prepare PFP, often adopt financial technology tools for this purpose.

Regarding the TRI scale constructs, it is important to emphasize that the four coefficients showed the expected signs. The variables that represent the motivating constructs Optimism and Innovativeness showed statistical significance at 10%. Keeping the other variables constant, the Optimism factor causes individuals to show a 6.9% greater probability of using software tools in planning, while the Innovativeness factor causes individuals to show a 5.2% greater probability of using software tools in planning. PFP. The observed results confirm research hypotheses h1 and h2, where the Optimism and Innovativeness factors significantly influence the intention to use financial technology tools in the PFP.

Pires and Costa (2008), researching the use of internet banking solutions, found evidence that only the Optimism construct was an antecedent of the intention to use this type of technology, partially confirming the results pointed out in this work.

The results of the regressions do not indicate the Discomfort and Insecurity factors as significant influencers of the intention to use technology tools in personal planning, that is, the null hypotheses of h3 and h4 were rejected, although the observed signs were in line with expectations. The gender, age, age2, marital status and income variables also did not show statistically significant coefficients at the usual levels.

Table 11
"Use of financial technology tools" dependent variable regression.

Explanatory Variables	Expected Signal	MQO	Logit		Probit Model	
		Coefficients	Coefficients	Variation of probability	Coefficients	Variation of probability
Constant		0.046	-2.395 [-1.119]	–	-1.517 [-1.213]	–
Gender	-	0.010	0.091 [0.320]	0.014	0.047 [0.290]	0.013
Age	+	0.016	0.085 [0.728]	0.013	0.050 [0.741]	0.014
Age^2	-	-0.0002	-0.001 [-0.982]	–	-0.0009 [-0.970]	–
Marital Status	-	-0.073	-0.687 [-1.374]	-0.097	-0.346 [-1.382]	-0.090
Schooling Level	+	0.120	**0.803 * [1.795]**	0.128	**0.449 * [1.774]**	0.128
Occupation	+	0.161	**0.682 ** [2.186]**	0.122	**0.416 ** [2.141]**	0.13
Income	+	0.038	0.341 [0.932]	0.053	0.174 [0.818]	0.049
OPT	+	0.070	**0.441 * [1.835]**	0.069	**0.251 * [1.752]**	0.071
INN	+	0.051	**0.331 * [1.725]**	0.052	**0.195 * [1.751]**	0.055
DIS	-	-0.024	-0.125 [-0.738]	-0.738	-0.075 [-0.751]	-0.021
INS	-	-0.018	-0.137 [-0.654]	-0.654	-0.056 [-0.453]	-0.016
R^2 McFadden		0.135 (R^2)	0.127		0.125	
Likelihood log		-177.172	-173.061		-173.538	
Schwarz criterion		425.176	416.953		417.9080	
Number of correctly predicted cases		-	286 (78.1%)		286 (78.1%)	
Sample observations		366	366		366	

Source: Prepared by the authors.

Evaluating the results of the two regressions in combination, in relation to the central objective of the study on which constructs measured by the TRI scale exert greater influence on the intention to use financial technology tools in the PFP, the observed results indicate that only the construct Innovativeness is consistently influential, in a positive way, in the adoption of PFP by individuals and in the use of technology tools for this purpose.

It should be noted that, although this article follows statistical procedures used in previous studies (Parasuraman, 2000), when calculating descriptive statistics from Likert scales, considerable inference biases can be incurred. According to Fávero and Belfiore (2017, chap. 11), the use of arbitrary weighting procedures in qualitative variables – such as those derived from Likert scales – tends to constitute a serious methodological weakness in quantitative studies. Harpe (2015) states, however, that there are controversies surrounding the appropriate analysis of various types

of rating scales, a controversy that dates back to the time when the original structure of Likert scales was proposed, and that fully limiting the use of parametric analyzes to aggregated scale data can be an overly restrictive approach. For that author, studies suggested that parametric approaches are acceptable when the scales have some characteristics, such as having at least five length categories and equidistant ends from the central anchor. The call to use only non-parametric approaches to aggregated rating scales would be overly restrictive, resulting in the near extinction of the use of these scales in studies where they would be potentially useful.

5. FINAL CONSIDERATIONS

In this study, the psychometric Technology Readiness Index (TRI) scale developed by Parasuraman and Colby (2014) was used to measure the factors that motivate and inhibit individuals in using technology for Personal Financial Planning (PFP). It sought to assess which factors influence the predisposition to adopt financial technology tools in the PFP. In an exploratory way, it was found that the constructs Optimism and Innovativeness positively influenced individuals in the adoption of technology tools, while the inhibitory constructs were not statistically significant. The findings point to a probable reduction in the population's fears when using technology, a likely result of the increasingly widespread dissemination of its use. It turns out, however, that not all individuals feel tempted to use it, i.e., even though they no longer reveal an aversion to use, these individuals do not recognize a great benefit in the use of technology, still opting for other methods of controlling and optimizing their accounts.

The results of the regressions, descriptive statistics, and bivariate analyzes were qualitatively similar to those found in studies on the adoption of mobile payment applications by Wiese and Humbani (2019) and Souza and Luce (2005). It was possible to observe a significant volume of respondents who claim to use technology tools in mobile applications or smartphones, a promising new branch of research on the subject.

Combining sociodemographic variables with TRI scale constructs, it was possible to evaluate the data from different angles, with the results summarized demographically as follows: female, young, single individuals, with income of up to one minimum wage are more likely to belong to the group that does not plan and does not use technology in the PFP.

In terms of limitations of the research presented here, two points stand out: (1) although the present article follows procedures used in several previous studies (Parasuraman, 2000), descriptive statistics calculated from Likert scales can lead to biases in terms of statistical inference. Authors such as Fávero and Belfiore (2017) point out that the use of arbitrary weighting procedures in qualitative variables – such as those derived from Likert scales – tends to constitute a serious methodological weakness, and (2) the sample used in this article has a non-probabilistic nature, a direct result of the data collection method employed by the researchers. There is a possibility of occurrence of "Hawthorne effects" in this context, as the presence of researchers in the collection environment can affect the behavior of study participants. This possibility limits the external validity of the present study, making it difficult to generalize the results reported here.

In terms of virtues of the present study, the construction of a primary database related to the financial planning behaviors of undergraduate and graduate students in the city of São Paulo stands out initially. There is a severe shortage of records of this type of information at the national level. Additionally, the application of non-linear models with a limited dependent variable (probit and logit) to the data from the questionnaires tends to constitute a set of robust evidence related to the importance of socioeconomic variables for the financial planning of the respondents.

In terms of lines of future research, we highlight two possibilities. The first would be the construction of a database related to PFP with national scope, given that there are considerable cultural differences in the Brazilian territory, which may reveal different patterns of behavior according to the considered Federation Unit. Another possibility would be to carry out experiments comparing the performance – in terms of PFP – of users with academic training in different areas of knowledge. In general terms, the results reported here pave the way for more advanced studies on the subject and point to the possible benefit of introducing the PFP in Brazilian secondary and higher education.

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AUTHOR'S CONTRIBUTION

Each author has sufficiently participated in this work. HS: based on the original, the version sent for publication. Guided the original work, suggested and evaluated econometric analysis tools and results; MM: complemented and validated the final version of the text now sent for publication. Supervised the econometric analyzes and co-supervised the original work; PF: collected the data, performed the analyzes and wrote the original version of the work.

CONFLICTS OF INTEREST

The authors declare that there is no conflict of interest regarding the publication of this article.

APPENDIX 1

Sociodemographic variables of the online questionnaire.

Type	Variable (explanatory)	Specification
Sociodemographic	Enrollment	Student registration number
	Gender	Male
		Female
	Age	Student's age
	Marital status	Single
		Married
		Consensual union
		Separated
		Divorced
		Widow/widower
	Current education level	Undergraduate
		Graduate
		Academic Master's Degree
		Professional Master's Degree
	Current course	Business Administration
		Executive Assistant
		Auditing
		Accounting Sciences
		Economic Sciences
		Business Accounting with IFRS and USGAAP
		Controllership
		Online Controllership
		Economy Applied to Business
		Corporate Finances
		Energy Management
		Public Management and Controllership
		Strategic People Management
		Logistics Management of Supply Networks
		Online Public Management in Auditing
		Online Public Management in Controllership
		Online Public Management
		Tax Management
		Marketing
		MBA in Accounting
		MBA in Business Management
		MBA in Risk Management and Compliance
		Executive MBA in Finance
		Capital Market
		Academic Master's in Accounting
		Professional Master's in Business Administration - Finance

Type	Variable (explanatory)	Specification
Sociodemographic	Current course	International Business and Foreign Trade
		Forensics
		Advertising
		International Relations
		Public Relations
		Executive Secretariat
	Occupational situation	Does not work, only studies
		Out of work
		Freelancer
		Private company employee
		Private company employee
		Entrepreneur
		Retired
	Individual monthly income	No income
		Up to 1 minimum wage (up to R$ 998.00)
		From 1 to 3 minimum wages (R$ 998.01 to R$ 2,994.00)
		From 3 to 6 minimum wages (R$ 2,994.01 to R$ 5,988.00)
		From 6 to 9 minimum wages (R$ 5,988.01 to R$ 8,982.00)
		From 9 to 12 minimum wages (R$ 8,982.00 to R$ 11,976.00)
		From 12 to 15 minimum wages (R$ 11,976.01 to R$ 14,970.00)
		More than 15 minimum wages per month (above R$ 14,970.01)

Source: Prepared by the authors.

APPENDIX 2

Attributes of the scale proposed by the TRI 2.0 model.

Dimension of Constructs	Construct (explanatory)	**Below, you will answer 16 questions related to your view of how technology influences your Personal Financial Planning activities. Note: Questions comprise Technology Readiness Index 2.0, copyright A. Parasunaman and Rockbridge Associates, Inc., 2014. This scale has been duplicated with permission of the authors**
Motivators	Optimism	OPT1 - New technologies contribute to improving our quality of life
		OPT2 - Technology gives me greater freedom to come and go
		OPT3 - Technology gives people more control over their daily lives
		OPT4 - Technology increases my productivity in my personal life
	Innovativeness	INN1 - I am sought after for advice on new technologies
		INN2 - I'm usually among the first of my friends to buy new technology as soon as it's on the market.
		INN3 - I can usually understand new high-tech products and services without help from others.
		INN4 - I stay informed about the newest technological developments in my areas of interest
Inhibitors	Discomfort	DIS1 - When I need technical support from a product or service provider, I feel that those who know more are passing me by.
		DIS2 - Phone support doesn't work because they don't explain things in a way that I understand
		DIS3 - Sometimes I think that gadgets or systems with technology were not designed to be used by ordinary people.
		DIS4 - No state-of-the-art product or service manual is written in accessible language
	Insecurity	INS1 - People rely heavily on the work that technology does for them.
		INS2 - Too much technology distracts people to the point that it becomes harmful
		INS3 - Technology diminishes the quality of relationships by decreasing face-to-face interaction
		INS4 - I am not comfortable doing business with partners who only allow online contact

Source: Prepared by the authors.

APPENDIX 3

Personal financial planning habits.

Type	Variable (explained)	Specification
Specific Questions Personal Financial Planning Habits	Do you prepare your own Personal Financial Planning, with definition of objectives, control of revenues, expenses and investment strategy?	Yes
		No
	Which instrument do you use in the preparation of your Personal Financial Planning?	Notepad (paper)
		Appointment book (paper)
		Calendar
		Spreadsheet (Excel or similar)
		Electronic application installed on the computer
		Web-based (personal computer) and cloud-based planning application
		Mobile app installed on smartphone
		Personal Financial Planning Service (outsourced)
		Online Banking application linked to the current account of the bank where you have an account
		Others
	Do you prepare your personal financial budget, with a forecast of income, expenses and investments for six months ahead?	Yes
		No

Source: Prepared by the authors.