



Linking entrepreneurial orientation to project success

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Abstract

Entrepreneurial orientation (EO) is a strategic posture of an organization, and it is related to basic policies and practices for the development of entrepreneurial actions looking for creating competitive advantages. This study develops and tests a model of the relationship between entrepreneurial orientation and project success in Brazilian context. As quantitative research, a survey was used to collect data. A sample of 100 valid answers from project practitioners was treated through the structural equation modeling method. As research implications, the main result points out the positive correlation between the entrepreneurial orientation and the project success, contributing to the development of this research subject and helping to minimize the gap in the literature that addresses the relationship between project success and EO. In practical terms, understanding that innovativeness, risk taking, proactiveness, autonomy and competitive aggressiveness (the dimensions of the EO) can contribute to project success and can also indirectly impact on organizational performance, could help organizations get competitive advantage when developing correlate factors. Finally, the results suggest that practices of project management can be aligned to the firm's entrepreneurial orientation to enable firms to attain better results in their projects and generate a competitive advantage. On other hand, given the proportion of the impact of EO on project success (20.3%) identified in this study, it is critical that project management professionals expand their horizon to recognize other factors that affect project success.

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Keywords: Project management; Project success; Entrepreneurial orientation; Entrepreneurship; Structural equation modeling; SmartPLS

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1. Introduction

Recent market dynamics levels are largely responsible for stimulating growth and innovation, which puts pressure on organizations to respond to more complex demands using increasingly competitive cost approaches. To meet the concerns arising from this scenario, a natural decrease occurs in the organization's set of operations, making room for an escalation of activities through projects (Shenhar and Dvir, 2007). Because of this, a significant number of companies are adopting project management techniques (Berssaneti and Carvalho, 2015) and investing resources and efforts in the implementation of project management (Martens and Carvalho, 2016).

Studies on project management point out positive impact of the use of project management methods on project performance (Dvir et al., 2003; Ling et al., 2009). Nevertheless, projects present failures. According the Pulse of the Profession® report (PMI, 2017), for each US\$ 1 billion invested in projects that did not reach their objective, US\$ 97 million are lost.

The development of project-based activities in the organizational setting is naturally accompanied by approaches focused on evolving the understanding of project success (PS) as well as its influence on the organizational performance. PS is related to the objectives of the project (De Wit, 1988). The concept of PS, given by Kerzner (2004), is directly linked to the results that are obtained in each of its projects, especially when they constitute the core business and the essential abilities of that company. According to Carvalho and Rabechini (2017), there has been a number of studies addressing project success and how it can be measured in projects. So, as projects are successful, organizational results can be favored, referring to the contribution of project success to organizational performance in certain areas (e.g., efficiency, development and innovation) (Yang et al., 2014).

Organizational performance has also been the focus of studies in literature on entrepreneurship, especially relating to the entrepreneurial orientation (EO) of an organization. According to Lumpkin and Dess (1996), the EO consists of five main dimensions: innovativeness, risk taking, proactiveness, autonomy and competitive aggressiveness. These dimensions characterize and distinguish key entrepreneurial procedures (Lumpkin and Dess, 1996), and characterize the firm level entrepreneurship (Anderson et al., 2015; Martens et al., 2016). Studies show that organizations with a higher EO tend to have better organizational performance (Rauch et al., 2009; Moreno and Casillas, 2008).

The topics of project management and entrepreneurship have been increasingly developed in the literature, but few studies address the connection between them and their subareas (Kuura et al., 2014), as well as the link between EO and project success (PS). Lundin et al., 2015 point out the link between entrepreneurship and project management as a challenge for research in the project management field. Martens et al. (2015) studied the relationship between EO and project management and identified a positive relationship, characterized in terms of several knowledge areas such as integration, scope, time, cost, quality, human resources, communication, risk and procurement management. These same authors point out that the EO can affect the project

management maturity, and they suggest that the decision-making process is likely to acknowledge and encourage elements of the EO, as a step to seek excellence and success in projects (Martens et al., 2015). In recent study Gemünden et al. (2018) proposed a new concept of the project-oriented organization composed by three segments, i.e. values, structures, and people, pointing the entrepreneurial orientation as one of the values this concept.

In addition to this signaling about EO and PS, other aspects of the literature suggest a relationship between EO dimensions and good project management practices: the potential convergence between innovation and the use of good practices in project management (Gordon and Tarafdar, 2007); the development of new products, processes and services (Meredith and Mantel, 2008); the tendency to take risks in an organization as a deciding factor in the project selection process (Kerzner, 2004; Carvalho and Rabechini, 2015); proactive thinking as an expectation for an outstanding project manager (Kerzner, 2004); and obtaining of autonomy from the project sponsor as contributing to the success of the project (Russo and Sbragia, 2007; Kerzner, 2004). Kock and Gemünden (2016, p.11) suggest that “EO is an important contingency factor for the performance of portfolio management practices”. However, there is still a research gap to work on the relationship between EO and project success.

In this context, this research aims to answer the following question: what are the effects of the entrepreneurial orientation on project success? Thus, the main objective of this research is to develop and test a model of the relationship between entrepreneurial orientation and project success in Brazilian context. As quantitative research, a survey was developed together with professionals engaged in projects in different size of companies (most of them were working in large companies) operating in service and manufacturing industry in the Brazilian context, and the data were analyzed using the structural equation modeling (SEM). The results show a positive relationship between EO and PS. These results contribute to the development of this research topic as well as lead organizational practices that can contribute to project success.

Following this introduction, a brief conceptual review is carried out on PS and EO; next, the research method is described, results are presented and discussed, and, finally, closing remarks are made.

2. Literature review

2.1. Project success

The theme of project success has been addressed in different ways in the literature. Initially, it is paramount to point out a distinction between success in projects and success in project management. According to De Wit (1988), project success is related to the goals and benefits that are provided in a project for its organization as a whole, dealing with the effectiveness, objectives and benefits that are provided by the project, and success in project management is related to the direct action from a project manager, applying tools as determined by the scope, deadline and cost of each project. This distinction is also

cited by [Cooke-Davies \(2002\)](#) and recently collaborated by [Martens and Carvalho \(2016\)](#).

By and large, the approaches used in the literature to define project success are either similar to the Iron Triangle model, also known as unidimensional ([Adnan et al., 2013](#)), considering that different projects could be different sets of success factors ([Dvir et al., 2003](#)). There has been a continuous search for identifying the factors that positively affect project success ([Mir and Pinnington, 2014](#)).

One of the multidimensional approaches is given by [Shenhar and Dvir \(2007\)](#). This approach is composed of five independent dimensions, for example efficiency, impact on the customer, impact on the team, business and direct success, and preparation for the future, which enables the understanding of the impact of projects on each of these dimensions independently, and their approach is corroborated by several other authors. According to the authors' approach ([Shenhar and Dvir, 2007](#)), the efficiency dimension is a short-term measure that assesses whether the project was completed according to schedule, budget and scope ([De Wit, 1988](#); [Adnan et al., 2013](#); [Berssaneti and Carvalho, 2015](#)). The second dimension, impact on customer, points out how the project's result impacted the customer's life or business in its effort to meet customer needs ([Mir and Pinnington, 2014](#)). The third dimension called impact on the team assesses the cumulative impact of the project, i.e., project team satisfaction, morale, overall loyalty to the organization, as well as the retention of team members in the organization after project completion ([Martens and Carvalho, 2016](#)). The business and direct success dimension is an expression of the project's business success, for instance it is focused on the contribution to the construction of the final result of the organization ([Cooke-Davies, 2002](#)). Finally, the preparation for the future dimension has a long-term nature and evaluates how well the project helps the organization to prepare its infrastructure for the future, or even how it creates new opportunities for the organization ([Carvalho and Rabechini, 2015](#); [Shenhar and Dvir, 2007](#)).

The Shenhar and Dvir model produces a project success assessment using metrics related to dimensions focused on different time horizons—from the short to the long term, given the fact that some of the information that makes up the metrics can only be collected after specific periods of project life cycle (business success, for example, can be measured only in the final delivery of the project). Concerning this peculiarity, [Zahra and Covin \(1995\)](#) emphasized that the pay-off of certain entrepreneurial orientation (EO) variables are based on long-term time horizons and exemplified it by citing the 1977 study developed by Von Hippel about 18 businesses, which reported a success rate of 60% in projects (obtaining a 10% gross profit) within a horizon of 3–5 years after the launch of the project.

Although the relationship between the existence of EO and project success is not clear, many authors have developed studies that show that organizations with a higher EO also tend to perform better ([Rauch et al., 2009](#); [Moreno and Casillas, 2008](#)). Thus, understanding project success is as important as understanding EO, and the aspects of both concepts are presented in the following section.

2.2. Entrepreneurial orientation

Entrepreneurial orientation (EO), as a concept, is “a firm's strategic posture towards entrepreneurship” ([Anderson et al., 2015, p.1579](#)). Conceptually, EO is related to basic policies and practices for the development of entrepreneurial actions and decisions and the processes that decision makers use to enhance the purpose of their organizations, support their vision and create competitive advantages ([Rauch et al., 2009](#); [Freitas et al., 2012](#)). According to [Lumpkin and Dess \(1996\)](#), EO is characterized by five dimensions in the organizational context: innovativeness, risk-taking, proactiveness, autonomy and competitive aggressiveness.

Innovativeness entails the organization's need to renew, innovate and seek new opportunities ([Miller, 1983](#)). It involves a tendency to engage in creativity and experimentation, through research and development (R&D) ([Rauch et al., 2009](#)), and to support initiatives that can result in new products, services or processes ([Lumpkin and Dess, 1996](#)). The dimension of risk-taking is very close to that of innovativeness, involving bold actions that venture into the unknown or the commitment of significant resources to uncertain ventures ([Rauch et al., 2009](#)), with the expectation of obtaining high returns (financial or opportunity-wise) ([Lumpkin and Dess, 1996](#)). This dimension comprises general risk, decision-making risk, financial risk and business risk ([Freitas et al., 2012](#)).

Proactiveness, in turn, is characterized as the organization's tendency to be ahead of the competition when launching new products, technologies or services, rather than to just follow market initiatives ([Miller, 1983](#)). It is related to the capacity to anticipate and seek new opportunities ([Lumpkin and Dess, 1996](#); [Setiawan et al., 2015b](#)) and act in anticipation of future demands ([Rauch et al., 2009](#)), with the expectation of a share in emerging markets. Another dimension, somewhat close to proactiveness, is competitive aggressiveness. Some authors tend to equate these two concepts ([Covin and Covin, 1990](#)); however, other authors see proactiveness as a response to opportunities, and competitive aggressiveness as a response to market threats ([Lumpkin and Dess, 2001](#)). Competitive aggressiveness is related to the tendency to challenge competition ([Lumpkin and Dess, 1996](#)) with the aim to overcome it ([Rauch et al., 2009](#)) by adopting a combative stance in order to improve the organization's position ([Freitas et al., 2012](#)). This dimension of EO contributes to continuously assessing the condition of the competitors, their weaknesses and strengths ([Setiawan et al., 2015a](#)). Finally, autonomy can be characterized as independent action by individuals or a team to bring an idea or vision to its completion ([Lumpkin and Dess, 1996](#); [Lumpkin et al., 2009](#), with the aim to develop a project ([Rauch et al., 2009](#)).

The presence and the potential different combinations of all or some of these dimensions in an organization characterizes its EO ([Lumpkin and Dess, 1996](#); [Rauch et al., 2009](#)). The interface between EO and organizational performance mentioned in the literature ([Rauch et al., 2009](#); [Martens et al., 2016](#)) refers to the research question of this study and to the attempt to relate EO and project success. In this sense, the next section seeks to approximate these two themes.

2.3. Approaching entrepreneurial orientation and project success

The relationship between EO and good organizational performance has traditionally been tackled in the literature on entrepreneurship (Rauch et al., 2009; Filser and Eggers, 2014), with performance being one of the most explored themes in EO studies for about 30 years (Martens et al., 2016). A central argument in this connection is that “EO may be viewed the entrepreneurial strategy-making processes that key decision makers use to enact their firm’s organizational purpose, sustain its vision, and create competitive advantage (s)” (Rauch et al., 2009, p.762).

Project-oriented companies have their results closely related to the success of the projects they develop. In this sense, the evidence from the literature that EO contributes to good organizational performance refers to the possibility of a relationship between EO and project success. In a study aimed to understand project success factors, Vezzoni et al. (2013) pointed out that the two most important project success factors were preparation to face risks and empowerment, which may be related to two dimensions of EO, for example risk-taking and autonomy, respectively. In a study developed with leaders and employees, Ahmed et al. (2014) showed that entrepreneurial individuals on project teams increase a project’s success. Studies also relate project management to innovation (Gordon and Tarafdar, 2007) and to the development of products, processes and services (Meredith and Mantel, 2008). Kerzner (2004) points out proactivity as something expected of project managers and autonomy with the sponsor as an element that can contribute to the success of the project.

Some authors suggest that a gain in economic performance can be caused by the attitude of innovative organizations that develop and introduce new products and technologies to the market (Schumpeter, 1934; Brown and Eisenhardt, 1998). Organizations that behave proactively are able to create an

advantage by being the first to position themselves in the market (Setiawan et al., 2015b), thereby benefiting from all aspects that this advantage provides, such as charging higher prices and exploring specific markets ahead of other competitors (Zahra and Covin, 1995). Rauch et al. (2009) pointed out that strategic activities implied by an EO have benefits in terms of financial and nonfinancial indicators of performance. Thus, taking into account the context just presented, the following hypothesis is proposed:

H1. The entrepreneurial orientation positively impacts the project success.

Fig. 1 shows the theoretical model that illustrates the EO and PS constructs, with their dimensions, as well as this study’s hypothesis.

3. Research design

The research used in this study is characterized as explanatory (Creswell, 2014) seeking to explain project success through entrepreneurial orientation. A survey research model for collecting quantitative data (Forza, 2002) was adopted together with professionals responsible for projects in middle and large companies operating in service and manufacturing industry in Brazilian firms selected through convenience non-probability sampling, in 2014. The survey research was designed in 4 phases, as follow.

In the first research phase, a literature review was developed, followed by the research model, and finally, the research instrument for collecting data was performed. After the main documents for establishing the review on constructs of EO and PS, a model presented in Fig. 1 was designed. The research instrument developed was a questionnaire based on four studies

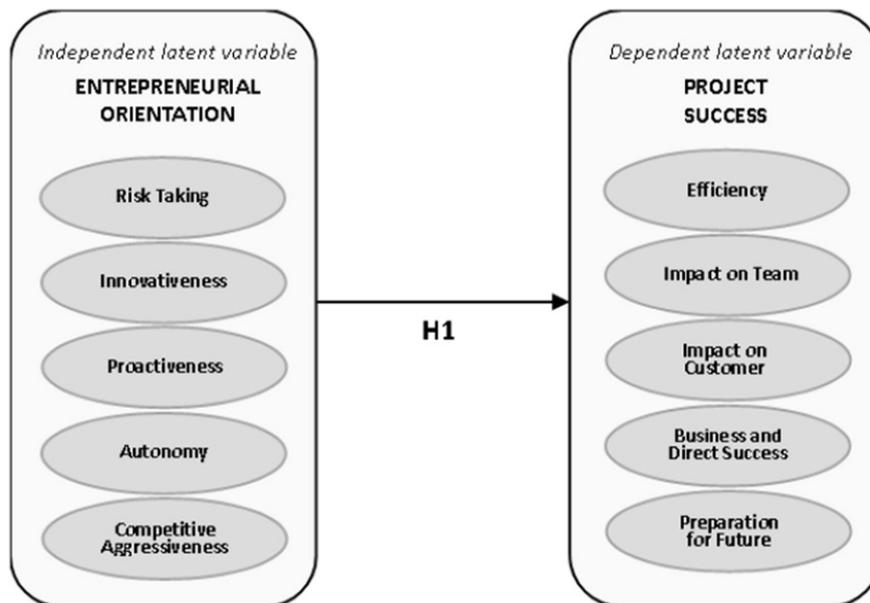


Fig. 1. Graphical representation of the hypothesis.
Source: Authors.

that present indicators for the constructs EO and PS, and their dimensions. Most closed questions used 5-point Likert scales, where 1 was related to “I totally disagree” and 5 “I totally agree”.

The EO axis included indicators drawn from the studies conducted by Covin and Slevin (1989) (innovativeness, risk-taking and proactiveness dimensions, with 3 indicators each), by Lumpkin and Dess (2001) (competitive aggressiveness dimension, with 2 indicators) and by Lumpkin et al. (2009) (autonomy dimension, with 4 indicators). For the PS theme, we adopted the model given by Shenhar and Dvir (2007), with indicators to measure PS through five dimensions (see Table 1). Shenhar and Dvir model was used in our study because it has been applied in several studies with the same goal. The model can give good support to identify results from projects when managers were asked about ended projects (Martens and Carvalho, 2016; Carvalho and Rabechini, 2017). For each indicator a code was created then used in data analysis. Thus, the data collection instrument included 15 indicators of EO and 27 of PS (Table 1). In order to respond about the PS indicators, the respondent was led to think about a project already completed.

The second research phase comprised the data collection. Initially, respondents were selected on the by using the web databases of project managers and web social networks, especially LinkedIn. All respondents of our research were from Brazilian organizations. The sample needed for this study was calculated with the help of G* Power v.3.1.9.2 software (<http://www.gpower.hhu.de/en.html>) (Faul et al., 2009). One parameter called f^2 effect size was taken into consideration, whose value was set to 0.15 (Cohen, 1988; Hair et al., 2014). The result indicated that the minimum sample should be 89 observations. The survey link was sent to potential respondents working in project management. As a way of ensuring the sample profile, the first question of the questionnaire was whether the respondent acts in project management. If the answer was: (i) negative, the questionnaire was terminated; (ii) affirmative, the other questions were completed. Initially, a pre-test was developed with three project managers. Its results were used only for the purpose of evaluating the questionnaire developed.

We received questionnaires electronically, and after excluding all missing values, the sample of this study consisted of 100 reliable and valid questionnaires, indicating a reliability sample power of 96,96%. In addition, Table 2 points out that all results of Cronbach's alpha are over than 0,734, showing high level of validity and reliability of the data collection. When we look at demographic statistic treatments, findings show that: 73% of the respondents came from the service segment, 16% from the industries and 11% from the trade sector. In addition, seventy percent (70%) of all those sampled are working in project management positions (as managers, directors or coordinators), and 30% in project-related positions (as analysts, or consultants). Also, it was identified that about 45% of the respondents have worked with projects for over five years.

The third research phase led the way to treat the data collected preciously. Structural equation modeling was adopted for data analysis. It is a multivariate statistical analysis technique that is capable of measuring latent variables, linked to an unobservable

theoretical concept, which is verifiable in an approximate manner by means of manifest variables (Hair et al., 2014). The latent variables typically represent constructs that are unable to be measured directly and have their measure linked to indicators of the respective model (Hair et al., 2014).

The structural equation modeling in this research adopts the reflective measurement model for the latent variables, where the direction of the causality is from the construct to the measure and the lack of an indicator does not change the meaning of the construct. The adoption of the reflective model for both EO construct and PS construct is in line with the recommendations made by George and Marino (2011).

The multivariate statistical analysis included the following tests: normality verification, measurement model analysis by checking the convergent validity of the model, discriminant validity verification, analysis of loadings of variables and constructs (internal consistency), and analysis of the structural model through Pearson's correlation analysis (R^2), Student's t -test (bootstrapping), predictive relevance test (Q^2), and Cohen's effect size test (f^2) (Hair et al., 2014). This analysis was developed using IBM SPSS v.21 software, and Smart PLS 2.0.M3 (Ringle et al., 2005).

Taking these method parameters into consideration, the fourth research phase presents the results and discussion of the data analysis.

4. Research findings

After characterizing the sample, the Kolmogorov-Smirnov test was used to assess the research normality with the aid of the IBM SPSS software version17. The parameters considered for this analysis were suggested by Field (2009): $p > 0.5$ for a normal distribution and $p < 0.5$ for a non-normal distribution. All observations yielded results of $p < 0.5$, which determines the distribution of the model as non-standard, i.e., the sample data significantly differ from a normal distribution (Field, 2009). Given this non-normality, the PLS method was adopted to develop the structural equation modeling (SEM).

After the assessment of normality, tests were applied for the SEM model's measurement. EO and PS were designed in a reflective way, as discussed before. The measurement model reliability and validity were analyzed by the composite reliability indicator and Cronbach's alpha coefficient, expecting values > 0.70 (Henseler et al., 2009). Related to the Cronbach's alpha coefficient, only the innovativeness and efficiency constructs did not reach exceptional values. Moreover, the convergent validity was performed based on the Average Variance Extracted (AVE) analysis (Henseler et al., 2009; Fornell and Larcker, 1981) that should be at least above the threshold of 0.5 (Henseler et al., 2009; Hair et al., 2014). Convergent validity analysis evaluates the degree to which two measurements of the same concept are related (Hair et al., 2014).

According to the first AVE analysis, there was a need for a deeper understanding of the dimension (first-order construct) preparing for the future (PF, with an observed result of 0.444), which had a score below 0.5. Thus, it was decided to exclude

Table 1
Conceptual framework of the study: constructs, dimensions, codes and questions.
Source: Authors.

Constructs	Dimensions/latent variables	Codes	Indicators or questions/observable variables	Source	
EO – Entrepreneurial Orientation	IN Innovativeness	EOIN_1	In general, the top managers of my firm favour a strong emphasis on R&D, technological leadership and innovations.	Covin and Slevin (1989)	
		EOIN_2	My firm marked very many new lines of products or services in the past 5 years.		
		EOIN_3	Changes in products or services in my firm have usually been quite dramatic in the past 5 years.		
	RT Risk taking	EORT_1	In general, the top managers of my firm have a strong proclivity for high-risk projects (with chance of very high return).	Covin and Slevin (1989)	
		EORT_2	In general, the top managers of my firm believe that owing to the nature of the environment, bold, wide-ranging acts are necessary to achieve the firm's objectives.		
		EORT_3	When confronted with decision-making situations involving uncertainty, my firm typically adopts a bold, aggressive posture in order to maximize the probability of exploiting potential opportunities.		
	PR Proactiveness	EOPR_1	In dealing with its competitors, my firm typically initiates actions which competitors then respond to.	Covin and Slevin (1989), Lumpkin et al. (2009)	
		EOPR_2	In dealing with its competitors, my firm is very often the first business to introduce new product/services, administrative techniques, operating technologies, etc.		
		EOPR_3	In general, the top managers of my firm have a strong tendency to be ahead of other competitors in introducing novel ideas or products		
	AU Autonomy	EOAU_1	My firm supports the efforts of individuals and/or teams that work autonomously.	Lumpkin et al. (2009)	
		EOAU_2	In general, the top managers of my firm believe that the best results occur when individuals and/or teams decide for themselves what business opportunities to pursue.		
		EOAU_3	In my firm individuals and/or teams pursuing business opportunities make decisions on their own without constantly referring to their supervisor(s).		
		EOAU_4	In my firm employee initiatives and input play a major role in identifying and selecting the entrepreneurial opportunities my firm pursues.		
	CA Competitive Aggressiveness	EOCA_1	My firm is very aggressive and intensely competitive.	Lumpkin and Dess (2001)	
		EOCA_2	In dealing with its competitor, my firm typically adopts a very competitive "undo-the-competitors" posture.		
	PS – Project Success	EF Efficiency	PSEF_1	The project was completed on time or earlier.	Shenhar and Dvir (2007)
			PSEF_2	The project was completed within or below budget.	
			PSEF_3	The project had only minor changes.	
PSEF_4			Other efficiency measures were achieved.		
IT Impact on Team		PSIT_1	The project team was highly satisfied and motivated.		
		PSIT_2	The team was highly loyal to the project.		
		PSIT_3	The project team had high morale and energy.		
		PSIT_4	The team felt that working on this project was fun.		
		PSIT_5	Team members experienced personal growth.		
		PSIT_6	Team members wanted to stay in the organization.		
IC Impact on Customer		PSIC_1	The product improved the customer's performance.		
		PSIC_2	The customer was satisfied.		
		PSIC_3	The product met the customer's requirements.		
		PSIC_4	The customer is using the product.		
		PSIC_5	The customer will come back for future work.		
DS Business and Direct Success		PSBD_1	The project was an economic business success.		
		PSBD_2	The project increased the organization's profitability.		
		PSBD_3	The project has a positive return on investment.		
		PSBD_4	The project increased the organization's market share.		
		PSBD_5	The project contributed to shareholders' value.		
		PSBD_6	The project contributed to the organization's direct performance.		
PF Preparation for the Future		PSPF_1	The project outcome will contribute to future projects.		
		PSPF_2	The project will lead to additional new products.		
		PSPF_3	The project will help create new markets.		
	PSPF_4	The project created new technologies for future use.			
	PSPF_5	The project contributed to new business processes.			
	PSPF_6	The project developed better managerial capabilities.			

Legend: The codes are formed with 2 letters representing the main construct (Entrepreneurial Orientation = EO; Project Success = PS) added of 2 letters representing the dimensions and a number showing the indicators (for example, there are three indicators of innovativeness: IN_1, IN_2 and IN_3).

Table 2
Analysis of the results of the SEM's measurement model.
Source: Survey data extracted from the Smart PLS 2.0.M3 software (Ringle et al., 2005).

	AVE	Composite reliability	Cronbach's alpha	Q ²	f ²
CA	0.811	0.895	0.77	0.436	0.386
RT	0.666	0.857	0.753	0.292	0.333
AU	0.589	0.85	0.765	0.234	0.309
EF	0.507	0.797	0.663	0.246	0.205
IC	0.523	0.843	0.765	0.363	0.289
IT	0.579	0.891	0.852	0.318	0.404
IN	0.582	0.806	0.64	0.323	0.176
PF	0.555	0.833	0.734	0.214	0.247
PR	0.762	0.906	0.843	0.454	0.507
DS	0.594	0.896	0.859	0.35	0.425

the manifest variables or indicators with smaller loading factors of this dimension, as follows: PSPF_6 (0.513) and PSPF_4 (0.578), and then the model was run again in order to recheck the convergent analysis. The set of the loading factors of all manifest variables configured the final measurement model that is the start for all subsequent analysis, as can be seen in Fig. 2.

The analysis of the loading factors between variables and constructs, or internal consistency (Fornell and Larcker, 1981), requires for all reflective manifest variables, values showing significant loading factors higher than 0.6, which result in an AVE higher than the minimum value of 0.5 for each latent variable (Fornell and Larcker, 1981). In the final measurement model, the minimum requirement of 0.5% in the AVE was met and reached the expected convergent validity, as shown in Table 2.

Once the pre-set criteria for confirming the convergent validity of the model were met, the next step was to confirm the model's discriminant validity, which occurs when there is verification that two conceptually similar concepts are distinct (Hair et al., 2014). In this case, the correlations of the manifest variables of a particular construct are more substantial than for the other constructs or latent variables of the model (Chin, 1998). The discriminant validity also indicates whether the latent variables are independent from one another (Hair et al., 2014; Fornell and Larcker, 1981). Two tests were successfully performed applying the Fornell and Larcker (1981) criterion. The first showed bigger loading factors of the manifest variables in their respective latent variable than those relating to any other latent variable of the model, by means of the cross-loadings criterion. In the second test, the confirmation could be achieved by comparing the latent variables and their respective square root values of the AVE analysis, also known as Fornell-Larcker criterion (Table 3).

After performing the necessary calculations, it was found that the AVE square root values of each latent variable were checked as higher than the correlations found for the other dimensions, thereby confirming the assumption proposed by Chin (1998) (Table 3). Once the analysis confirming the model's discriminant and convergent validities was completed, the loading factors of the manifest variables and their respective latent variables were then considered as definitive.

Following the structural equation modeling analysis, evaluations were made to the structural model. As a resampling technique, this study made use of the Student's *t*-test through the bootstrapping technique, where the original data is successively sampled with replacements to determine the model sample (Hair et al., 2014). For this application, we used 100 cases with 500

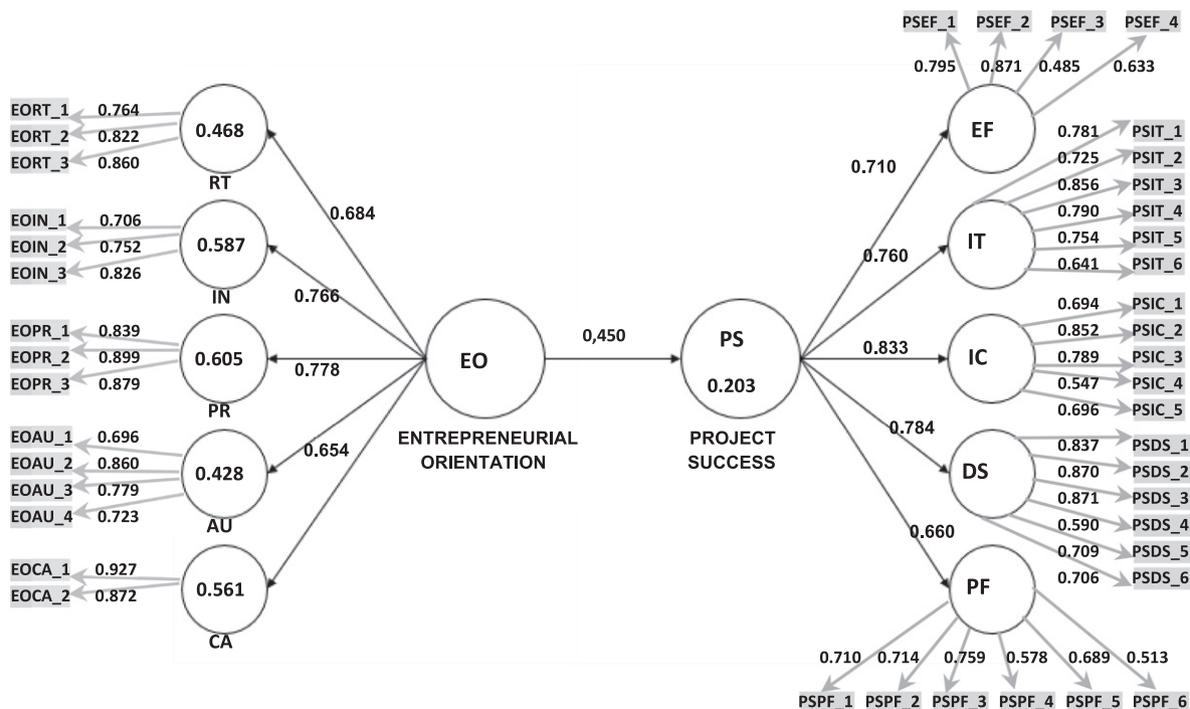


Fig. 2. Estimated standardized loadings of the indicators of the adjusted SEM's measurement model.
Source: Survey data extracted from the Smart PLS 2.0.M3 software (Ringle et al., 2005).

Table 3
Discriminant validity analysis (Fornell-Larcker criterion).
Source: Survey data extracted from the Smart PLS 2.0.M3 software (Ringle et al., 2005).

	CA	RT	AU	EF	IC	IT	IN	PF	PR	DS
CA	0.9									
RT	0.651	0.816								
AU	0.393	0.286	0.767							
EF	0.161	0.201	0.214	0.712						
IC	0.174	0.204	0.114	0.565	0.723					
IT	0.155	0.302	0.261	0.51	0.536	0.761				
IN	0.451	0.322	0.329	0.235	0.138	0.392	0.763			
PF	0.052	0.134	0.082	0.314	0.436	0.389	0.195	0.745		
PR	0.35	0.319	0.359	0.346	0.35	0.469	0.662	0.212	0.873	
DS	0.239	0.143	0.243	0.436	0.609	0.335	0.31	0.49	0.38	0.771

repetitions (subsamples) for the observation of the Student *t*-test, where the *t* value represents a real difference between the groups, taking the standard error into account. The value that can be considered significant is that of *t*-value > 1.96 (Hair et al., 2014). Table 4 shows the values obtained.

The *t*-test values can be considered relevant because they are above the given level of relevance, thus indicating the causal relationship between the two constructs EO and PS. This analysis showed that the EO construct positively affects PS, according to the Student’s *t*-test (4.376), thereby explaining 20.3% of the EO effect on PS given by variance or coefficients of Pearson’s determination (R^2) (Cohen, 1988), and confirming hypothesis H1. According to the studies of Cohen (1988), the minimum value for explained variance or coefficients of Pearson’s determination (R^2) must be >0.26, which is endorsed by Hair et al. (2014). Based on this parameter, the R^2 for the latent variables (dimensions or first-order constructs) of the proposed model is considered high.

The predictive relevance test (see Table 2), also known as Stone-Geisser’s Q^2 test, indicates whether the model is able to satisfactorily predict the indicators classified as endogenous. This is achieved through the reuse of the aggregate sample and the omission of certain D data points, making use of estimates to predict these same omissions (Hair et al., 2014). The same authors suggest values of 0.02 as having a low explanatory

Table 4
Final structural model of adjusted SEM.
Source: Survey data extracted from the software Smart PLS 2.0.M3 (Ringle et al., 2005).

Paths	Original sample	Average	Standard deviation	T-Test	<i>p</i> -Value
EO → CA	0.749	0.745	0.058	13.004	0.000
EO → RT	0.685	0.686	0.065	10.553	0.000
EO → AU	0.654	0.658	0.074	8.803	0.000
EO → IN	0.766	0.769	0.056	13.788	0.000
EO → PR	0.778	0.777	0.062	12.566	0.000
EO → PS	0.451	0.450	0.103	4.376	0.000
PS → EF	0.716	0.715	0.066	10.818	0.000
PS → IC	0.842	0.844	0.029	28.616	0.000
PS → IT	0.754	0.753	0.065	11.621	0.000
PS → PF	0.653	0.659	0.062	10.567	0.000
PS → DS	0.789	0.789	0.056	14.084	0.000

Note. Boldface (value of *t*-test that confirms the relation between EO and PS).

power, 0.15 as possessing an average explanatory power and 0.35 with a high explanatory power. Moreover, they suggest D omission values between 5 and 10, and 7 was the value used for this study. The Stone-Geisser indicator can be obtained by calculating the average overall redundancy of the adjusted model with the help of SmartPLS, in the blindfolding report. Thus, the results suggest that all values of predictive relevance are considered to have a good explanatory power.

Chin (1998) and Hair et al. (2014) indicate that Cohen’s f^2 effect size, also given by the blindfolding test, is obtained by including and excluding the model’s constructs in order to evaluate the usefulness of each construct for the proposed model. Cohen (1988) proposes that, by calculating the double estimation (with and without the dependent variable) in structural models, it is possible to calculate the coefficient of determination for each of the latent variables. Thus, in the analysis of f^2 , the impact of independent latent variables on dependent ones to adjust the model is considered low if the values are up to 0.02, moderate if up to 0.15, and substantial if 0.35 for each latent variable analyzed (Hair et al., 2014).

As observed in Table 2, for all the f^2 values for this study, the results are between the moderate and substantial classification, for instance the latent variables (first-order constructs or dimensions) of competitive aggressiveness (CA), impact on the team (IT), proactiveness (PR), business and direct success (DS) had a substantial impact, whereas risk taking (RT), autonomy (AU), efficiency (EF), impact on the customer (IC), innovativeness (IN), entrepreneurial orientation (EO) and preparation for the future (PF) had a moderate influence.

5. Discussion of the results

The results of this study present empirical evidence of a positive and significant relationship between the constructs of the theoretical model of entrepreneurial orientation and project success. This relationship was statistically proven in this study and explained by two tests that confirm the hypothesis (H1) where EO variables positively influence the achievement of PS. In the first test, there was a highly significant causal relationship between the EO and PS constructs given by the Student’s *t*-test (4.376), > 1.96, as suggested by Hair et al. (2014), and with a *p* value < 0.01 (see Table 4). The second test, called explained variance or Pearson’s R^2 coefficient of determination test showed that 20.3% of the effects on the PS construct are explained by the EO construct (Cohen, 1988). Fig. 3 shows the final structural model showing the main two results.

These results indicate that it is possible to increase the likelihood of a successful project if the organization presents an EO characterized by innovativeness, risk taking, proactiveness, autonomy and competitive aggressiveness. Thus, the results also confirm previous research of Rauch et al. (2009) where business are likely to benefit from a pursuit off EO, based in a meta-analysis of a sample from 51 studies about the correlation of EO with performance. Additionally, the current EO literature addresses the clear relationship between EO and organizational performance improvement (Lumpkin and Dess, 1996; Rauch et al., 2009; Filser and Eggers, 2014, among others). Kock and

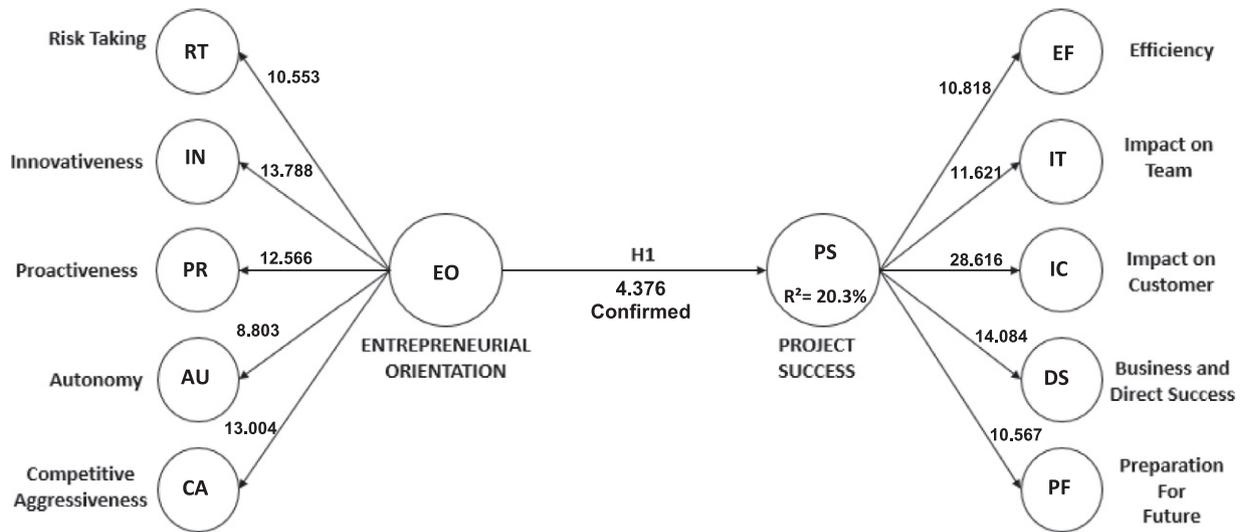


Fig. 3. Final empirical research model.
Source: Authors.

Gemünden (2016) found that four success factors of project portfolio management become even more important for high levels of entrepreneurial orientation. Considering the success of the projects, this relationship has been confirmed in the present study, suggesting that the effects of EO are beneficial to project success, which ultimately reflects in the performance of project-oriented organizations.

In practical terms, an organization that has an entrepreneurial orientation, has features of innovativeness, risk taking, proactiveness, autonomy, competitive aggressiveness. Innovativeness reflects the means by which firms pursue new opportunities, what justify its importance as a component of an EO (Lumpkin and Dess, 1996). The linkage between project management, innovation and entrepreneurship (Gordon and Tarafdar, 2007; Kuura et al., 2014) suggests that innovation is a relevant concept in the relation between EO and PS, aligned with results of this study. Innovativeness can contribute to gain in economic performance (Schumpeter, 1934; Brown and Eisenhardt, 1998). Kock and Gemünden (2016) show that firms high in innovativeness profit more from stakeholder engagement compared to firms low in innovativeness. In other words, when the organization acts innovatively, the projects could attain better results.

Another component of an EO is risk taking. This dimension of EO is characterized by the firm's proclivity to engage in risky projects (Lumpkin and Dess, 1996). Risk is inherent to project activity, and the greater the level of technology or complexity of the project, the greater is the criticality of risk management (Carvalho and Rabechini, 2015). For PMI (2013), the project should have its risks in balance with the potential for rewards, for example, a coherent risk approach should be adopted for each project, considering that the preparation to face risks as important project success factors (Vezzoni et al., 2013).

This refers to the importance of risk-taking, which is a component of EO. The EO risk-taking dimension and project risk management have similar objectives, such as maximizing positive impacts, mitigating or minimizing negative impacts,

obtaining significant or high returns, always seeking to achieve the organization's objectives (Carvalho and Rabechini, 2015).

Proactiveness is the third component of an EO. An organization is considered to have proactiveness when it typically initiates to act which competitors then respond, is the first business to introduce new products/services, and has a strong tendency to be ahead of other competitors in introducing novel ideas or products (Lumpkin and Dess, 2001). This organization's proactive behavior creates an advantage by being the first to position itself in the market (Setiawan et al., 2015b) and exploring specific markets ahead of other competitors (Zahra and Covin, 1995). Kerzner (2004) points out proactivity as something expected of project managers and as an element that can contribute to the success of the project. Rank et al. (2015) show that proactiveness is positively associated with preparedness for the future and portfolio synergy, reinforcing the importance of this component of the EO in the context of project management.

Autonomy is another component of an EO. It is often characterized by two-stage process (Lumpkin and Dess, 1996, p.142): "a project definition that is carried out by autonomous organizational members and a project impetus that is carried out by champions who sustain the autonomous efforts". autonomous behavior is usually identified at the individual level and in project teams. Some studies show that the entrepreneurial individuals on project teams tend to increase a project's success (Ahmed et al., 2014), and the entrepreneurship trend of the project managers has positive effect on innovative project success (Russo and Sbragia, 2007). Vezzoni et al. (2013) pointed out empowerment as an important project success factor, referring to the importance of autonomy.

Finally, the last dimension of an EO is competitive aggressiveness. It is related to fast response of a firm to the actions of the competitors (Lumpkin and Dess, 2001): the organization is very aggressive and intensely competitive. Competitive aggressiveness contributes to assessing the weaknesses and strengths of the competitors (Setiawan et al., 2015a) and reacting to them. Kock and Gemünden (2016) used the responsiveness in same way to

competitive aggressiveness, suggesting that it is a management practice related to portfolio success.

On the other hand, there is still 79.7% of influence of other variables on the PS construct, which denotes how complex the study of project success is (Mir and Pinnington, 2014; Dvir et al., 2003), for it can be influenced by several other variables, such as issues related to the use of project management methods (Dvir et al., 2003; Crawford, 2005; Ling et al., 2009). The variety of other influences reinforces the need for more adjusted approaches to assess the project success through multidimensional concepts that comprise a broader range of attributes.

These results suggest that, in the project management environment, project managers need further studies to understand the relationship between EO and project success, and more broadly between entrepreneurship and project management, as these topics are still little explored in the literature (Martens et al., 2015; Lundin et al., 2015; Kuura et al., 2014). Similarly, the gains related to projects under the perspective of an alignment with EO need to be understood in depth (Martens et al., 2015). Thus, it is suggested that while EO dimensions are being considered, they deserve a greater integration in the context of projects and project management in order to get better results in successful project measurements.

Finally, the findings suggest the validity of the theoretical empirical model looking at the measurement and structural model analysis. This is positive because it confirms the hypothesis (H1) of this study showing that EO significantly contributes to obtaining PS. These results are in line with studies indicating that EO contributes to organizational performance (Filser and Eggers, 2014; Rauch et al., 2009), in addition of that, successful projects can improve organizational results.

6. Conclusions

The results of this study point out that entrepreneurial orientation can explain 20% of the effects on project success. Given that 80% of the effects have not been explained by this study, this finding enables new approaches to the topic of project success that will allow better understanding of the complexity of this relationship between entrepreneurial orientation and project success. In addition, another research niche could involve the inclusion of moderator or mediator variables in the EO-PS relationship model in order to understand new relationships that could be identified.

In addition, studies of the specific relationships and power of influence among each dimension of each construct (entrepreneurial orientation and project success), can contribute evidence to each entrepreneurial orientation dimension to project success and even to each category of success of the adopted model. Organizations can then better target the aspects of entrepreneurial orientation they want to develop in order to contribute to project success.

6.1. Theoretical implications

In the academic context, the validation of the proposed hypothesis sheds light on the contribution of EO to project

success. More broadly, the article contributes to the development of studies linking entrepreneurship and project management, and strengthens the relationship evidenced in the literature that the EO contributes to organizational performance, in this case by contributing to the success of projects. Additionally, the article adds knowledge to studies seeking to understand the factors that influence the success in projects, as well as it contributes to the list of benefits of EO for organizations. Taken into consideration the existing gap in the literature that addresses the relationship between project success and EO, this study helps to minimize it and to further stimulate research on this topic.

6.2. Practical implications

In the practical sense, understanding the factors or variables (from EO or others) that can contribute to project success and can also indirectly impact on organizational performance, could help organizations to get competitive advantage. This article validates the theoretical model pointing out to managers the importance of developing in their respective organizations in the pursuit of project success. Thus, the results suggest that practices of project management can be aligned to the firm's entrepreneurial orientation to enable firms to be better results in their projects and generate competitive advantage. In other hand, given the proportion of the impact of EO on project success (20.3%) identified in this study, it is critical that project management professionals expand their horizon to recognize other factors that affect project success.

6.3. Limitations

Among the limitations of this study, it is worth noting that the results are limited to the context of the sample of Brazilian firms. This limitation creates the opportunity for furthering studies on model validation for specific business sectors and specific sizes of organizations, as well as for increased samples. Another limitation to consider is that we did not observe the success criteria in different time frames, as suggested by Shenhar and Dvir model, instead of the data were collected in a single moment and the respondent was asked to consider a project already completed.

6.4. Avenues for further research

Different organizational segments may also have different effects of entrepreneurial orientation on project success. According to Lumpkin and Dess (1996: 150): "although we argue here that all five dimensions are central to understanding the entrepreneurial process, they may occur in different combinations, depending on the type of entrepreneurial opportunity a firm pursues". In this sense, how much a dimension of EO has a greater or less importance for the PS can also vary, which was not object of study of our research. For example, in segments or contexts where innovation is more present, it can be speculated that the innovativeness dimension plays a more important role on project success than in those where firms do not promote innovation. This situation can also occur with other dimensions in

environments where the teams operate more autonomously, the competition is stronger, the risk behavior is more or less conservative, or where there is more market proactiveness, thereby opening up possibilities for future research.

The literature presents variables that potentially moderate the EO–performance relationship (Lumpkin and Dess, 1996; Rauch et al., 2009). One of these variables is the size of the business, suggesting that the EO could be most influenced by the CEO in smaller companies (Rauch et al., 2009). This moderation could be analyzed considering the size of the project and the influence of the project manager. Technological intensity of the industry is another variable that may moderate the relationship between EO and performance. In the context of project management, projects and organizations that operating in industries where technology change rapidly (i.e. information technology, biotechnology, pharmaceuticals) are more likely to benefit from entrepreneurial initiatives (Rauch et al., 2009). Studies focusing the high-tech and nonhigh-tech industries/projects could bring contribution for the relation between EO and PS.

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