

Entrepreneurial Leadership Behavior Estimative Through Cognitive Styles and Cognitive Flexibility: An Experimental Test

Estimativa do Comportamento de Liderança Empreendedora Segundo Estilos Cognitivos e Flexibilidade Cognitiva: Um Pré-Teste Experimental

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Abstract

Purpose: Estimate the entrepreneurial leadership behavior of university students according to the dimensions of cognitive styles, and flexibility.

Design/methodology/approach: A pre-test was carried out in a quasi-experiment through the application of the Cognitive Style Index, Cognitive Flexibility Scale, and observation of entrepreneurial leadership behavior in the "Marshmallow Challenge" with 68 Accounting students from a South Brazilian university.

Research, Practical & Social implications: Adaptive style and the response flexibility predominate in the sample. Quasi-analytical students manifested the highest levels of entrepreneurial leadership. The experiment is suitable to identify the entrepreneurial leadership profile of students through a practical perspective. Risk taking, innovation and response flexibility determine the highest profile of entrepreneurial leadership in the simulated uncertain socioeconomic environment.

Originality/value: The crossing of data from the application of questionnaires and the observation of a workshop reveal a differential of the model in relation to traditional research on the subject. The experiment is appropriate for identifying cognitive-behavioral skills of entrepreneurial leadership in students.

Keywords: Entrepreneurial Leadership; Cognitive Styles; Cognitive Flexibility.

Resumo

Objetivo: Estimar o comportamento de liderança empreendedora de estudantes universitários de acordo com as dimensões de estilos cognitivos e flexibilidade.

Desenho/metodologia/abordagem: Foi realizado um pré-teste (quase experimento) pela aplicação do Índice de Estilo Cognitivo, Escala de Flexibilidade Cognitiva e observação do comportamento de liderança empreendedora no "Desafio do Marshmallow" com 68 estudantes de Contabilidade de uma universidade brasileira.

Implicações de pesquisa, práticas e sociais: O estilo adaptativo e a flexibilidade de resposta predominam na amostra. Estudantes quase analíticos manifestaram os mais altos níveis de liderança empreendedora. O experimento é adequado para identificar o perfil de liderança empreendedora dos alunos na perspectiva prática. Tomada de risco, inovação e flexibilidade de resposta determinam o perfil mais alto de liderança empreendedora no ambiente socioeconômico incerto simulado.

Originalidade/valor: O cruzamento dos dados da aplicação de questionários e da observação de uma oficina revela um diferencial do modelo em relação às pesquisas tradicionais sobre o tema. O experimento é apropriado para identificar habilidades cognitivo-comportamentais de liderança empreendedora em estudantes.

Palavras-chave: Liderança Empreendedora; Estilos Cognitivos; Flexibilidade Cognitiva.

Introduction

A variety of elements should be considered in assessing ways of responding to the environmental stimuli generated by capitalist expansion. The integration of world communication and the globalization of industrial, commercial, and psychosocial relations are complex phenomena. It comprises interactions between diverse and adverse realities, indetermination, and random uncertainties (Prigogine & Stengers, 1997; Morin et al., 2002). The interactions between the parts of the global system generated "uncertainty par excellence" (Prigogine & Stengers, 1997). The complexity of a changing world limits the freedom to choose and influences the cognitive process that individuals need to put into action to make wise choices as well as updating the course in uncertain environments.

Entrepreneurial behavior fosters innovation and adaptation to changing environments (Renko et al., 2015; Di Fabio et al., 2016). It involves the cognitive processes, practices, and decision-making activities that lead to entrepreneurship. The Cognitive Constructivist Theory (Bandura & Walters, 1977; Martin & Sugarman, 1996, 1997; Davies, 1998) supports the conceptual assumptions about the cognitive experiences, self-efficacy, and behavioral intentions that determine entrepreneurial behavior (Newman et al., 2018).

Consolidated studies on planned behavior tend to determine laws on intention to act with environmental stim-

uli in uncertain environments (Ajzen, 1991; Doll & Ajzen, 1992; Molaei et al., 2014; Kautonen et al., 2013). The investigation of self-efficacy to control environmental conditions allows for identifying probabilities of action in uncertain situations.

Entrepreneurial leadership is a competence for scaling adaptability and innovation in uncertain environments (Harrison et al., 2015). The development of entrepreneurial capabilities like entrepreneurial leadership is crucial to surviving the pressure of dynamic, changing, and uncertain environments (Cui et al., 2016; Henley et al., 2017).

Cognitive styles emerge according to the adaptability required by the environment. Normative principles to represent, organize, and process stimuli, information, and experiences indicate cognitive styles (Allinson & Hayes, 1996; Kickul et al., 2009). Cognitive Styles influence the way individuals interpret the environment and how they alter their mental models to guide their behavior (Hayes & Allinson, 1998; Mueller & Shepherd, 2016).

In recent years, there is a growing interest in the application of cognitive style in the field of business and management (Armstrong et al., 2011; Jain & Jeppesen, 2013; Molaei et al., 2014). The exploration of the role of cognitive styles of business leaders in the success of knowledge creation and its application is the result of processes of human cognition (Jain & Jeppesen, 2013). Therefore, investigating the influence

of cognitive styles on entrepreneurial leadership potential may be an area of interest in researching entrepreneurial behavior.

Cognitive adaptability requires the flexibility to respond to unexpected events. Adaptability in uncertain environments involves changing perspectives to address dynamic problems through entrepreneurial capabilities (Cui et al., 2016). Likewise, the diverse repertoire of thinking on a topic, and the use of multiple mental representations, that is, cognitive flexibility, favors the adoption of alternative communication systems between elements of knowledge (Martin & Rubin, 1995; Guerra, 2012; Spiro et al., 2012).

Cognitive flexibility is a necessary feature to undertake. However, it is little explored in studies of entrepreneurial behavior, focusing on classical investigations of cognitive psychology, for example in the study by Gao et al. (2018). In addition, in the studies on entrepreneurial leadership competences investigated for this article, flexibility appears as a term associated with the speed of reasoning and adaptation without mentioning a specific concept.

Currently, there is a blind trust in the influence of people's judgment on their ability to organize and execute courses of action. Self-efficacy is the most highlighted social-cognitive concept in recent studies about entrepreneurial capabilities (Gu et al., 2017; Newman et al., 2018).

Despite the social-cognitive perspective based on interactions, shared

mental models, and the active learning of the entrepreneurs focus on self-perception, and neglect field experiments and realistic simulations of entrepreneurial behavior (Newman et al., 2018; Hameed et al., 2018). Considering the globalization, speed, and constant change, technological evolution, it is possible that new confirmatory experiments are necessary for metric constructs and standards of entrepreneurial leadership.

Entrepreneurs tend to consider potential directions but may show inadequate confidence in their abilities when evaluating an opportunity (Corbett & Hmieleski, 2005). Cognitive styles have a direct impact on how entrepreneurs evaluate opportunities (Keh et al., 2002). However, there is no consensus on the entrepreneurs' cognitive profile and a multidimensional perspective can be adopted in the future to gain a clearer picture (Armstrong et al., 2011). More research using integrated measures and a wide range of indicators is needed to achieve the heterogeneity that characterizes entrepreneurial behavior.

Specific constructs related to adaptation to today's rapidly changing world have been studied separately in the past (Di Fabio et al., 2016). More research is needed on cognition to unearth the much-neglected social and human side of the rational processes to adapt and create sustainable economic growth (Hameed et al., 2018). An integrated perspective is needed to further investigate and understand the cogni-

tive-behavioral processes of entrepreneurial leadership.

The interest of university students in entrepreneurship has been increasing in recent years due to an open to opportunity and volatile market (Moraes et al., 2018; Vignochi et al., 2020). Recent studies have investigated links between entrepreneurship and leadership in college students (Miller et al., 2018; Townsend et al., 2018; Roessler et al., 2019; Vignochi et al., 2019; Vignochi et al., 2020). The classroom can be a favorable environment for the application of experiments in this subject due to the educational context of professional training (Gartner & Vesper, 1994; Raposo & Paço, 2011; De Simone, 2016; Vignochi et al. 2020).

The present study differs from the others once it emphasizes the data collection through a task simulation of the entrepreneurial action to manage the resources, promote the pursuit of opportunities, and search for advantages (De Simone, 2016; Phillips & Phillips, 2016). Experimental investigation of cognitive processes into simulated challenging actions can stimulate the attitude of entrepreneurial leadership in students facing uncertain opportunities in a rapidly changing environment and scarce resources. Since the achievement of the entrepreneurial objectives consists of a set of real actions, it becomes necessary to verify the entrepreneurial behavior on its consolidation.

Therefore, this paper aims to estimate the entrepreneurial leadership behavior through the dimensions of cog-

nitive styles and flexibility. The present study differs from current models with the advantage of traversing individuals' self-perception of cognitive processes (through questionnaires) and direct observation of entrepreneurial leadership behavior (through a field experiment).

Conceptual Model

In this chapter, we discuss the main definitions that support the conceptual model proposed. It begins with a brief discussion of the social cognitive perspective of entrepreneurship. Subsequently, the concepts of Cognitive Styles, Flexibility are presented and, after a brief discussion about the evolution of the concept of leadership, Entrepreneurial Leadership is defined.

Socio-cognitive perspective of entrepreneurship

Entrepreneurship involves the evaluation of real opportunities in environments of uncertainty, so it has become a fertile field for research (Hisrich et al., 2014). The ability to modify decisions according to environmental information presupposes the incorporation of cognitive adaptation (Ajzen, 1991; Kautonen et al., 2013). The decision to undertake is a result of the evaluation of the environmental conditions to act on an opportunity (McMullen & Shepherd, 2006; Mueller & Shepherd, 2016). Entrepreneurial action involves the mental processes in the reduction of doubts and the decision to undertake or

refute an opportunity (Sánchez et al., 2011; Hisrich et al., 2014). Social

Such cognitive processes underlie individual motivation to achieve entrepreneurial goals. They are fundamental to verify the feasibility and convenience of acting in situations of uncertainty (Koryak et al., 2015). They are the main characteristics of the environment concept adopted to the conceptual model.

The concepts of Cognitive Styles (CS) and Cognitive Flexibility (CF) characterize the information-processing construct.

Cognitive Styles

A CS is a normative principle that indicates ways of organizing and processing information and experiences (Allinson & Hayes, 1996). They influence the mental processing of information to reveal adaptability in changing and uncertain environments (Allinson & Hayes, 1996); Kickul et al., 2009). Allinson and Hayes (1996) defined different dimensions of CS: intuitive - immediate judgment of information and/or experience based on feelings and under a global view; analytical - judgment of information and/or experi-

ence based on reasoning; adapter - judgment based on the combination of global vision and reasoning; almost intuitive - more for intuitive than adapter and almost analytical - more for analytical than an adapter. The following dimensions of CS were selected according to Carland and Carland (1996) and Nascimento et al. (2015), as show in Table 1.

Cognitive Flexibility

Cognitive Flexibility (CF) is the ability to discern useful mental representations to meet adaptation needs in a given environment (Martin & Rubin, 1995; Cañas et al., 2003; Moore & Malinowski, 2009; Guerra, 2012; Spiro et al., 2012). It consists of responding to opportunities that arise and avoiding courses of action that restrict adaptability to new situations. Therefore, it is assumed that the higher the cognitive flexibility index, the greater the ability to adapt to uncertain environments. In the present studies, the dimensions of CF are investigated as defined by Guerra (2012), shown in Table 2.

Dimension	Definition
Strategic Posture	Use of planning to evaluate decision-making.
Propensity of Innovation	Incorporation of innovation in the action of entrepreneurship.
Personality Traits	Personal trends and patterns to overcome obstacles.
Risk Propensity	Facing unexpected situations.

Table 1. Dimensions of Cognitive Styles

Source. Adapted from Carland and Carland (1996) and Nascimento et al. (2015).

Dimension	Definition
Flexibility of Attention	Individual's ability to be aware, select, filter, focus, allocate and refine stimulus integration.
Flexibility of Representation	Ability to analyze, synthesize, store and retrieve information.
Flexibility of Response	Ability to generate strategies, plans, elaboration, regulation, execution, control, decision and execution programs.

Table 2. Dimensions of Cognitive Flexibility

Source. Adapted from Guerra (2012).

Evolution of the concept of leadership, and definition of Entrepreneurial Leadership

The theoretical currents of leadership have defined, over time, different concepts and styles according to the

historical moment and the advances in studies on the subject (Griffin & Moorhead, 2016; Robbins et al., 2020). Figure 1 shows a timeline containing the main leadership approaches and typologies that are linked to the concept of Entrepreneurial Leadership.

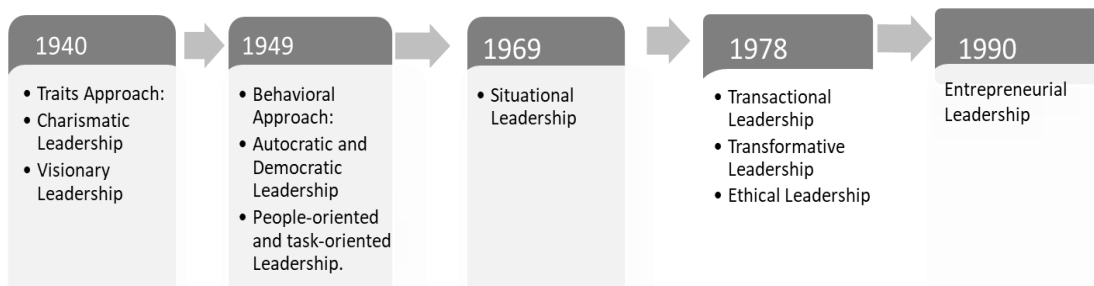


Figure 1. Timeline of leadership styles

Source. The authors

The Traits Approach, popularized in the 1940s, identified enduring and stable traits that differentiated leaders from non-leaders, such as charisma, intelligence, decisiveness, enthusiasm, integrity, and self-confidence (Griffin & Moorhead, 2016; Robbins et al., 2020). Among the types of leadership identified in this approach are Charismatic Leadership and Visionary Leadership. The first consists of the ability to convince and influence, the second involves the ability to create and articu-

late a realistic, credible, and attractive vision of the future for an organization (Robbins et al., 2020).

The Behavioral Approach emerged in the late 1940s, from the schools of Ohio State University and Michigan University in the USA (Griffin & Moorhead, 2016). The first evidence is that leaders can be more autocratic or democratic, that is, consultative or liberal. The second sought determinants of patterns of leadership behavior for the acquisition of effective performance by

work teams in organizations. Such behaviors involve tendencies toward task orientation or people orientation (Robbins et al., 2020).

Situational Leadership, which emerged in 1969, complements the behavioral approach based on the assumption that the leader's behavior varies according to the situation and contingency (Griffin & Moorhead, 2016). According to this typology, the leader can be a director, guide, supporter, or delegate, according to the situation and maturity of the team.

Transactional Leadership and Transformative Leadership, created by James McGregor Burns in 1978, are based on the assumption that the leader guides and mobilizes the team toward organizational objectives through evolutionary changes in the external environment (Robbins et al., 2020). The main difference is between the focus on the interaction between people and the capacity for transformation anchored in improving skills to keep up with the changes and uncertainties involved in the evolution of the environment (Griffin & Moorhead, 2016; Robbins et al., 2020). Added to these new leadership perspectives, is the finding that "transforming" leaders inspire followers by aligning their own and their followers' value systems toward important moral principles (Brown et al., 2005; Robbins, 2020). The aforementioned set of moral principles is studied in terms of values and attitudes within the scope of Ethical Leadership.

From the 1990s onwards, with the intensification of entrepreneurial actions in the social, political, and economic environment, marked by leadership attitudes in the management of new ventures and the market, Entrepreneurial Leadership emerged (Fernald et al., 2005).

Entrepreneurial Leadership (EL) is a leadership style in which a leader influences and directs employee performance to recognize and exploit business opportunities in uncertain environments (Gupta et al., 2004; Fernald et al., 2005; Jensen & Luthans, 2006; Surie & Ashley, 2008; Renko et al., 2015; Volery et al., 2015; Chell et al., 2016; Di Fabio et al., 2016; Newman et al., 2018).

Evidence on relationships between Cognitive Styles, Cognitive Flexibility, and Entrepreneurial Leadership

There is not enough theoretical and practical evidence to verify relationships between CS and CF in studies based on the socio-cognitive perspective and in the field of entrepreneurship. Most research on gender is concerned with highlighting generic cognitive and behavioral characteristics in populations stratified by age groups (Allinson & Hayes, 1996; Cañas et al., 2003; Koryak et al., 2015; Chell et al., 2016; Vignochi et al., 2019; Vignochi et al., 2020). The present study aims to overcome this limitation and also seek to test relationships between cognitive behavioral processes and the entrepre-

neurial leadership profile of university students.

The proposed model

EL is a critical competency for entrepreneurs and leaders to assess opportunities and risks of innovation, un-

der conditions of uncertainty control (Di Fabio et al., 2016; Roessler, 2019). In this study, we propose that it is identified according to the propensity to respond to the stimuli of an opportunity according to information processing (CS, CF, and its dimensions). Figure 2 shows the proposed model.

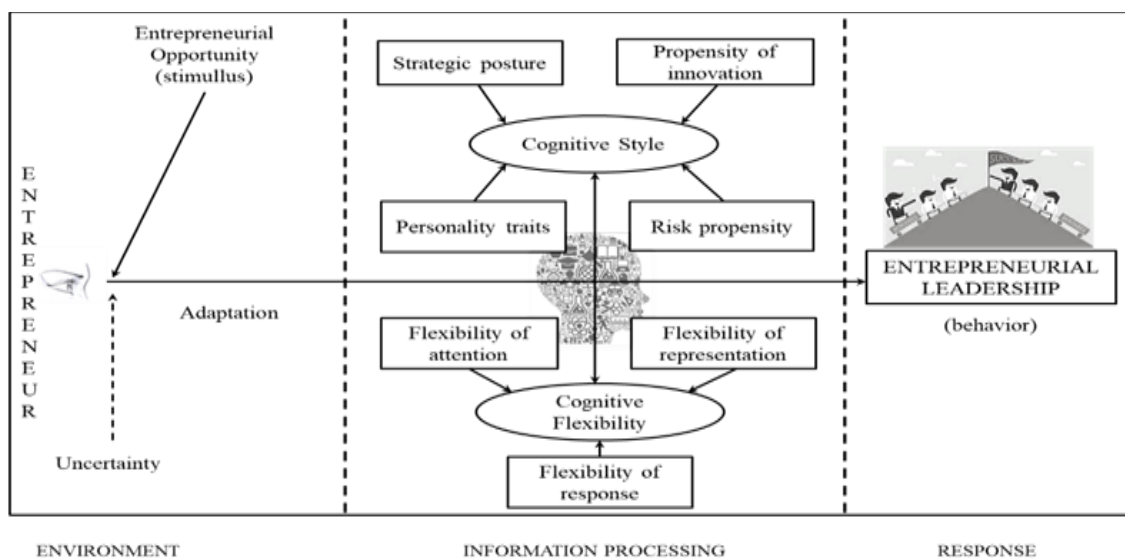


Figure 2. Proposed Model

Source. The authors.

The model proposed in Figure 2 involves three constructs. First, the environment is formed by the concepts of entrepreneurial opportunity (the stimulus to undertake), uncertainty, and the need for adaptation to the changing environment. The second construct, the cognitive processing of information, comes into play to formulate the response to a given stimulus (opportunity). According to Planned Behavior Theory and Social Constructivist Theory, CSs and CF determine informational processing. The EL consists of the assertiveness of the path chosen, that is,

the behavioral response of the individual suitable to lead an enterprise.

Method

A quasi-experiment was applied to achieve the main goal. Experiments are lab studies that occur in an artificial environment that was created for research purposes (Colquitt, 2008). An entrepreneurial task is simulated through a practical exercise to configure a field experiment in a classroom environment. Simulation of real-world experiences through classroom tasks is a research tool that resembles real-world events

(De Simone, 2016). The classroom environment favors the empirical investigation of the cognitive processes that involve the entrepreneurial response through behavioral observation (Phillips & Phillips, 2016). Entrepreneurship students represent a relevant population for experiments, observations, and behavioral inventories (Gartner & Vesper, 1994; Raposo & Paço, 2011; De Simone, 2016).

Participants

The sample is composed of 68 undergraduate academics from an accounting undergraduate course (4th and 8th semesters) from a university in the southern region of Brazil. The main selection criteria were the presence of an entrepreneurship discipline in the academic curriculum. From the sample, 34 academics did not attend the entrepreneurship discipline (50% referring to the fourth phase of the course) and the others 50% finished the discipline in the eighth semester. The sampling criterion was for convenience, according to the need to perform a pretest. The participants signed the Free and Informed Consent Term, and the researchers assumed the responsibility of keeping confidentiality and preserving the identity of the study subjects, being able to use it only for inconclusive scientific investigations.

The research subjects were characterized according to age, sex, stage of the course, if they work and in what activity, and if they are intent on opening

a business in the future. The academics had ages ranging from 19 to 40 years ($X = 23.93$, $SD = 4.35$), 45 (66.17%) females, and 23 males (33.82%). Almost all of the academics work (97.05%) in the accounting segment (33.82%). Most of the participants intend to start their own business when they complete the training, although some do not manifest themselves in this situation (2.04%).

Instruments

"The Marshmallow Challenge"

A team leadership exercise that requires participants to build a tower structure using 20 uncooked spaghetti fillets, 1 meter of scotch tape, 1 meter of string, and 1 marshmallow in 18 minutes (Wujec, 2010; De Simone, 2016). Participants needed to find alternatives to build the structure, with scarce resources, which they do not know until they open a package containing the material. Groups should pursue the success of the venture (a tower as high as possible with a marshmallow attached to the top of the structure) within a limited period. This challenge simulates a real opportunity situation (stimulus to build a tower) in an environment of uncertainties (unknown and limited material).

Participants process information according to their CSs and CF to achieve the task goal. EL was scored according to the height and sustainability of the structure at the end of the time to accomplish the challenge. Table 3 shows the criteria adopted to

verify the EL in this research, according to four specialists (psychology, management, accounting, and mathematics).

In item 3.2.4 we declare how the observation of EL behavior occurred.

Levels	Scale	Criteria
Low	1	Group has not fulfilled the task and the procedures adopted.
Middle	2	Group fulfilled the task and resulted in the second-highest tower.
High	3	Group fulfilled the task and resulted in the highest tower.

Table 3. Levels of the propensity for Entrepreneurial Leadership

Source. The authors.

Cognitive Style Index

A questionnaire by Allinson and Hayes (1996) was widely used to measure cognitive style through five types: Intuitive (In), Quasi-Intuitive (QI), Adaptive (Ad), Quasi-Analytical (QA), and Analytical (A). It includes 38 items that express the CS's characteristics. In this study, the 38 items are distributed

in four dimensions of the observable variables shown in Figure 2, according to Carland and Carland (1996). Responses are given as true, uncertain, or false, and the values assigned for each alternative response can be respectively 2, 1, or 0. The CSs were assigned according to the scores shown in Table 4.

Style	In	QI	Ad	QA	An
Score	0-28	29-38	39-45	45-62	53-76

Table 4. Cognitive Styles scores

Source. Allinson and Hayes (1996)

Cognitive Flexibility Scale

Martin and Rubin (1995) elaborated a questionnaire to measure CF. It consists of a set of 12 items for self-assessment of the individual's ability to integrate knowledge and procedures related to the resolution of problem situations. In this study, the 12 items were distributed in three dimensions shown in Figure 2, according to Guerra (2012). The answers are given on a six-point Likert scale: strongly disagree (1), disagree (2), slightly disagree (3), agree slightly (4), agree (5), and strongly

agree (6). The sum of the scale punctuation indicates the level of CF.

Observation protocols

The experts used three observation protocols during the quasi-experiment. Cognitive Style Index and Cognitive Flexibility Scale items were adapted to record the observations of CSs and CF. The criteria established in Table 3 compose the EL protocol. The protocol was completed according to the observation in loco, from the measurement of the height of the towers built by the groups,

after discarding those who did not complete the task. The largest tower reached level 3; the rest reached level 2 and the discarded reached level 1. Students who did not participate in the practical stage were not counted in this stage. The "Marshmallow Challenge" images were videotaped for further confirmation of the protocols completed by the experts.

Procedures

The procedures performed in this research constitute a three-step quasi-experiment (Colquitt, 2008; Gartner & Vesper, 1994; Raposo & Paço, 2011; De Simone, 2016): (1) application of the Cognitive Style Index and the Cognitive Flexibility Scale, (2) "Marshmallow Challenge", and (3) expert observations. In the first step, the four experts applied the two questionnaires (20 minutes). In the second stage, participants were invited to perform the "Marshmallow Challenge" in the classroom environment. Participants were randomly assigned to four and five-member groups to involve all volunteers. Subsequently, the instructions were given, and envelopes closed with the material for each group to perform the challenge (18 minutes). The third step consists of the observations of group behavior by the specialists during the challenge. The behaviors observed are related to the observed variables about CSs and CF during the task, as well as the level of EL in each group at the end of the challenge. The quasi-experiment was carried out twice. First, with the class that did not

attend the discipline of Entrepreneurship and, in the second moment, with the group that already studied the discipline. Figure 3 shows the design of the quasi-experiment used to test the conceptual model proposed in this article.

An uncertain opportunity environment was simulated to perform an entrepreneurial task according to the stimuli given in the "Marshmallow Challenge" (WUJEC, 2010; DE SIMONE, 2016). The application of the questionnaires had the objective of collecting the individual self-evaluation about the information processing (CSs and CF). The observation by experts aimed to assess group behavior. The "Marshmallow Challenge" images were videotaped for further confirmation of the protocols completed by the experts.

Data analysis

We used the Excel application for the tabulation and organization of the data, and for the data analysis, the statistical program Statistical Software for Social Sciences* (SPSS®) version 21.0 for Windows. Descriptive statistics were analyzed to explore the variables of CSs and CF (Kolmogorov-Smirnov test). ANOVA was used to establish a comparison of averages.

The course semester was defined as the predictor to relate CSs with CF and EL. A correlation analysis was performed between the dimensions of ECs and CF with EL. Finally, we attempted to identify an explanatory model of EL

in each phase of the accounting sciences course through regression analysis.

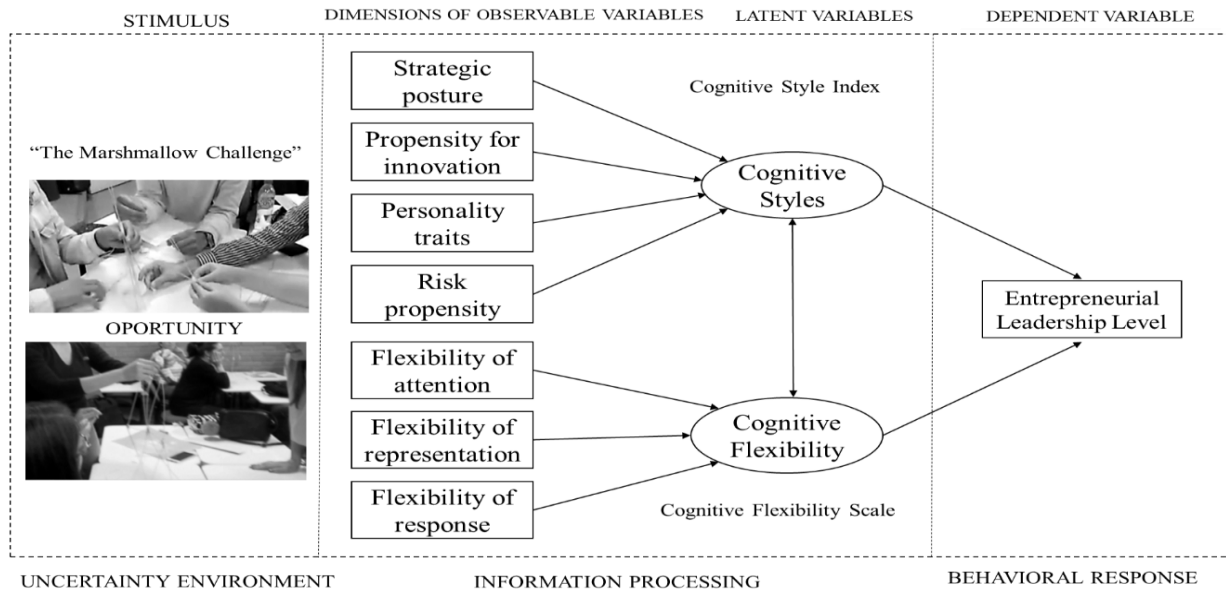


Figure 3. Quasi-experiment design

Source. The authors.

Results

The 4th and 8th phases were considered as a total sample and the average, standard deviation, asymmetry, and kurtosis were calculated for the four dimensions of CSs and the total

sum. The same procedure was performed concerning CF.

The Kolmogorov-Smirnov test with Lilliefors adjustment (non-parametric test, $p > 0.05$) was used for the data treatment. Table 5 shows the results.

Latent variables	Dimensions (Observed variables)	Average	Standard deviation	Asymmetry	Kurtosis
CSs	SP	14.86	3.79	0.17	-0.61
	PI	5.63	1.34	-0.42	-0.03
	PT	16.35	2.84	-0.68	0.53
	RP	8.92	3.25	-0.16	-0.61
	Index	45.77	11.23	-1.10	-0.73
CF	FA	17.23	3.42	-0.43	0.24
	FR	13.82	2.52	-0.43	-0.42
	FRE	21.51	3.88	-0.60	0.17
	Index	52.57	9.83	-1.47	-0.001

Table 5. Descriptive statistics

Source. Field research.

Dependent variable	Predictor	N	Average	Standard Deviation	Standard Error
CS	4P	34	45.9706	6.44551	1.10540
	8P	34	45.5882	9.11914	1.56392
CF	4P	34	52.8529	6.60369	1.13299
	8P	34	52.2941	9.88580	1.69540

Table 6. Comparison of averages

Source. Field research.

The total sample shows a Cognitive Style index of 45.77 and a standard deviation of 11.23. Flexibility reached an index of 52.57, and a standard deviation of 9.89. For the analysis of the variance of each dimension, we used the ANOVA of a single dependent varia-

ble. It consists of a suitable statistical resource against the violation of normality and the homoscedasticity of the errors (Hair et al., 2005). ANOVA results allowed for verifying normality for all dimensions of CS and CF.

Latent Variable	Levene test		T-test for equality of averages						
	F	Sig.	t	df	Sig. (2 tailed)	Averagediff.	Std. Error diff	95% confidence interval diff.	
								Lower	Upper
CSs equal variances assumed	5.950	.017	-.200	66	0.842	-.38235	1.91513	-4.20604	3.44134
Equal variances not assumed			-.200	59.387	0.842	-.38235	1.91513	-4.21401	3.44930
CF equal variances assumed	6.093	.016	-.274	66	.785	-.55882	2.03913	-4.63007	3.51243
Equal variances not assumed			-.274	57.574	.785	-.55882	2.03913	-4.64122	3.52358

Table 7. The equality of variance test

Source. Field research.

The CS and the CF are dependent variables, and the course semester is the predictor for the analysis of variance. Student's t-test allowed the comparison

of the independent sample averages (4th P and 8th P). Table 6 shows the comparison of averages.

The academics who did not complete the entrepreneurship course presented an average of 45.97 CS and 52.85 CF. The academics that completed the course presented a mean of 45.58 CS and 52.29 CF. There is no significant difference in averages for the predictors of CS and CF. The Levene test for equality of variances was conducted to confirm these results (Table 7).

Table 7 shows that although the Sig. for F indicate a difference of variability, t-test results for equality of averages al-

lowing to affirm that the averages of the 4th and 8th phases are not different. Table 8 shows the sampling classified according to Allinson and Hayes (1996).

As shown in Table 8, the predominant CS in the 4th phase is the QA, followed by Ad. In the 8th phase, the CS varies from Ad to An. Only one individual in the whole sample is classified as In. The predominant CSs in the phases are Ad and QA. The academic In was excluded because he is an outlier.

CS	Phase		Sum
	4 th	8 th	
In	0	1	1
QI	4	6	10
Ad	10	11	21
QA	16	5	21
An	4	11	15
Total Sample	34	34	68

Table 8. Cognitive Styles

Source. Field research.

Relationships between CSs as predictors and CF were found in the total sample. The Ad academics present the highest CF of the sample (57.76 ± 8.47). The QA and academics do not present differences in the CF. Individuals classified in these two CSs have the lowest CF of the sample (49.33 ± 7.15 ; 49.53 ± 6.44). The academics classified as QI and Ad form two distinct groups (54.50 ± 7.10 ; 57.76 ± 8.47). Is not possible to say the same concerning the QA and An (49.33 ± 7.15 ; 49.53 ± 6.44). Tests were performed to verify relationships between CSs and EL.

The individuals classified as QA have the highest EL average (1.52 ± 0.81). The lowest average was found among Ad and An (1.23 ± 0.53 ; 1.26 ± 0.70).

The t-test results were calculated at each stage of the accounting course. Individuals classified as Ad in the 4th phase had the highest CF index (57.66 ± 6.61), and the An had the lowest CF index (48.5 ± 4.72). For the relationships of CSs with EL, the QAs had the highest EL levels (1.41 ± 0.79), and the Ad had the lowest EL levels (1.33 ± 0.50). In the 8th phase, for CSs versus CF, the Ad

had the highest CF index (58 ± 10.41), and the QA had the lowest CF index (44.40 ± 10.99). For the relations of CSs with EL, it was found that the QAs had the highest EL levels (1.80 ± 0.84), and the QIs had the lowest EL levels (1.33 ± 0.52).

Sample statistics

The associations of the dimensions (observable variables) of CSs, CF, and the EL were calculated for the independent samples of the 4th and 8th phases of the accounting sciences course. Table 9 shows the results for academics that did not complete the en-

trepreneurship discipline (4th semester).

Table 9 shows a significant positive correlation between FR and FA as well as between FRE and FA. Dimensions of CF are all positively correlated. On the other hand, there is a significant negative correlation between FA and RP and between FRE and RP. It demonstrates that the lower the CF, the greater the risk propensity (RP), and vice-versa. Likewise, there is a negative and significant correlation, which is corroborated between risk propensity (RP) and entrepreneurial leadership (EL).

Dimensions	SP	PI	PT	RP	FA	FR	FRE	EL
SP	1.00							
PI	-0.0924	1.00						
PT	0.3150	-0.0036	1.00					
RP	0.2536	-0.1602	0.0020	1.00				
FA	-0.3073	0.1337	-0.0019	-0.5882	1.00			
FR	0.1798	0.1888	-0.0452	-0.2444	0.5453	1.00		
FRE	-0.2785	0.0044	0.0081	-0.3477	0.5024	0.3030	1.00	
EL	-0.1268	-0.0177	0.1353	-0.4653	0.2039	0.0684	-0.0348	1.00

Significance $p \leq 0.05$

Table 9. 4th Phase correlation matrix

Source. Field research.

When calculating the regression equation with the data from the 4th period to estimate entrepreneurial leadership, the regression ANOVA was significant ($p = 0.0077$), with a multiple R being equal to 0.5103 and an adjusted coefficient of determination of 18.65% (adjusted $R^2 = 0.1865$). The existing partial correlations indicated that only risk propensity (RP) contributes signifi-

cantly ($\beta = -0.54$) to the EL estimate. Tests carried out confirmed the homoscedasticity of the residues, as well as their normality and independence. Regression equation for the 4th period is $EL = 3.74 - 0.14 RP$. Table 10 shows the results for the academics that completed the entrepreneurship discipline (8th Phase).

Dimensions	SP	PI	PT	RP	FA	FR	FRE	EL
SP	1.00							
PI	-0.0544	1.00						
PT	0.6562	0.6049	1.00					
RP	0.5780	-0.0848	0.6049	1.00				
FA	-0.3280	0.2357	-0.1931	-0.3459	1.00			
FR	-0.0605	0.2200	0.2008	0.0850	0.5471	1.00		
FRE	-0.2082	0.1395	-0.638	0.0843	0.6816	0.6957	1.00	
EL	0.0685	0.3438	0.1646	0.0692	0.0949	0.1890	0.0309	1.00

Significance $p \leq 0.05$

Table 10. 8th Phase correlation matrix

Source. Field research.

In addition to these associations, there is also a significant positive relationship between SP (strategic posture) and RP (risk propensity). This shows that the students of the 8th (and final) semester, which have already finished the discipline of entrepreneurship, increase or decrease their RP in direct relation to their SP and its PT. When one observes the possible links of entrepreneurial leadership, there is a significant statistical relationship with the propensity for innovation.

Discussion

The results for the total sample show that the predominant CS was the Ad. Regarding CF, the FRE dimension was highlighted. This corroborates previous findings regarding the importance of a varied repertoire of responses for adaptation in complex situations. The ability to respond adaptively to situational demands allows the restructuring of the knowledge to act in uncertain environments (Spiro et al., 2012; Guerra, 2012). Finding opportuni-

In the calculation of the regression equation to estimate the EL, the ANOVA indicates that it is valid since it was a p -value = 0.0464. However, the multiple R was only 0.3438 and the adjusted R^2 was only 9.06%. As happened for the 4th period only a single predictor variable is significant in the estimation of EL, in this case, PI ($\beta = 0.34$). After the tests with the residues, homoscedasticity, normality, and independence were also confirmed. The regression equation for the 8th semester is expressed by $EL = 0.19 + 0.19 PI$

ties, including adapting ideas to different knowledge, solving unstructured problems, and seeking unexpected solutions (Kickul et al., 2009; Jain & Jeppesen, 2013; Molaei et al., 2014). Presenting high FRE indices indicates the capacity for decision and execution (Martin & Rubin, 1995; Guerra, 2012) in this case responds to the stimuli (opportunity) of an environment of uncertainty to simulate a venture.

Individuals classified as Ad presented the highest CF index. This points to close relationships between adapta-

tion and agility to respond to the demands of the environment. To adapt to uncertain situations is to have the flexibility to vary the repertoire of responses and to plan the behavior according to the environmental changes (Ajzen, 1991; Kautonen et al., 2013). However, the highest EL level was attributed to the QA style. Influencing people, consolidating ideas into opportunities and business strategy depends on the information analysis that allows evaluating and planning for risk, (Jensen & Luthans, 2006; Kickul et al., 2009; Renko et al., 2015; Chell et al., 2016; Gu et al., 2018), or which QA can be more efficient.

It sought to verify the influence of the course semester as the predictor of CS and CF. The experiment was carried out, firstly, with the 4th stage academics and later with the 8th semester academics. The groups were treated as independent samples, and it was not possible to affirm that completing the entrepreneurship discipline alters CS and CF. This can be attributed to the fact that in academia the main investment is the formal knowledge curriculum. This finding points to the importance of simulating practical challenges to develop entrepreneurial cognitive skills. Teaching models based on practical and cognitive challenges can aid in the development of social skills, build relationships, and facilitate adaptation to consolidate a new venture (Mueller & Shepherd, 2016).

The EL model was defined for the independent samples of each semester.

For the 4th semester, it was found that EL is inversely proportional to RP. This relation does not negate the role of the RP dimension for the LE in this group studied. Thus, when entrepreneurs are prone to different risks, it could lead to different business decisions (Cui et al., 2016). Considering the QA as the predominant style for EL in this course semester, it is possible to confirm the importance of the analysis of the information to minimize risks concerning the decision to lead a venture (Jensen & Luthans, 2006; Kickul, et al., 2009; CHELL et al., 2016). For the 8th semester, it was found that the higher the PI, the greater the EL. According to Sánchez et al. (2011, p.435), "successful entrepreneurs enjoy discovering opportunities, being innovators and taking risks, as inventors". Leadership is a key factor in driving innovative behavior. Innovative behavior is more likely to be influenced by the extent to which the leader exhibits entrepreneurial leadership behaviors (Hameed et al., 2018). The analytical capacity allows for judging the innovative potential of an enterprise (Carland & Carland, 1996; Hayes & Allinson, 1998; Armstrong et al, 2012; Jain & Jeppesen, 2013; Molaei et al., 2014).

It should be noted that in none of the course semesters was there a significant, and this represents the ability of the CF in the regression model to estimate the EL, only the CS. Samples had to be treated independently. However, in both groups, the flexibility of attention presented a moderate positive rela-

tionship with the flexibility of representation and flexibility of response. Focus attention on important information is a requirement to build a representation of the situation and respond swiftly to the demands of an uncertain opportunity environment (Molaei et al., 2014; Kautonen et al., 2013). Therefore, the flexibility of attention between the dimensions of cognitive flexibility is emphasized, although it is not significant to estimate entrepreneurial leadership.

The experiment, as it was organized (self-perception plus the direct observation of behavior) highlights the influence of RP and PI to measure LE, according to another current research (Renko et al., 2015; Chell et al., 2016; Gu et al., 2018; Hameed et al., 2018; Newman et al., 2018). Further studies should be conducted in this direction and depth.

The experimental model test suggests that the "Marshmallow Challenge" can force particular kinds of adaptation that may both compel and enable entrepreneurial initiatives. The experts noted that the involvement of participants in the task of building a tower under the conditions offered allowed them to adapt to the uncertain situation (previously unknown material, resources, and limited time) to reach potential levels of entrepreneurial leadership.

Conclusion

This paper aimed estimate entrepreneurial leadership behavior through

dimensions of cognitive styles and flexibility. A quasi-experiment was carried out through the application of the Cognitive Style Index, the Cognitive Flexibility Scale, and the observation of entrepreneurial leadership in the "Marshmallow Challenge" with 68 students of Accounting Sciences. This device allowed simulation an opportunity to "create a venture" in an uncertain environment, with scarce resources and limited time. The application of the questionnaires gave access to the significant dimensions of cognitive information processing during the challenge to estimate the entrepreneurial leadership behavior of two independent groups. In the group of students of the fourth period (those who did not finish the entrepreneurship discipline), the main dimension to estimate entrepreneurial leadership was risk propensity. In the group of students of the 8th period (those who completed the discipline of entrepreneurship), the main dimension to estimate entrepreneurial leadership was the potential for innovation. This means that for the higher levels of entrepreneurial leadership in these groups, the respective dimensions are the most significant. The results of the influence of both cognitive dimensions on entrepreneurial leadership are useful for research and entrepreneurial actions.

The statistical tests prove that the conceptual model is effective in estimating entrepreneurial leadership. The importance of observation by specialists already exemplified in previous

studies should be emphasized. The “Marshmallow Challenge” is useful for simulating uncertain environments, such as the opportunity to create a new venture, and measuring entrepreneurial leadership behavior according to cognitive dimensions.

The mix between the application of questionnaires and the realization of a workshop is a differential of the model. The experiment is appropriate for identifying cognitive-behavioral skills of entrepreneurial leadership in students.

The results are limited to the sample size and the heterogeneity between the data considered in the research. For future works, it is suggested to consider the homogeneity between the data to identify the behavioral cognitive processes and the entrepreneurial leadership profile of specific groups according to cognitive styles. Further studies in larger samples and populations may contribute to establishing complex relations through the model dimensions.

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