

Corporate entrepreneurship at the university: the influence of managerial support, autonomy and reward on the innovative behavior of university professors

Influence of
managerial
support

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Abstract

Purpose – The study aims to analyze the influence of managerial support, autonomy and reward perception on the innovative behavior of university professors.

Design/methodology/approach – Quantitative methodology based on partial least squares structural equation modeling. The sample obtained totaled 208 responses from professors at three public universities in the State of São Paulo, Brazil.

Findings – The results indicate that managerial support is a fundamental factor for developing an organizational environment that is more conducive to innovative behavior and corporate entrepreneurship. However, in educational institutions with a more focused entrepreneurial ecosystem, it was discovered that reward perception is not a fundamental factor for the innovative behavior of university professors.

Practical implications – From a practical perspective, academic institutions interested in stimulating corporate entrepreneurship should create opportunities for collaboration among professors to solve problems, encourage professors to expose their work beyond the university environment and improve the main indicators of management support and autonomy presented in this research.

Social implications – The study presents indicators and implications, which are of particular interest for university managers and public policy writers.

Originality/value – The study is demonstrably original. Through its unique analysis of the innovative behavior of university professors and the connections between variables in the university environment and its use of a robust modeling method in an emerging-economy context, the study furthers existing research by helping to understand why some firms are better than others at corporate entrepreneurship.

Keywords Corporate entrepreneurship, Innovative behavior, University environment, Entrepreneurial ecosystem, Management support

Paper type Research paper



1. Introduction

Corporate entrepreneurship has recently gained relevance to the academic world and business practice, as it intensifies the generation of innovations and technologies. This is due to market competitiveness, which has led businesses to seek the innovations necessary to create and maintain competitive advantages when responding to environmental pressures (Hughes and Mustafa, 2017). By encouraging their employees' innovative behavior, businesses can identify new opportunities (Ireland *et al.*, 2009) and revitalize and increase the capacity for organizational innovation (Ireland *et al.*, 2009). In a scenario of constant technological change, in which innovation and entrepreneurship are catalysts, businesses need to innovate and respond with reduced risk, act in a targeted manner and plan by encouraging internal innovative activity (Kuratko *et al.*, 2014; Kuratko and Morris, 2018).

Corporate entrepreneurship is a term that concerns the entrepreneurial behavior of established organizations, in the sense of creating an environment where entrepreneurial actions take place (Stopford and Baden-Fuller, 1994; Morris *et al.*, 2011). Corporate entrepreneurship has become a fundamental strategy for organizations of all sizes and types. It contributes to the development of innovations and technologies by bringing an organization and its market closer together. This concept of corporate entrepreneurship also found its focus in universities, by encouraging the entrepreneurial behavior of employees and professors, as well as the development of research that could be converted into innovations and technologies. The intention to promote corporate entrepreneurship in universities is to improve the university environment to support entrepreneurial and innovative practices, modernizing the organization of universities (Fischer *et al.*, 2019; Kuratko and Morris, 2018; Moraes *et al.*, 2020).

To encourage corporate entrepreneurship, there is a need for the creation of an internal entrepreneurial environment, achieved through and guaranteed by the upper management, who negotiate time availability, rewards, autonomy and organizational limits (Kuratko *et al.*, 2014; Chebbi *et al.*, 2020). To encourage the growth of an entrepreneurial spirit within a university environment or a university ecosystem, the adaption of structures and methods to promote a stronger sense of enterprise among employees, professors and students are fundamental (Babatunde *et al.*, 2021; Canever *et al.*, 2017; Fischer *et al.*, 2019; Moraes *et al.*, 2020; Walsh *et al.*, 2021). One difference that universities offer is the active flow of human capital, that is, students and professors, who can update and innovate much more than research and development departments within businesses (Etzkowitz and Zhou, 2017; Etzkowitz *et al.*, 2020).

Seeking to establish an organizational environment that is more conducive to innovation, many universities are developing initiatives to foster ecosystems that encourage the entrepreneurial activity of their professors and students (Galán-Muros and Davey, 2019; Moraes *et al.*, 2021). One of the pillars of university strategy is the creation of an entrepreneurial ecosystem (Miller and Ács, 2017). For a university to become an entrepreneur, it needs to foster a culture of innovation and instigate policies and practices favorable to entrepreneurship (Kalar and Antoncic, 2015).

Despite the wealth of discussion about the role that the corporate environment plays in stimulating entrepreneurial behavior, articles on the influences of culture and how companies are structured for corporate entrepreneurship are still few and far between (Schindehutte *et al.*, 2018; Schröder *et al.*, 2020). The literature is even scarcer in the context of emerging economies (Hughes and Mustafa, 2017) and university environments (Fischer *et al.*, 2019; Moraes *et al.*, 2020; Walsh *et al.*, 2021). The entrepreneurial behavior of employees and how the corporate environment influences such behavior is an emerging

topic and a gap in corporate entrepreneurship research (Kang *et al.*, 2016; Kuratko and Morris, 2018; Schindehutte *et al.*, 2018). Understanding these influences will allow us to understand why some companies and universities are better than others at generating entrepreneurial behavior for corporate entrepreneurship (Pirhadi and Feyzbakhsh, 2021).

The environment of Brazilian public universities, non-profit entities, despite the existence of innovative practices, is little encouraged by the institution's administration. The apparent difficulty in encouraging entrepreneurial practices in this context demonstrates the importance of understanding how these innovative attitudes can be stimulated (Pereira *et al.*, 2018). As public universities in Brazil offer free education to students, many university environments lack the necessary incentive to create an environment that encourages innovative behavior (Weller and Horta Neto, 2020). Some universities see this process as an important stimulus to maintain free education and create favorable environments for the university-industry approach.

The present research aims to contribute to closing these literature gaps by studying the innovative behavior of university professors in Brazil. This type of study will help to clarify which variables have the greatest impact on the entrepreneurial behavior of professors and students (Renault *et al.*, 2019).

Corporate entrepreneurship at the university can have professors as agents responsible for developing mechanisms and actions that encourage innovative behavior in the internal community (Fischer *et al.*, 2019; Moraes *et al.*, 2020). Thus, the objective of this study is to analyze the influence of managerial support, autonomy and reward perception on the innovative behavior of university professors, from a Brazilian perspective.

The study was conducted in Brazil, an emerging economy, with the collaboration of professors at three universities located in the State of São Paulo: the University of São Paulo (USP), the State University of Campinas (UNICAMP) and the Paulista State University (UNESP). Brazil is the largest Latin-American country and the sixth-largest country in the world, covering 8.46 million square kilometers and home to a population of approximately 211 million people (IBGE, 2021). The state of São Paulo has the largest gross domestic product (GDP) per person in the country and the highest population density, with more than 46 million people. Additionally, it has the best Development of Basic Education results, being the twelfth largest in the area (IBGE, 2021) and is one of the most important metropolitan regions of the country (Guerrero *et al.*, 2021). The state, which is located in the southeast of the country, contributed 29.87% of Brazil's GDP alone in 2019, being the country's largest contributor (IBGE, 2021). In terms of its educational system, Brazil had a total of 2,608 Higher Education Institutions in 2019 and 25% of course enrollments were made in São Paulo (INEP, 2021).

The remainder of the article is structured as follows: Section 2 explores the theoretical background of the research. Section 3 presents the methodology and Section 4 describes the empirical results. Section 5 presents the discussion of the results and the theoretical and practical implications. Section 6 concludes with the limitations and with suggestions for future research.

2. Theoretical background

2.1 Institutional environment of universities in Brazil

In the Brazilian institutional context, public universities concentrate most researchers and their technology transfer activities are regulated by government acts (Fischer *et al.*, 2018; Moraes *et al.*, 2021). Despite the recent advance of research carried out in Brazilian private universities, public universities are still classified as the main organizations in research and teaching quality (Rocha *et al.*, 2021). However, the ecosystem of public universities is more

developed for scientific research activities than for entrepreneurial activities (Barral *et al.*, 2018; Moraes *et al.*, 2021).

Brazilian private universities have a stronger interaction with companies and the labor market and naturally, the environment is more conducive to entrepreneurship. In addition, these universities have a more prepared infrastructure to support entrepreneurship, which involves, for example, incubators, maker spaces and access to financial resources (Canever *et al.*, 2017).

Thus, private universities in Brazil demonstrate a stronger capacity to shape organizational ecosystems in favor of entrepreneurial behavior (Barral *et al.*, 2018; Canever *et al.*, 2017; Moraes *et al.*, 2021). And this is worrying, as it demonstrates a disconnection between research and the market, reducing the amount of innovation in new companies.

In this context of the interaction between Brazilian universities and companies, there have been recent significant changes. Principle among them was the creation of the Brazilian Innovation Law in 2004, whose function is to regulate the university-industry relationship. Although the public university and research institutes in Brazil are responsible for almost all the research carried out in the country, prior to 2004 little of this knowledge was transferred to companies. From 2004 onwards, the scenario began to change, with public universities in Brazil forming closer ties with the business sector. As a result, in less than five years from the enactment of the Law, of the five institutions that most requested the registration of patents, four were public universities.

In terms of their management, public universities have gained great autonomy. This is especially true in the state of São Paulo, where public universities also have financial autonomy from the state. This context has been an important stimulus for the emergence and existence of entrepreneurial universities (Dalmarco *et al.*, 2018; Guerrero *et al.*, 2021). And this reinforces the importance of studying the influence of the internal environment on the entrepreneurial behavior of university professors.

Thus, the next section of this study will discuss the innovative behavior of university professors alongside the environmental dimension of entrepreneurship, which is derived from the idea of corporate entrepreneurship. In the light of corporate entrepreneurship, the influences that affect the innovative behavior of university professors will be understood. That is because corporate entrepreneurship is the implementation of entrepreneurial mindsets in the organizational culture and strategy of a university as much as it is of a corporation.

2.2 The innovative behavior of university professors

Corporate innovation or innovation in the workplace is a field of study that has advanced in recent years (Kreiser *et al.*, 2019; Vila *et al.*, 2014). The identification of new corporate-level innovative result-promoting factors is indicative of this (Belloc, 2012). Yet, although previous studies have examined the impact of individual factors on corporate innovation performance (Miron *et al.*, 2004), there is a dearth of studies that approach those factors by which employees are involved in activities leading to diverse innovation results at a corporate level (Vila *et al.*, 2014).

To generate new ideas in an innovative and creative way, employees need to work in an environment that supports and encourages their development. This is because the process of collecting information and evaluating ideas is often very demanding (Gernreich, 2018). Company leadership and managerial support, as well as ensuring the efficient implementation of best work routine proposals, have a fundamental role to play in motivating and training employees to behave innovate. Thus, so that organizations can sustain desired results, the creation of a corporate culture that deals openly with problems

and ensures sufficient time, information and support to resolve them, is fundamental (Oelsnitz, 2009).

Many studies on academic entrepreneurship have been written to highlight universities and the management of university processes (Crow *et al.*, 2020), but few have been specifically written from the perspective of the behavior of university professors or employees (Li *et al.*, 2020).

A microanalysis of corporate entrepreneurship at university reveals that professors do not necessarily plan entrepreneurial behavior, instead, it is often the result of their experience, intuition and improvisation in decision-making (Kalar and Antoncic, 2015). This shows that, although universities do not have an entrepreneurial culture, many professors or employees can, through their network of contacts, demonstrate entrepreneurial and innovative behavior (Bercovitz and Feldman, 2008). Although the absence of an entrepreneurial culture is clear, some elements of university culture, such as autonomy, managerial support and rewards, may generate entrepreneurial behavior in university professors or employees.

2.3 The internal environment for corporate entrepreneurship in universities

The term “entrepreneurial university” refers to the capacity that a university must stimulate entrepreneurship through teaching and research, constituting an environment where entrepreneurial actions are valued and rewarded. When there is a widespread entrepreneurial culture in a university, there is a natural stimulus for the development of an entrepreneurial academic profile (Clark, 2001; Guerrero and Urbano, 2019). In the internal university environment, one form of stimulus occurs when a university is directed toward the development of marketable research and a diversified research funding base (Clark, 2001). The internal environment of an entrepreneurial university should incorporate, implement, communicate, encourage and support the entrepreneurial actions of professors, as well as endorse, recognize and promote the existing entrepreneurial behavior (Campos *et al.*, 2021; Moraes *et al.*, 2021).

Thus, the development of the organizational environment of an entrepreneurial university should include a structure of governance aimed at entrepreneurship, support for entrepreneurial action, an entrepreneurial education, a system of rewards, an entrepreneurial teaching methodology and community attitudes relating to entrepreneurship (Guerrero and Urbano, 2012). The strategic change of a university, to one that embraces an entrepreneurial environment, should be governed by teaching and learning forms of entrepreneurship, the spread of an entrepreneurial culture, encouragement and reward regarding activities aimed at entrepreneurship and innovation and greater integration with the entrepreneurial system (Klofsten *et al.*, 2019). This is the only way to create an environment that stimulates academic entrepreneurship and innovation.

From the perspective of corporate entrepreneurship, various authors point out that the creation of an entrepreneurial business environment requires the support of upper management and that the availability of time, rewards, autonomy and organizational limits are essential (Chebbi *et al.*, 2020; Kuratko *et al.*, 2014). This company management concept, applied to ideas, management strategies, cultural change and the creation of an entrepreneurial mindset, can be equally stimulated and developed in universities. For, although companies and universities have different purposes, corporate entrepreneurship can be an effective guide to understanding changes in the internal environments and management strategies of universities (Behzadi *et al.*, 2014; Salamzadeh *et al.*, 2019).

In the context of the current work, carried out in public universities from the State of São Paulo, the constructs used to analyze the creation of an internal environment suitable for corporate entrepreneurship were: managerial support; reward; and autonomy.

Our first set of hypotheses (*H1*, *H2* and *H3*) concerns the determinants for the innovative behavior of university professors. Thus, the impacts of managerial support, reward and autonomy on innovative behavior will be analyzed.

The involvement of upper management or managerial support has a direct positive relationship on the innovative results of an organization and on the innovative behavior of employees and includes the defense of innovative ideas and the supply of resources that employees need to act innovative (Chebbi *et al.*, 2020; Kuratko *et al.*, 2014). Thus, we present the first hypothesis of this study:

H1. Managerial support positively influences the innovative behavior of university professors.

An appropriate reward system is of paramount importance to further encourage academic entrepreneurship and the innovative behavior of professors (Guerrero and Ubano, 2019; Mavi, 2014). Promotion, recognition, reward and endorsement are central factors – often informal in an organizational environment – for encouraging entrepreneurial behavior (Mavi, 2014). In the absence of rewards or recognition, the growth of an entrepreneurial university is highly unlikely, for such growth is largely dependent on the desire of entrepreneurial professors to act without institutional support (Rubens *et al.*, 2017). Thus, smaller universities or those lacking a research tradition have more difficulty in creating an entrepreneurial environment. These universities are often restricted to the actions of a few professors and are not commensurate with an innovative environment (Rubens *et al.*, 2017).

Fernández-Nogueira (2018) also reinforces the importance of rewards for generating good business and production ideas at entrepreneurial universities, ideas that further stimulate the growth of innovations, spin-offs and startups. Centobelli *et al.* (2019), in a study on the management of knowledge in an entrepreneurial university, tested the importance of rewards for encouraging knowledge sharing. The results show that there is a positive correlation between reward and the dissemination of knowledge at entrepreneurial universities.

The perception of reward, which encourages risk-taking and innovation, is another factor that has a demonstrably strong effect on the tendency for individuals to behave innovatively (Kuratko *et al.*, 2014; Kreiser *et al.*, 2019). This construct concerns the extent to which it is perceived that an organization uses a reward system based on the entrepreneurial activity of an employee and success. Thus, we present the second hypothesis of the research:

H2. The perception of reward positively influences the innovative behavior of university professors.

Academic entrepreneurship only occurs when there is autonomy at both university and researcher/professor levels (Etzkowitz and Zhou, 2017). Although a researcher/professor has relative autonomy regarding research and actions, absolute autonomy is a myth, in the sense that there must be some proposal that links, for example, the research under development and the university of which it is a part (Krimsky, 2006). However, professors should have autonomy over aspects such as the choice of the subjects participating in their research, the application and dissemination of the data generated and a certain degree of freedom concerning partnerships developed with the business sector (Krimsky, 2006). Thus, autonomy can be considered the principal factor motivating the innovative behavior of

researchers/professors and more important than financial gain (Matlay and van Gelderen, 2010). When autonomy is experienced, researchers/professors demonstrate greater commitment, volition and goodwill, which results in increased entrepreneurial achievement (Orazbayeva *et al.*, 2019).

Autonomy is related to the freedom to make decisions, for example, when supervisors delegate authority and responsibility to managers and subordinates (Kuratko *et al.*, 2014; Kreiser *et al.*, 2019). In the case of universities, professors can be seen as intermediate-level managers and as such have greater autonomy. In this role, they are prone to act more creatively and decide on the best ways of carrying out their work (Orazbayeva *et al.*, 2019). In this sense, we present the third hypothesis of the research:

H3. The autonomy that a university provides to its professors positively influences their innovative behavior.

Our second set of hypotheses (*H4* and *H5*) concerns the impact of managerial support on the constructs. Thus, the influence that managerial support has on reward and autonomy will be analyzed.

The organizational environment, with its managerial support, has a direct influence on the behavior of professors. An entrepreneurial environment can positively motivate professors and students and should be driven by diverse stimuli (finances, resources, knowledge and rewards) concerning entrepreneurial activity (Bergman *et al.*, 2018). For this reason, rewards are important and universities should create strategies to deal with disincentives that may occur (Gianiodis and Meek, 2020). When disincentives occur, such as the loss of finances or time or a specific product or service that may have a negative effect on society, universities must have strategies to deal with or minimize them. The actions of entrepreneurs should not be discouraged. Instead, because strategies to deal with disincentives are directly linked to managerial support, they should positively influence the reward system (Gianiodis and Meek, 2020). In this way, we present the fourth hypothesis:

H4. Managerial support has a positive influence on the reward perception of university professors.

Over the past few decades, universities have succeeded in achieving autonomy. However, this autonomy is generally passive, in the sense that it does not separate universities from the traditional condition (Clark, 2001). Thus, it is essential that autonomy is proactive. This can be achieved through the constitution of an organizational climate of trust, incentives to attract external resources and the establishment of partnerships and the development of basic and applied research that is capable of generating returns for the sponsoring university (Clark, 2001). Autonomy is linked to university governance and the forms of application/coordination of resources (human, financial, physical and material), that is, to the managerial support provided (Armbruster, 2008). A university can only be an entrepreneur when it offers autonomy in the application of resources and internal governance and this autonomy has a direct influence on university professors (Etzkowitz, 2020).

The autonomy of a professor reduces when there is a hierarchy in the research or action of a university. The degree of autonomy a university has and the degree of autonomy that it concedes to its professors and researchers are essential factors for the establishment of an entrepreneurial environment (Guerrero and Ubano, 2019). When the managerial support within a university encourages professorial autonomy, the integration of this autonomy to the obtainment of resources increases and university-business partnerships and long-term

research projects that involve various agents can be established (Guerrero *et al.*, 2021). Thus, we present the fifth hypothesis of the research:

H5. Managerial support has a positive influence on the autonomy of university professors.

These five hypotheses facilitate a better understanding of the internal environment required if corporate entrepreneurship in a university ecosystem is to thrive. Positively assessing the influence of managerial support, reward perception and autonomy on innovative behavior will enable professors to develop innovations and technologies for society.

From the literature review and the hypotheses presented above, a conceptual research model was prepared (Figure 1). The conceptual model represents the research objective, which is: to analyze the influence of managerial support for corporate entrepreneurship, autonomy and reward perception on the innovative behavior of Brazilian university professors. The visual representation below provides a clear picture of the theoretical model proposed (Whetten, 1989).

3. Methodology

This section is divided into two blocks, one for procedures and participants and the other for measurement instruments.

3.1 Procedure and participants

The research used a quantitative approach using partial least squares structural equation modeling (PLS-SEM) with SmartPLS 3.0 M3 software (Ringle *et al.*, 2015). The choice of the PLS-SEM is justified because the objective is to predict and explain the constructs and relationships (Hair *et al.*, 2019). In addition, the technique resolves the apparent dichotomy between explanation and forecasting, which is the basis for the development of managerial implications (Hair *et al.*, 2019).

Data collection was performed with two transverse cuts using a questionnaire that sought, among other objectives, to identify opinions and the distribution of the phenomenon within a population by using multivariate data analysis statistical techniques. It was carried out virtually, with the authorization of institution managers, between the months of

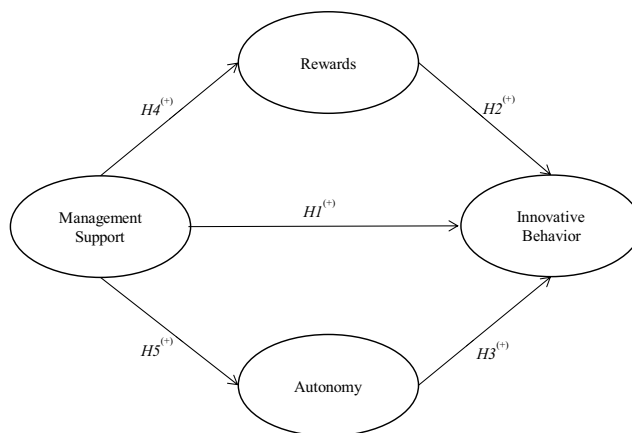


Figure 1.
Conceptual research model

September and December 2020. An invitation to participate in the research was sent to all professors via their institutional email addresses. The email included a presentation of the research, the approval of the research ethics committee and a link to the digital questionnaire.

To evaluate the sample size of each stage of the study and the statistical power of the analysis, we used the G*Power 3.1 software. Considering the three variables used to predict the innovative behavior construct – a significance level of 5%, a statistical power of 0.8 and an average effect size ($f^2 = 0,15$, equivalent to $r^2 = 13%$) – we determined that the minimum sample size is equal to 77 responses.

The sample obtained totaled 208 responses. The first data collection stage involved professors from the USP. The sample of answered questionnaires was 86, out of 190 invitations sent (a 45% response rate). This stage served to validate the questionnaire. The second data collection stage involved professors from the UNICAMP and the UNESP and returned 122 responses from 217 invitations sent (a response rate of 56%). Therefore, the two samples in our study achieved the minimum required size. The profiles of the survey respondents can be seen in [Table 1](#).

The State Universities from São Paulo are among the best in the country, according to international ranking classifications. In the Times Higher Education World University Rankings 2021, USP is in the first place (between 201 and 250 in the world), UNICAMP is in second place (between 401 and 500 in the world) and UNESP is in sixth place (between 601 and 800 in the world) (Times Higher Education, 2021). In the [Quacquarelli Symonds \(2021\)](#) (QS) World University Rankings of 2021, USP comes in the first place (115 in the world), UNICAMP in second place (233 in the world) and UNESP in fifth place (493 in the world).

3.2 Measures instrument

The questionnaire was divided into five blocks. An initial block with questions to rank respondents and the other blocks were separated according to the constructs, namely: management support for corporate entrepreneurship; autonomy; rewards and innovative behavior.

The questions used for the constructs management support, autonomy and rewards were extracted from the corporate entrepreneurship assessment instrument (CEAI), developed by

Characteristics		(%)
Institution	USP	41
	UNICAMP	31
	UNESP	28
Gender	Female	40
	Male	60
Age (years old)	<40	18
	≥40 and <50	37
	≥50	45
Numbers of years teaching	<10	22
	≥10 and <20	33
	≥20 and <30	26
	≥30	19
Numbers of years at current university	<10	41
	≥10 and <20	39
	≥20 and <30	11
	≥30	9

Table 1.
Respondents' profile

Kuratko *et al.* (2014). CEAI is a diagnostic tool used to assess managers and is widely used in the corporate entrepreneurship literature. The scale of responses was exactly the same as the original scale by Kuratko *et al.* (2014).

The innovative behavior indicators were extracted from a European survey on the transition from higher education to labor markets, called REFLEX project, a graduate survey conducted in 2005, across 14 countries, incorporating the responses of more than 40,000 individuals who graduated from higher education institutions 5 years previously., presented by Vila *et al.* (2014). The questions address the self-assessed competency levels about the types of innovators. The questionnaire response options were based on the Likert five-point scale (1: strongly disagree; 2: disagree; 3: not sure; 4: agree; 5: strongly agree), according to the original scales proposed by the authors.

The complete questionnaire used in the research is found in [Appendix](#). The data collection instrument (research questions) is shown in the data collection instrument.

Data collection instrument

Questions:

- (1) Management support for corporate entrepreneurship:
 - (MS1) My organization is quick to use improved work methods.
 - (MS2) My organization is quick to use improved work methods that are developed by faculty.
 - (MS3) In my organization, developing one's own ideas is encouraged for the improvement of the corporation.
 - (MS4) Upper management is aware and very receptive to my ideas and suggestions.
 - (MS5) Faculty appreciation usually follows from the development of new and innovative ideas.
 - (MS6) Those faculty who come up with innovative ideas on their own often receive management encouragement for their activities.
 - (MS7) People are often encouraged to take calculated risks with ideas around here.
 - (MS8) Faculty are encouraged to talk to employees in other departments of this organization about ideas for new projects.
- (2) Autonomy:
 - (AU1) I feel that I am my own boss and do not have to double-check all of my decisions with someone else.
 - (AU2) This organization provides the chance to be creative and try my own methods of doing the job.
 - (AU3) This organization provides the chance to do something that makes use of my abilities.
 - (AU4) I have the freedom to decide what I do on my job.
 - (AU5) I have much autonomy in my job and am left on my own to do my own work.
- (3) Rewards:
 - (RE1) My manager helps me get my work done by removing obstacles and roadblocks.
 - (RE2) The rewards I receive are dependent upon my innovation on the job.

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- (RE3) My supervisor will increase my job responsibilities if I am performing well in my job.
 - (RE4) My supervisor will give me special recognition if my work performance is especially good.
 - (RE5) My manager would tell his/her boss if my work was outstanding.
- (4) Innovative behavior:
- (IB1) I feel alert to new opportunities.
 - (IB2) I usually come up with new ideas and solutions.
 - (IB3) I usually question my own ideas and those of others.
 - (IB4) I feel free to present products, ideas or reports.
 - (IB5) I feel free to write reports, memos or documents.

Note: The questionnaire responses options used the Likert five-point scale (1: strongly disagree; 2: disagree; 3: not sure; 4: agree; 5: strongly agree), according to the original scales.

4. Analysis of the results

The first data analysis performed was a confirmatory factor analysis (CFA), using the first collection of data. The CFA, presented in [Table 2](#), shows the indicators and descriptive statistics for each construct.

In the second stage, we discarded the data from the first stage and carried out a new collection of data. To evaluate the measurement model proposed, with the new sample, we verified the convergent validity, discriminant validity and indicator reliability. The average variance extracted (AVE), with a value superior to 0.50 and composite reliability (CR) with a value superior to 0.70 for each construct, is recommended for the measurement model validation ([Hair et al., 2019](#)). The other discriminant is a validity indicator that refers to the square root of the average variance extracted from the constructs (highlighted in bold in the diagonal in [Table 3](#)), which must be greater than the correlation between the latent variables ([Hair et al., 2019](#)). [Table 3](#) shows the values of these metrics and indicates that the results permit subsequent analyses to be conducted. No indicator needed to be excluded from this analysis.

The structural model assessment procedure involves examining the model's predictive capabilities and the relationship between the constructs, starting with the evaluation of its collinearity. The variance inflation factor (VIF) values for each subpart of the structural model were calculated and found to be within the established parameters, below 5 ([Hair et al., 2019](#)).

[Table 4](#) presents the coefficients of the structural model, where the relationships are established by the values of the construction coefficients. The bootstrapping technique was used to analyze the significance of the indicators ([Hair et al., 2019](#)). The *t*-value was analyzed for each relationship, with a critical value of 1.96, related to a significance level of 5% and a two-tailed test, meaning that the null hypothesis is rejected and the coefficient path is considered significant ([Hair et al., 2019](#)).

According to the results ([Table 4](#)), except for *H2*, the other hypotheses were confirmed (about the positive influence of reward on innovative behavior).

To evaluate the determination coefficient (R^2) [Cohen's \(1988\)](#) study proposal was used. According to the analyses, the complete model presented determination coefficients that are considered high for the three dependent variables used: management support, innovative

Indicators	Standardized path loading	Mean	Standard deviation	Critical ratio	<i>p</i> -value
<i>Management support</i>					
(MS1)	0.591	2.012	0.828	6.739	0.000
(MS2)	0.694	2.226	0.867	8.633	0.000
(MS3)	0.681	2.200	0.846	9.467	0.000
(MS4)	0.581	2.188	0.785	5.914	0.000
(MS5)	0.557	2.709	0.833	4.511	0.000
(MS6)	0.779	2.744	0.795	13.995	0.000
(MS7)	0.771	2.698	0.836	16.324	0.000
(MS8)	0.832	2.593	0.812	24.997	0.000
<i>Autonomy</i>					
(AU1)	0.506	2.548	0.868	2.818	0.005
(AU2)	0.714	2.919	0.796	5.920	0.000
(AU3)	0.805	3.271	0.722	8.189	0.000
(AU4)	0.720	3.337	0.692	3.399	0.001
(AU5)	0.587	3.314	0.736	2.120	0.034
<i>Rewards</i>					
(RE1)	0.771	2.407	0.894	14.879	0.000
(RE2)	0.737	2.588	0.968	10.612	0.000
(RE3)	0.711	2.417	0.967	8.731	0.000
(RE4)	0.798	2.482	0.840	14.371	0.000
(RE5)	0.766	2.679	1.058	15.272	0.000
<i>Innovative behavior</i>					
(IB1)	0.646	3.388	0.684	2.959	0.003
(IB2)	0.580	3.729	0.442	2.492	0.013
(IB3)	0.726	3.651	0.500	3.152	0.002
(IB4)	0.748	3.500	0.586	3.768	0.000
(IB5)	0.573	3.523	0.677	2.200	0.028

Table 2. Confirmatory factor analysis

Constructs	Management support	Autonomy	Innovative behavior	Rewards
Management support	<i>0.733</i>			
Autonomy	0.496	<i>0.710</i>		
Innovative behavior	0.346	0.347	<i>0.754</i>	
Rewards	0.667	0.427	0.179	<i>0.737</i>
Cronbach's alpha	0.876	0.764	0.809	0.795
rho_A	0.881	0.881	0.834	0.816
Composite reliability	0.902	0.825	0.867	0.854
Average variance extracted (AVE)	0.537	0.504	0.568	0.543

Table 3. Summary of the evaluation of measurement models

Hypotheses	Indicadores	Sample mean	SD	<i>t</i> -statistics	<i>p</i> -values
<i>H1</i>	Managerial support → innovative behavior	0.304	0.112	2.793	0.005
<i>H2</i>	Rewards → innovative behavior	-0.117	0.098	1.390	0.165
<i>H3</i>	Autonomy → innovative behavior	0.267	0.098	2.553	0.011
<i>H4</i>	Managerial support → rewards	0.674	0.051	13.018	0.000
<i>H5</i>	Managerial support → autonomy	0.511	0.069	7.243	0.000

Table 4. Coefficients of the structural model between constructs

behavior and rewards. The complete model resulting from the empirical research is presented in [Figure 2](#).

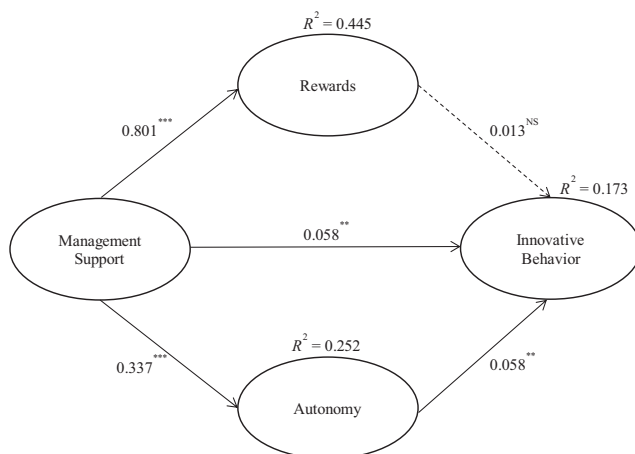
5. Discussion

The objective of the study was to analyze the influence of managerial support, autonomy and reward perception on the innovative behavior of university professors. Universities invest in resources to create the infrastructure, mechanisms and support programs for entrepreneurship in their university communities ([Guerrero and Ubano, 2019](#)). Such innovative behavior is also expected of university professors ([Greven et al., 2020](#)). Therefore, the study sought to present a robust modeling method, with a high explanatory value, for the three constructs considered (dependent variables): innovative behavior, reward perception and autonomy.

The results confirmed the positive influence of managerial support for corporate entrepreneurship on innovative behavior, reward perception and autonomy. This result aligns with previous investigations that have explored the influence of managerial support for corporate entrepreneurship on innovative behavior ([Chebbi et al., 2020](#); [Kuratko et al., 2014](#)), reward perception ([Ganiodis and Meek, 2020](#)) and autonomy ([Guerrero and Ubano, 2019](#)). The influence of innovative behavior was also confirmed, the result being similar to that found previously in [Orazbayeva et al. \(2019\)](#).

Regarding the influence of reward on innovative behavior, however, the results were different from those found in the literature ([Guerrero and Ubano, 2019](#); [Kuratko et al., 2014](#); [Kreiser et al., 2019](#); [Mavi, 2014](#)). This was because reward perception in the present study did not indicate a positive impact on the innovative behavior of university professors. This result may relate to the fact that the universities studied are institutions focused on and considered to be a reference in, research, teaching and extension in the national context. In smaller institutions, where there is no such research tradition, professors often need to demonstrate initiative without counting on institutional support, which increases the need for rewards ([Rubens et al., 2017](#)).

The next subtopic highlights the theoretical and practical implications of our research.



Note: * = significant at 5%; ** = significant at 1%; *** = significant at 0.1%; NS = not significant

Figure 2.
Complete empirical model

5.1 Theoretical and practical implications

Considering the research gaps presented, the study offers an interesting theoretical contribution to literature in the area. Through a relevant sample of university professors from the best universities in Brazil, it developed and validated a robust modeling method considering the connections between university environments and professorial behavior, raising questions regarding the structuring of corporate entrepreneurship in universities (Schröder *et al.*, 2020).

Additionally, we presented in-depth information about the teaching bodies used in public universities within the context of a country in development, thereby contributing to the body of evidence regarding these themes, taken out of the context of developed economies. The study presented evidence that may guide initiatives aimed at corporate entrepreneurship in universities. By approaching a little-studied context and presenting the specifics of this context, the discoveries here contribute to academics and public policy writers and offer profound implications for the development of university ecosystems that foster entrepreneurship.

In this way, based on the results of the model used with the sample of Brazilian public universities, this study contributes new empirical evidence, summarized in the following theoretical implications and suggestions:

First, managerial support is the fundamental factor for the development of an organizational environment that is more conducive to innovation and corporate entrepreneurship, as it impacts different constructs that lead an organization to adopt a more innovative culture. The construct of managerial support impacts innovative behavior in the same manner that professorial autonomy does, although it also significantly impacts as much on reward perception as on autonomy. Thus, improving managerial support for entrepreneurship means that the other dimensions needed to strengthen a university environment that supports entrepreneurship are impacted. Note that literature regarding aspects of culture and the way companies are structured for corporate entrepreneurship is still scarce (Schindehutte *et al.*, 2018; Schröder *et al.*, 2020). This is especially true in university environments (Moraes *et al.*, 2020; Walsh *et al.*, 2021) and can, therefore, be considered academic gaps.

Second, in teaching institutions with a more focused entrepreneurial ecosystem, rewards are not fundamental factors for the innovative behavior of professors. As much in the case of Brazil as in other countries, the structural differences in public and private university environments play a moderating role in the professional and entrepreneurial decisions of students (Galán-Muros and Davey, 2019; Moraes *et al.*, 2021) and, according to the results, also of the professorial bodies. A fundamental point for this result must be the fact that public universities use the majority of Brazil's researchers. Additionally, governmental acts regulate the technology transfer activities of public universities (Ryan, 2010) and thereby their classification as the main organizations in terms of research and teaching quality. Furthermore, the literature identifies that research and educational quality are key predictors of higher spin-off generation rates at the university level (Di Gregorio and Shane, 2003). Understanding the innovative behavior of employees is an emerging topic and a gap in corporate entrepreneurship research (Kang *et al.*, 2016; Kuratko and Morris, 2018; Schindehutte *et al.*, 2018). This is particularly the case in the context of emerging economies (Hughes and Mustafa, 2017). We believe, therefore, that the present research helps to fill this gap.

From a practical viewpoint, the study presents important indicators that university managers and public policy developers interested in improving the university ecosystem of support for entrepreneurship might adopt when seeking to develop a university

entrepreneurial culture. Such indicators include improving work methods suggested by professors and employees; being receptive to and encouraging new ideas; incentivizing the exchange of ideas, participation in the projects of different departments; and encouraging innovative initiatives, even when there is a certain risk of failure.

Complementarily, in terms of managerial support, public academic institutions must develop opportunities for professors to collaborate in teams to solve problems within an organization (Humphrey *et al.*, 2007; Suseno *et al.*, 2020). Professors must also be exposed to external influences, such as participation in conferences, seminars, workshops and agreements between public and private institutions (Guerrero and Ubano, 2019; Moraes *et al.*, 2020). Thus, professors from academic institutions can act as intermediaries, bringing in intelligence from the outside. Having been historically characterized by hierarchical and bureaucratic structures, this is particularly important in the public sector as it seeks to become more corporate in the provision of services (Suseno *et al.*, 2020), especially when it comes to public universities (Moraes *et al.*, 2020).

The professorial body acts as a facilitator in terms of encouraging connections between academia and the business environment, simultaneously transmitting practical knowledge to students and encouraging their innovative behavior by assisting in the development of entrepreneurial university culture. The results also throw light on the mechanisms by which the connections between professors and university ecosystems occur and how professors can feed the productive structure with their entrepreneurial talent, an aspect that deserves greater attention from future studies of ecosystems and entrepreneurship.

6. Limitations and future research

As a limitation of the research, the sample used is non-probabilistic, composed of professors from only three Brazilian public universities, which deepens the analysis in a specific and important audience, but implies a sampling bias. Another limitation was cross-sectional data collection, which may not reflect reality over time, making generalization difficult.

As suggestions for future research, expanding the sample to include public universities from other states could validate the model to explain the innovative behavior of professors, increasing the generalizability of the results. Another possibility is to carry out qualitative and longitudinal studies offering deep perspectives on the relationships between variables with more detailed information, which can serve to complement these results.

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Appendix A - Research “Corporate Entrepreneurship at the University”**Research presentation:**

This research aims to understand the entrepreneurial behavior of professors at public universities in the State of São Paulo.

There are no correct or incorrect answers, so be as honest as possible in your answers. This survey is confidential and complies with the ethical criteria of ESOMAR (European Society for Opinion and Marketing). No individual data will be disclosed. Thanks in advance for your collaboration.

1) Gender:

- Male
 Female

2) Institution:

- Paulista State University - UNESP
 University of São Paulo - USP
 State University of Campinas - UNICAMP

3) Age (in years):

4) Full years of teaching:

5) Complete years of teaching at a public university in the State of São Paulo:

6) Year of completion of the PhD

7) Nationality:

8. Using the scale below, please indicate how much you agree or disagree about each of the alternatives, considering your teaching, research and extension activities. There are no right or wrong answers, we just want to know how much you agree or disagree.

Questions	(1) Strong disagree	(2) Disagree	(3) Not sure	(4) Agree	(5) Strong agree
Management Support for Corporate Entrepreneurship					
(MS1) My organization is quick to use improved work methods	1	2	3	4	5
(MS2) My organization is quick to use improved work methods that are developed by faculty	1	2	3	4	5
(MS3) In my organization, developing one's own ideas is encouraged for the improvement of the corporation	1	2	3	4	5
(MS4) Upper management is aware and very receptive to my ideas and suggestions	1	2	3	4	5
(MS5) Faculty appreciation usually follows from the development of new and innovative ideas	1	2	3	4	5
(MS6) Those faculty who come up with innovative ideas on their own often receive management encouragement for their activities	1	2	3	4	5
(MS7) People are often encouraged to take calculated risks with ideas around here	1	2	3	4	5
(MS8) Faculty are encouraged to talk to employees in other departments of this organization about ideas for new projects	1	2	3	4	5
Autonomy					
(AU1) I feel that I am my own boss and do not have to double check all of my decisions with someone else	1	2	3	4	5
(AU2) This organization provides the chance to be creative and try my own methods of doing the job	1	2	3	4	5
(AU3) This organization provides the chance to do something that makes use of my abilities	1	2	3	4	5
(AU4) I have the freedom to decide what I do on my job	1	2	3	4	5
(AU5) I have much autonomy on my job and am left on my own to do my own work	1	2	3	4	5
Rewards					
(RE1) My manager helps me get my work done by removing obstacles and roadblocks	1	2	3	4	5
(RE2) The rewards I receive are dependent upon my innovation on the job	1	2	3	4	5
(RE3) My supervisor will increase my job responsibilities if I am performing well in my job	1	2	3	4	5
(RE4) My supervisor will give me special recognition if my work performance is especially good	1	2	3	4	5
(RE5) My manager would tell his/her boss if my work was outstanding	1	2	3	4	5
Innovative Behavior					
(IB1) I feel alert to new opportunities	1	2	3	4	5
(IB2) I usually come up with new ideas and solutions	1	2	3	4	5
(IB3) I usually question my own ideas and those of others	1	2	3	4	5
(IB4) I feel free to present products, ideas or reports	1	2	3	4	5
(IB5) I feel free to write reports, memos or documents	1	2	3	4	5

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