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The influence of entrepreneurial, market, knowledge management orientations on cleaner production and the sustainable competitive advantage

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ABSTRACT

Enterprises from different economic sectors play a fundamental role in furthering a sustainable development in the region where it is inserted. However, it is the environmental practices of these organizations which determine the prompt impacts on environmental sustainability. In this sense, Cleaner Production is responsible for the decrease in natural and material resources' consumption and energy, as well as for the systematic decrease in waste and pollutants emission. Thus, it is important to identify the strategical guides which came before Cleaner Production and, consequently, lead the enterprises to achieve a Sustainable Competitive Advantage before their competitors. In this context, this research aims at analysing the influence of strategic drivers (Entrepreneurial Orientation, Market Orientation and Knowledge Management Orientation) on Cleaner Production and the Sustainable Competitive Advantage. This research was about a survey applied to 1774 small and medium enterprises in Southern Brazil, in the sectors of transformation industry, commerce and services, and it was analysed by the Structural Equation Modelling, typifying it as a quantitative and descriptive research. The results show there is an intense previous influence of strategic drivers over Cleaner Production, pointing out that the correlations among the three antecedents have a high intensity, showing that the enterprises researched use the strategic drivers separately, and that, when they are combined, there is a higher chance of Cleaner Production success, with a significant increase in Sustainable Competitive Advantage for the small and medium enterprises.

1. Introduction

The concern raise on environmental problems forces citizens and enterprises to reduce waste, encourages goods recycling, reuse and remanufacture. Thus, environmental sustainability foments the use of environmental practices in the organizations. Among the several environmental practices there is the Cleaner Production (CP), which aims at using natural resources wisely, the innovation in the organizational processes and the minimization of waste production by the enterprises, which excels for a Sustainable Competitive Advantage (SCA) in a progressive world population and, consequently, shortage of natural resources.

Within this context, the countries with economy in transition are under pressure to increase the entrepreneur activities which will allow for a rapid growth, thus minimizing the impact on natural resources (Silajdžić et al., 2015). According to De Lucia et al. (2016), since 2010, the year of the 2.0 green revolution, entrepreneurship has been active and competitive in the globalized world, through sustainable initiatives innovation. Coherently, adequate initiatives are necessary to help promote creativity and orientation

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for entrepreneurship aiming at sustainability (Dentchev et al., 2016; De Lucia et al., 2016).

CP is a new form of innovation which incorporates significant improvements to the management's processes and methods. We highlight that the innovations have drawn near the environmental sustainability in order to minimize the economic activity impacts, whether in decreasing the residue generation, reducing the natural resources' consumption or using alternative sources of energy, as encouraged by the enterprises with some public policy incentive (De Oliveira et al., 2016; Bryan and Jorge Lemus, 2017; Rantala et al., 2018)

Determining which variables stimulate the entrepreneurial activity constitutes a hard task due to the interrelated factors, such as social, cultural (Castaño et al., 2015), environmental and economic (Severo et al., 2015), considering that each enterprise presents a unique synergy in the use of specific resources which generate sustainable innovations (Iñigo and Albareda, 2016). In this scenery, the strategic drivers, like Entrepreneurial Orientation (EO), Marketing Orientation (MO) and Knowledge Management Orientation (KM), can precede CP, which aims at the organization's SCA, as well as the superior managerial performance in relation to the competitors.

The alignment of high levels of EO and MO improves the business performance and, particularly, when the social and business networks are well developed, once within these terms, the performance benefits are more expressive (Boso et al., 2013). This way, the supplying chain structures, and the environmental initiative integration to disseminate CP, benefit enterprises in emerging markets (Hoof and Thiell, 2015). However, little do we know about the relationships among EO, MO, KM, CP and SCA, for they are the same actions to guarantee a high business performance.

In this context, this research aims at analysing the influence of EO, MO and KM over CP and SCA. In order to fill in this gap, this study analysed a set of data from 1774 small and medium enterprises from Southern Brazil, in the sectors of Industrial Manufacturing, Commerce and Services. The analysis was done through the Structural Equation Modelling (SEM) and characterized as a quantitative-descriptive research.

The SEM method is not restricted to a single technique, since it uses a set of methodological procedures of statistical analysis that allows the examination of a series of simultaneous dependence relationships (Hoyle and Panter, 1995; Fabrigar et al., 2010; Hair et al., 2010; Kline, 2011).

We highlight that SEM enables the analysis of a great amount of dependent and independent variables, in which the observable variables are grouped up in latent variables (constructs), with the use of the exploratory and confirmatory factorial analysis (De Guimarães et al., 2016). We notice that the latent variables are measured indirectly through the multiple observable variables (Feng et al., 2017). SEM is a method that is more confirmatory than exploratory and which needs a framework that constitutes a system of directional effects of a variable over another, configuring a diagram of paths to be used in the analysis of relationships between the constructs (Byrne et al., 1989: Hair et al., 2010; Golob, 2003). Structural equation models are often formulated using a prespecified parametric structural equation (Zhang et al., 2016), which is expressed in a framework for structural analysis since SEM is based on factorial and regression analysis.

2. Research hypothesis

This research is based on the assumption that there is a casual effect between the constructs (EO, MO, KM) which come before Cleaner Production and Sustainable Competitive Advantage. In this sense it is convenient to present the theoretical concepts that support the formation of these latent variables:

a) Entrepreneurial Orientation (EO) is a set of characteristics the enterprise has based on managerial decisions in which the enterprises that use EO are primarily looking for innovations in the businesses, products and services (Birkinshaw, 2000; Shane and Venkataraman, 2000). EO encompasses the behaviour identification and the creation of market opportunities, the organization's appearance and growth, the initiative in the formation of teams, the healthy destructive creation and the organizational transformation which can happen at the individual, team, organization, industry and community levels (Shane and Venkataraman, 2000; Gartner, 2001; Brush et al., 2003);
b) Market Orientation (MO) can be defined as the continuous search for clients' information, in order to identify market demands and offer solutions for the clients in a swift and satisfactory way through the creation and communication of service value and products offered to improve the organizational performance (Day, 1994; Baker and Sinkula, 2005; Hult et al., 2003);
c) Knowledge Management Orientation (KM) is composed of infrastructure and information technologies with the objective to store and provide the knowledge generated, besides the organization's structural and cultural facilitators (Good et al., 1999; Gold et al., 2001; Kim and Lee, 2006). We highlight that knowledge is developed by individuals based on their collective daily work. So, this knowledge is the continuous result of interaction between people, in and out of the organization (Prieto et al., 2009; De Guimarães et al., 2016);
d) Cleaner Production (CP) is an environmental practice which emphasizes the systematic reduction of the production process costs through the reeducation of raw material consumption and the minimization of industrial residue generation (Severo et al., 2015; Neto et al., 2016; Ghannadzadeh and Sadeqzadeh, 2016; Yong et al., 2016), as well as the reutilization of materials and recycling to minimize the environmental impact so that the organization benefits (Severo et al., 2015; Bhupendra and Sangle, 2016. Khalili et al., 2015; De Guimarães et al., 2017).
e) The Sustainable Competitive Advantage (SCA) is composed of the action results and managerial decisions which result in the organization's superior performance when compared to those of their competitors (Porter, 1991; Barney, 1991; Kim et al., 2012; De Guimarães et al., 2016). The innovation strategies, quality improvement, cost reduction and the socio-environmental precepts are used to improve the organizational performance (Kohli and Jaworski, 1990; Tan et al., 2015; De Guimarães et al., 2016).

2.1. Entrepreneurial orientation and cleaner production

Entrepreneurial Orientation (EO) in enterprises is a topic of researches in the management and business areas (Soininen et al., 2012; Núñez-Pomar et al., 2016; De Lucia et al., 2016; Chavez et al., 2017). According to Linton and Kask (2017), EO has nonlinear subdimensions, enables the enterprise's performance when adjusted with competitive strategies, and supports the research flow which has EO as a formative construct. To Soininen et al. (2012) EO directly affects the enterprise's growth rate.

However, Chavez et al. (2017) emphasize that EO moderates the relationship between capacities in flexibilities and organizational cost and performance, just like, without a sufficient EO level, there

will be no benefits for the organizational performance and, as such, EO must be positioned as a strategic driver. According to Soininen et al. (2012), EO is about an intrinsic strategic characteristic, which allows some enterprises to tolerate economic difficulties more strongly than their competitors.

Researches by Jansson et al. (2017) sustain that EO and the environmental practices' influences on commitment with sustainability imply a statement that the enterprises committed to sustainability see entrepreneurial and market advantages. Based on data from the Global Entrepreneurship Monitor (GEM), a study by Hörisch et al. (2017) proved that environmental orientation is frequently used as a source to guarantee the enterprises' entrepreneurship legitimacy.

New enterprises focused on sustainable entrepreneurship arise from the decision-maker owners, whose procedures are seen as guides of green-oriented enterprises (Silajdžić et al., 2015). Another important aspect is that entrepreneurial orientation influences the environmental practices, the corporative social responsibility and the enterprise's performance (Hernández-Perlines and Rung-Hoch, 2017; Jansson et al., 2017).

Consistently, CP is a proactive environmental strategy with extremely positive results in the environmental corporative management (Oliveira et al., 2016). We should highlight that the entrepreneurial characteristics from an organization must include environmental practices (Rahdaria et al., 2016; Dentchev et al., 2016), where EO can influence CP. This leads to our H1 hypothesis.

H1. Entrepreneurial Orientation is positively related to Cleaner Production.

2.2. Market orientation and cleaner production

Market knowledge is among the most valuable resources an enterprise can use in order to obtain a competitive advantage (Rakthin et al., 2016). According to Narver and Slater (1990), MO became important in the academic environment in the 1990's. As stated by Frösén et al. (2016), MO is one of the most used strategic marketing concepts among the professionals. To Wang and Miao (2015), MO falls into the modern thinking and marketing practice (Atuahene-Gima, 1996; Verhees and Meulenberg, 2004), since it contributes to the enterprise's development through innovation. To Hurley and Hult (1998), MO is also about a strong preceding organizational innovative culture.

The consumers' needs appreciation, as well as the environmental factors, can influence the consumption preferences. Therefore, understanding the demands is of fundamental importance to the market intelligence generation (Narver and Slater, 1990). Within this context, the studies by Corrocher and Solito (2017), Jansson et al. (2017) and Pipatprapa et al. (2017) show evidences that MO influences the environmental practices and contributes to the enterprises' economic performance through green innovation.

The orientation regarding the market actions and the product and processes' sustainable innovations contribute to the enterprises' positive results (Varadarajan, 2017). So, the environmental practices are market-motivated (Jansson et al., 2017). In this sense, MO can guide the CP practices in its precepts because of the environmental and economic benefits, since MO refers to the organization's responsiveness (Kohli and Jaworski, 1990). Based on the MO and CP interactions, we developed the H2 hypothesis.

H2. Market Orientation is positively related to Cleaner Production.

2.3. Knowledge management orientation and cleaner production

KM has been a constant topic of organizational research (Donate and Pablo, 2015; Fidel et al., 2015; De Guimarães et al., 2016). According to Donate and Pablo (2015), KM is an important innovation practice. To Fidel et al. (2015), KM enables the detection of new market opportunities and supports the relationship management with the client in the long run. De Guimarães et al. (2016) emphasize that KM is crucial to the process innovation sector in the industrial manufacture and commerce, benefiting methods, organizational structure and formal systems.

Research by Castrogiovanni et al. (2016) highlights that the human resources and the adoption of new technologies are the most efficient sources of knowledge acquisition and management. Tseng (2014) states that the knowledge management capacities aim at starting, improving and keeping relationships with the suppliers, as well as enhancing the corporative performance.

According to Lopes et al. (2017), organizational sustainability concentrates more and more on managing new knowledge and practices which can expand the business. Liu et al. (2010) highlight that knowledge management optimizes the use of resources and capacities, promoting the organizational performance.

Knowledge management, together with environmental sustainability orientation, widens the possibilities of success in product innovation, processes improvement and the organization's financial performance increase (Claudy et al., 2016), since the use of environmental practices and the Environmental Management System are directly influenced by the culture of knowledge management. It also produces knowledge from the enterprise's Intellectual Capital. In this sense, there are signs of relationship between the environmental practices, like CP, through projects management (De Guimarães et al., 2017) and environmental management (Severo et al., 2017).

Within this context, the environmental problematic knowledge and the use of methods for knowledge management force the enterprises to implement CP (Severo et al., 2015; Li et al., 2017; De Guimarães et al., 2017), with the objective of improving competitiveness. This leads to our H3 hypothesis.

H3. Knowledge Management Orientation is positively related to Cleaner Production.

2.4. Cleaner production and sustainable competitive advantage

CP is about an environmental practice which aims at the production process efficiency, the adequate input use and the minimization of industrial waste generation (Severo et al., 2017). Consistently, Jiménez et al. (2015) emphasize that the analysis of competitive advantages by the enterprises as a result of the environmental commitment appreciation is a relevant research topic. Therefore, CP aims at improving the environmental performance and the competitive advantage (Gong et al., 2017).

SCA can be explained by the unique products/services characteristics which keep the enterprise in a specific position and which make it different from their competitors, whether by the privileged market position (Barney, 1991; Kim et al., 2012), by the rational use of strategies, by the increase in market share due to the success of new products, or by CP implementation in the industrial process (Severo et al., 2017).

The CP implementation, together with the strategic drivers, contributes to the enterprise's success, maximizes the use of resources and widens the competitive advantage generation possibility (Tseng et al., 2009; De Guimarães et al., 2017). There are signs that SCA can be generated by the use of environmental practices such as CP, since this practice systematically tries to reduce

productive costs and waste and resources consumption (Severo et al., 2015). We should mention that the environmental efforts in an enterprise are related to SCA, since the environmental actions and practices contribute to the profit's maintenance and growth (Yadav et al., 2017). Based on what has been researched, we come to our H4 hypothesis.

H4. Cleaner Production is positively related to Sustainable Competitive Advantage.

As a supplement to the evaluation of the relationships between the constructs, in this research we considered the Activity Sector and Company Size moderating effect between the constructs and on the relationships intensity, considering the results from the studies by De Guimarães et al. (2017) and Severo et al. (2017), which checked the existence of response variation for the different Company Size and Activity Sector. Studies by Jansson et al. (2017) especially show that MO, EO and the environmental practices are different as to the importance for the commitment to sustainability between small and medium enterprises.

Within this context, we highlight that there is the Activity Sector moderating effect (Industrial Manufacturing, Commerce and Services) (H5) and Company Size (Small Enterprises and Medium Enterprises) (H6). Thus, the H5 hypothesis is subdivided into: H5a – Activity Sector has a moderating effect on the relationship between Entrepreneurial Orientation and Cleaner Production; H5b – Activity Sector has a moderating effect on the relationship between Market Orientation and Cleaner Production; H5c – Activity Sector has a moderating effect on the relationship between Knowledge Management Orientation and Cleaner Production; H5d – Activity Sector has a moderating effect on the relationship between Cleaner Production and Sustainable Competitive Advantage. The H6 hypothesis is also subdivided into: H6a – Company Size has a moderating effect on the relationship between Entrepreneurial Orientation and Cleaner Production; H6b – Company Size has a moderating effect on the relationship between Market Orientation and Cleaner Production; H6c – Company Size has a moderating effect on the relationship between Knowledge Management Orientation and Cleaner Production; H6d – Company Size has a moderating effect on the relationship between Cleaner Production and Sustainable Competitive Advantage. Fig. 1 shows the theoretical model with the research hypotheses.

3. Method

This study is a quantitative-descriptive research, analysed through the Structural Equation Modelling (SEM), according to the guidelines by Hair et al. (2010). A survey for data collection was carried out through the use of an online questionnaire which was sent to small and medium enterprises registered in the National Industry Confederation (CNI, 2015) and the National Confederation of Trade (CNC, 2015). As population, we considered 311,745 enterprises in Southern Brazil, which, according to the Brazilian Institute of Geography and Statistics (IBGE), conduct economic activities in the following areas: food and accommodation; automobile and motorcycle commerce and repair; construction; gas and electricity; transformation industries, among other service activities. At first we sent 12,637 random e-mails and had 187 replies. Then, we performed the collection by phone and registered it on an electronic form. Data collection took place between July 2016 and January 2017, totalling 1837 forms answered.

To choose the enterprises which compose the research sample, we took note of the following criteria: i) enterprise's size: we selected small and medium enterprises since they are in an intermediary phase of organization and complexity of internal processes in the utilization of EO, MO, KM and CP. In this sense, the micro-enterprises were not chosen since they present some difficulties to systematize information due to the non-existence of department and specialized personnel. We also excluded the big enterprises, since their level of specialization and departmentalization is high in comparison with the small and medium enterprises, which could bias the research; ii) the enterprises have to be registered in the CNI or the CNC; iii) they must have their full profile with e-mail address, phone number and number of employees to enable the communication with the enterprises and characterize the enterprise's size; iv) they must have a branch of business in Southern Brazil; and v), perform the selected economic activities from the 2015 IBGE's research, which composes the research's population.

For data cleansing we tried to identify univariate and multivariate outliers and discarded the forms on which the respondent concentrated the answers on one single alternative on a five-point scale. Data depuration resulted on 63 forms that were discarded. In order to avoid missing answers, the electronic form did not save incomplete information. These procedures resulted in 1774 valid

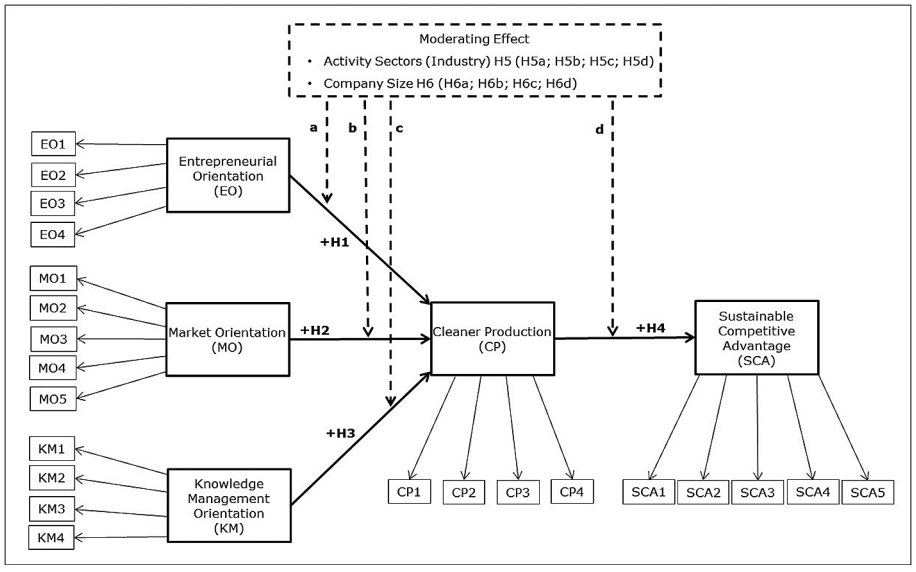

Fig. 1. Hypotheses model.

cases. Data analysis was done through the SPSS® (v.21) software for Windows and the AMOS® (v.21) software.

The questionnaire was drafted with affirmative answers, which were chosen by the respondents on a 5-point Likert scale: 1 = strongly disagree; 2 = disagree; 3 = neither disagree nor agree; 4 = agree; 5 = strongly agree. We based on the following studies for the constructs' composition and questionnaire elaboration (Table 1):

a) Entrepreneurial Orientation (EO): Contemplates the enterprise's entrepreneurial characteristics related to the risky susceptibility in new projects, to a pioneering spirit, to constant changes and to the emphasis on Research and Development (R&D), as well as the constant search for process innovation and products/services. This construct was shaped based on studies by Lumpkin and Dess (1996) and Hult et al. (2004);
b) Market Orientation (MO): Enterprises with MO present a tendency to develop products and services which offer value to clients based on market information, promoting actions of immediate response to the consumers' demands through innovations in products/services and process, which are the results of market intelligence information application (Atuahene-Gima, 1996; Hurley and Hult, 1998; Hult et al., 2004);
c) Knowledge Management Orientation (KM): KM can be encouraged in the enterprises from an organizational culture which allows creativity manifestation, team work for products/services innovation and processes, through formal procedures that break departmental barriers and encourage collective work (Prieto et al., 2009; Zack et al., 2009; De Guimarães et al., 2016);
d) Cleaner Production (CP): The CP practices are related to the activities' planning and execution that systematically try to reduce the costs with raw matter, water, electricity and waste, with the objective of improving the use of resources and thus widen efficiency and productivity to enhance products and services' quality (De Guimarães et al., 2017; Severo et al., 2015, 2017);
e) Sustainable Competitive Advantage (SCA): SCA is measured from the comparison with the main competitors evaluating the revenue with new products/services, operational costs, innovation profitability, as well as the use of socio-environmental precepts in the development and offer of new products/services (Paladino, 2007; Tan et al., 2015; De Guimarães et al., 2016).

We highlight that, upon using the Likert scale in our research along with the questionnaire subjective measures (self-answered) to collect data about several variables simultaneously, some Common Method Variance (CMV) may occur due to the respondent's exposition to one single technique and tool for data collection. Another research limitation refers to the use of affirmations with the levelled scale (5-point Likert scale), which can provide biased answers, like in the Halo effect. The Halo effect can come from the wrong generalization originated by providing answers from one

Table 1
Factorial loads of observed variables – Varimax Rotation.

Observable variables	Factorial load	Communality
Entrepreneurial Orientation (EO)		
EO1) The enterprise presents a tendency to invest in highly risky projects, with very high chances of return.	0.773	0.676
EO2) The enterprise develops market actions before their competitors.	0.796	0.705
EO3) Changes in product ranges or services have been very meaningful.	0.602	0.563
EO4) The enterprise focuses on Research and Development (R&D), technological leadership and innovations in processes and products/services.	0.572	0.524
Mean 4104; Standard Deviation 7,84; Cronbach's Alpha 0,733; CR 0,824; KMO 0,742		
Market Orientation (MO)		
MO1) There is a corporate culture in the enterprise, characterized by some willingness to supply the clients with higher values continuously.	0.869	0.878
MO2) The enterprise considers the response actions of fundamental importance to the market demand information.	0.775	0.756
MO3) The enterprise considers the projects and response actions to the market tendency information as priority.	0.801	0.780
MO4) The enterprise has departments or personnel to collect and handle market information, in order to turn this into market intelligence.	0.828	0.794
MO5) The Product/Service and Process innovations incorporate the market intelligence information.	0.576	0.530
Mean 4.174; Standard Deviation 0.628; Cronbach's Alpha 0.912; CR 0.951; KMO 0.864		
Knowledge Management Orientation (KM)		
KM1) The managers are open to individual proposals and creativity from the New Products and Processes Development team members.	0.804	0.688
KM2) The formal procedures and systems which affect the New Products/Services Development and Processes encourage people to search for new knowledge, no matter the organizational structure.	0.724	0.713
KM3) The formal procedures and systems which affect the New Products/Services Development and Processes are designed to help exchange knowledge through departmental borders.	0.672	0.704
KM4) The formal procedures and systems which affect the New Products/Services Development and Processes are intended to promote collective work instead of individual behaviour.	0.736	0.688
Mean 3.913; Standard Deviation 1.107; Cronbach's Alpha 0.843; CR 0.905; KMO 0.804		
Cleaner Production (CP)		
CP1) The CP practices reduced the use of raw matter, water and/or electricity in the enterprise's processes.	0.863	0.814
CP2) The CP practices improved the productive process and/or service delivery.	0.784	0.799
CP3) The enterprise encourages its employees to suggest new practices about CP and sustainable innovations.	0.641	0.495
CP4) The use of CP practices resulted in products and/or services with quality higher than the competitors'.	0.735	0.718
Mean 3.281; Standard Deviation 1.002; Cronbach's Alpha 0.852; CR 0.916; KMO 0.798		
Sustainable Competitive Advantage (SCA)		
SCA1) Our revenue with new products/services is much better in relation to our competitors'.	0.637	0.616
SCA 2) Our operation costs, during production and/or service delivery, is inferior to our competitors'.	0.733	0.616
SCA3) The profitability with new products/services is much better in relation to our competitors'.	0.636	0.705
SCA4) Our new products/services incorporate knowledge and concepts of Environmental Sustainability.	0.772	0.670
SCA5) Our new products/services are produced and offered respecting the Entrepreneurial Social Responsibility precepts.	0.717	0.737
Mean 3.763; Standard Deviation 1.059; Cronbach's Alpha 0.854; CR 0.913; KMO 0.809		

single characteristic, quality, object or person, as well as the influence of social desire that can increase or decrease the relationships between the constructs.

In order to determine the enterprises' size, we used the Complementary Law No. 139/2011 (Brazil, 2011) and Law No. 11638/2007 (Brazil, 2007), which take into account the company's annual revenues in local currency (the Brazilian Real with values converted to US Dollars, equivalent to BRL 3,1401 Brazilian Real to one USD Dollar, as of 21-07-2017). The companies were divided into two groups: Group 1 is also composed of Small Enterprises with an annual revenue between BRL 360 thousand and BRL 3.6 million (USD114.646.03 and USD 1,146,460.30); Group 2 is composed of Medium Enterprises with an annual revenue between BRL 3.6 million and BRL 300 million (USD1,146,460.31 and USD 95,538,358,65).

With the objective to verify the statistical data normality and consistency, we evaluated: i) Bartlett's test of sphericity, with meaningful result ($p > 0.001$); ii) Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) with values higher than 0.5 (Hair et al., 2010) (Table 1); iii) Kurtosis analysis with values lower than 5 (Mardia, 1971; Bentler, 1990); iv) Pearson's Coefficient of Skewness with values close to Zero (Hair et al., 2010; Kline, 2011); v) observable variables' simple reliability check, which was measured through the Cronbach's alpha calculus from which we expect higher values.

After the data normality and reliability evaluation, we proceeded with the Factorial Analysis to measure the correlation between the observable variables. The factorial analysis is frequently used in the researches on social and human sciences, which can be defined as a type of multivariate statistical methods whose main purpose is to define the underlying structure in a data matrix, assuming that the correlation between the variables comes from the sharing and the relationship these variables have with a common factor (construct) (Crawford and Lomas, 1980; Kamakura and Wedel, 2000; Steenkamp and Baumgarther, 1995; Miler, 2009). Therefore, high correlations between the variables generate the groups which configure the factors (Crawford and Lomas, 1980). As a process of initial analysis, and before SEM, we applied the Exploratory Factor Analysis (EFA), with the use of the Varimax Rotation, to verify the combination of observable variables in constructs.

With the EFA, we tested the theoretical model of construct composition through the observable variables presented in Table 1, from which we expected factorial loads above 0.5 (Hair et al., 2010). In the EO construct the observable variables EO1 and EO2, which are related to the susceptibility to taking risks and to the pioneering spirit, are the variables which mostly contributed to the EO formation, considering the Factorial Loads and showing that the enterprises present fundamental characteristics of entrepreneurship, which contributes to the competitive advantage. In MO we can notice that the enterprises researched still haven't invested enough in the incorporation of market intelligence in the innovations (product/service, process), which can be emphasized in the factorial load of MO5 (0.576). In KM, we highlight the KM1 variable with the highest factorial load (0.804) of contribution for the construct formation, which explains the intense relationship of participative leadership with knowledge management within the enterprises researched.

Still in Table 1, we notice that the resource consumption reduction practices are the main variable (CP1) for the CP formation, considering the factorial load (0.863). In the SCA construct, the observable variables present similar factorial loads, which demonstrates that, for the construct formation, the innovation results in revenue increase, cost reduction and higher profitability, besides the enterprises that embrace socio-environmental precepts. In order to analyse the relationships between the observable variables, we evaluated the Communality, from which we expected values higher than 0.5. We notice that only the CP3 variable presents low Communality, showing that, statistically, this variable doesn't share important bonds with the other observable variables in the construct.

To evaluate the total variance of each observable variable, we performed the Average Variance Extracted calculus (AVE) (Table 2), recommended by Fornell and Larcker (1981). From AVE, we performed the Convergent Validity measuring (CV) and the Discriminant Validity (DV) to measure the variance in the observable variables, which is explained by the construct. The CV measures the direct relationships between the construct's Latent Variables, and the DV measures the correlations between constructs (Raykov and Marcoulides, 2000; De Guimarães et al., 2016). An item's reliability is assessed through the factor loading of that item onto the underlying construct (Jenatabadi and Ismail, 2014). With the objective of evaluating the measuring consistencies between the observable variables, we used the Composite Reliability (CR) (Table 1), suggested by Koufteros et al. (2009) and Marôco (2010) from which we expect a value equal to or higher than 0.7. In these studies, the test demonstrates that the scale and construct response quality evaluation support the measuring model (framework) and scale validity. Therefore, the application of SEM along with this set of data is statistically viable.

To test the integrated model (framework) and measure the relationships and correlations between the constructs, we evaluated the Standardized Estimates (ES) and Unstandardized Estimates (UE) hypotheses tests. The framework adequacy, which predicts the covariance or correlation matrix, was evaluated considering the recommendations by Gerbing and Anderson (1988), Ullman (2007), Hair et al., 2010 and Kline (2011).

The following indexes: i) Chi-square value divided by the level of liberty (equal to or lower than 5); ii) Comparative Fit Index (CFI) ($\geq$0.9): compares the researcher model adjustment with a base model, usually the independent model, in order to better check the adjustment (Kline, 2011); iii) Normed Fit index (NFI) ($\geq$0.9): must be between 0 and 1 – the closer to 1, the more suitable the model is for the base model; iv) Goodness of Fit Index (GFI) ($\geq$0.9): used to evaluate the approximation of the model to the theory, as proposed by the researcher (Kline, 2011), regardless of other possible models; v) Adjusted Goodness of Fit Index (AGFI) ($\geq$0.9): in the calculation, it considers different degrees of complexity, even though it also favours the less complex models, and is used to check the structural model and the measuring adjustments (Hair et al., 2010); vi) the Root Mean Squared Error of Approximation (RMSEA) (between 0.05 and 0.08); vii) the Root Mean Square Residual (RMR); and viii) the Expected Cross-Validation Index (ECVI) were used to compare the initial integrated model and the final integrated model (rival models), to obtain lower values.

To evaluate the moderating effect from the Activity Sector (H5a, H5b, H5c, H5b) and Company Size (H6a, H6b, H6c, H6d), we used the studies and premises by Sharma et al. (1981), Baron and Kenny (1986) and De Guimarães et al. (2017), which stated that the use of moderation multivariate analysis can be applied with the objective to identify how the structural model is adjusted in different pre-established groups and the differences which can happen in the regression coefficients, due to the moderating value alteration.

For the verification of the possible variation between the respondents in the different Activity Sector and Company Size in relation to the constructs (EO, MO, KM, CP, SCA), we followed the recommendations by Hair et al. (2010) and Severo et al. (2017), with the use of the hypothesis test through ANOVA to compare the group response mean.

With the increase, we evaluated the intensity in the

Table 2
Convergent validity and discriminant validity – Integrated model.

Constructs	EO	MO	KM	CP	SCA
Entrepreneurial Orientation (EO)	0.545[a]				
Market Orientation (MO)	0.442[b]	0.797[a]			
Knowledge Management Orientation (KM)	0.457[b]	0.636[b]	0.705[a]		
Cleaner Production (CP)	0.592[b]	0.546[b]	0.615[b]	0.736[a]	
Sustainable Competitive Advantage (SCA)	0.574[b]	0.629[b]	0.647[b]	0.533[b]	0.680[a]

[a] Average Variance Extracted (AVE) – Convergent Validity (CV).
[b] Construct Correlation – Discriminant Validity (DV).

relationships between the constructs by using the multi-group hypothesis and following the recommendations by Byrne (2010), with the objective to compare the relationships between the constructs. For such, we applied the Chi-square (X^2) measuring and comparison between the groups, considering the premise that every path was kept fixed, except the path which was tested to evaluate if there is any difference between the Standardized Estimate (SE) values and check if the differences between the X^2 are statistically significant.

4. Results and discussion

The research resulted in a sample of 1774 valid cases, composed of 64% of Small Enterprises, 36% of Medium Enterprises, from which 49.5% were Industrial Manufacturing, 24.7% were Commerce and 2.8% were Services. We noticed that 58.2% are enterprises that have been around for less than 20 years and only 8.3% have been around for more than 50 years. In relation to the origin of social capital, 89% of the enterprises are exclusively Brazilian, which is the result of regional entrepreneurship.

The Exploratory Factorial Analysis (EFA), along with the Varimax rotation, grouped the observable variables into 5 factors (constructs) (Table 1), with 69% of data variability explanation, which is considered adequate for the analysis with the use of SEM. We should highlight that the observable variables' general mean is 3.847 and the mean deviation is 0.916, which demonstrates the respondents' agreement and the low variability, confirming that the enterprises have the attributes questioned in the research. CP carries the lowest response mean (3.281), suggesting that the enterprises researched still have opportunities to improve the environmental management practices, especially the CP precepts application.

After the normality and reliability tests, we performed the Average Variance Extracted (AVE) calculations (Table 2) to measure the Convergent Validity (CV), on which the MO (0.797), KM (0.705) and CP (0.736) construct results were above the recommended ($\geq$0.7), which contributes to the explanation of the observable variables' aggregation in the construct formation. The EO (0.545) and the SCA (0.680) constructs present CV values close to or lower than recommended, which shows the possibility of existence of other variables that were not researched, and some observable variables in this study are fairly integrated in the construct, which can be highlighted by the Communality (CP3 = 0.495). These results do not invalidate the measuring scale, so we kept all the observable variables.

We should mention that the Discriminant Validity (DV) (Table 2), which measures the correlation between constructs, presented higher CV values only in the EO↔CP (0.572) and the EO↔SCA (0.574) correlations, since the EO's CV measures 0.545. These results suggest that the EO is widely correlated to the CP practices and to the SCA formation. The Composite Reliability (CR) calculations (Table 1) were above the recommended (>0.7) (Hair et al., 2010; Marôco, 2010) in the constructs (EO = 0.825; MO = 0.951; KM = 0.905; CP = 0.916; SCA = 0.913) and in the set of all the observable variables (0.980), which supports the decision to keep the measuring model (framework) for the MEE analysis, according to parameters used by Koufteros et al. (2009), Jenatabadi and Ismail (2014), De Guimararães et al. (2016), Severo et al. (2017).

The Pearson Correlation analysis identified correlations with values higher than 0.7 among the MO1↔MO2 (0.802), MO1↔MO3 (0.797), MO1↔MO4 (0.845), MO2↔MO4 (0.704), MO3↔MO4 (0.752), CP1↔CP2 (0.780) and the SCA3↔SCA5 (0.729) variables, which can suggest multi-collinearity. With the scale and construct validation test results, they were considered consistent with the MEE analysis application on the Initial Integrated Model hypothesis (Fig. 1).

The H1, H2, H3 and H4 hypotheses test results (Table 3) from the Initial Integrated Model turned out to be meaningful values ($p < 0{,}001$) for the Standardized Estimate (SE) and Unstandardized Estimate (UE), which highlights the positive influence between the constructs: i) EO→CP (H1); ii) MO→CP (H2); iii) KM→CP (H3); iv) CP→VC (H4). In the Initial Integrated Model, the causal relationships show that the strategic antecedents (EO, MO, KM) positively influence the CP practices. The research results show that CP has a high influence over SCA (SE = 0.543). Consistently, this environmental practice contributes significantly to the enterprises' economic gain and differentiation.

In order to identify the degree on which the measuring model predicts the covariances, we used the absolute adjustment measure analysis (Table 3) based on reports from the AMOS software, where we noticed, in the Initial Integrated Model, that the CFI, NFI, GFI and AGFI indexes resulted in values lower than the recommended of 0.9 (Hair et al., 2010; Kline, 2011). RMSEA also presents a value far above the recommended ($\leq$0.08). These results suggest that the measuring model can be improved considering the correlations between the constructs and between the variables. To compose the Final Integrated Model (Fig. 2), we considered the Pearson Correlation results with values higher than 0.7. With the objective to improve the Final Integrated Model, we added the correlation test to the constructs (EO↔MO; MO↔KM; EO↔KM) which are the CP's antecedents and influencers.

The Final Integrated Model (Fig. 2) hypotheses tests, expressed on Table 3, restate the H1, H2, H3 and H4 research hypotheses and found important EO↔MO (SE = 0.587); MO↔KM (SE = 0.691) and EO↔KM (SE = 0.463) correlations, which emphasize that the strategic antecedents combined maximize the influence over CP, which significantly improves the CP→SCA (SE = 0.701) relationship. The Final Integrated Model, considering the correlations between the constructs and variables, significantly improved the model adjustment indexes (Table 4), coming very close to what is recommended. Therefore, this model is more adequate to the research collected data analysis.

The H5 hypothesis (there is the Activity Sector moderating effect, Industrial Manufacturing, Commerce and Services) and the H6 hypothesis (there is the Company Size moderating effect – Small Enterprises and Medium Enterprises) evaluation was tested

Table 3
Hypothesis tests (Covariance and Correlation) – Initial and Final Integrated Model.

Hypothesis				Initial Model		Final Model	
				SE*	UE*	SE*	UE*
H1	Entrepreneurial Orientation (EO)	→	Cleaner Production (CP)	0.392	0.530	0.387	0.486
H2	Market Orientation (MO)	→	Cleaner Production (CP)	0.302	0.267	0.215	0.196
H3	Knowledge Management Orientation (KM)	→	Cleaner Production (CP)	0.422	0.357	0.378	0.322
H4	Cleaner Production (CP)	→	Sustainable Competitive Advantage (SCA)	0.543	0.529	0.701	0.749
	Entrepreneurial Orientation (EO)	↔	Market Orientation (MO)			0.487[a]	0.178[a]
	Market Orientation (MO)	↔	Knowledge Management Orientation (KM)			0.691[a]	0.371[a]
	Entrepreneurial Orientation (EO)	↔	Knowledge Management Orientation (KM)			0.463[a]	0.181[a]

*Standardized Estimate (SE) and Unstandardized Estimate (UE) Significance level p < 0.001.
[a] Correlation constructs indexes.

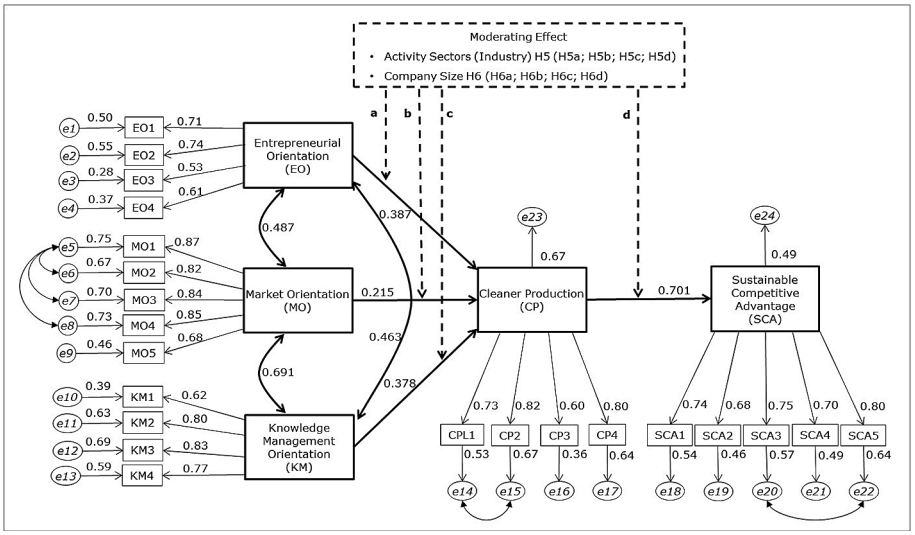

Fig. 2. Integrated model – Standardized Regression Weights.

through the ANOVA calculation, with the objective to compare the construct response averages and verify the existence of meaningful differences among the research respondents. The results show that: i) H5a, H5b and H5c were supported since they point out there is a meaningful difference ($p < 0.001$) among the Economic Activity Sectors' averages; ii) H5d has not been proved since there is no difference between Industrial Manufacturing, Commerce and Services in the relationship between CP and SCA, once the SCA response average was not meaningful ($p = 0.160$); iii) H6a and H6c were supported. Therefore, there is a meaningful difference ($p < 0.001$) in the Company Size; iv) H6b and H6d have not been proved. Thus, there are no statistical differences in the relationships (MO $p = 0.118$; SCA $p = 0.063$) between Industrial Manufacturing, Commerce and Services, in the relationships between MO→CP and CP→SCA.

We should mention that Table 5, on the relationship measuring between the constructs, EO→CP presents a high relationship (SE = 0.741) in the activity sector of services, which can be partly explained due to the fact that leadership entrepreneurial characteristics are present in Services, since the sample shows this sector is composed of 81.2% of small enterprises. In the MO→CP relationship, the activity sector of services stands out with high intensity (SE = 0.509), which can be explained by the direct contact between enterprise and clients. Another important result is the evidence that the industrial manufacturing (SE = 0.401) and Commerce (SE = 0.472) show an important influence in the KM→CP relationship, which is explained by the industrial manufacturing complex structure and, in the case of Commerce, by the proximity between managers and employees with consumers. The tests showed that the different activity sectors have a high CP influence over SCA, although this research has not proved a statistical difference between the enterprises of the industrial manufacturing, commerce and services in the CP→SCA relationship.

To measure the relations' intensity between the constructs, and considering Company Size (Small and Medium Enterprises), expressed on Table 6, the hypothesis tests (Covariance and Correlation) show that EO→CP is similar. However, there is a statistic difference, since, no matter the enterprise's size, the managers turned out to be entrepreneurs, which moderately influences the

Table 4
Model adjustment indexes.

Integrated model	X^2	GL	X^2/GL	CFI	NFI	GFI	AGFI	RMSE	RMR	ECVI
Initial	4865.998	205	23.7	0.811	0.804	0.802	0.755	0.113	0.192	2.799
Final	3396.027	202	16.8	0.870	0.863	0.859	0.819	0.096	0.067	1.979

Significance level p < 0.001.

Table 5
Hypothesis tests – Activity Sector (manufacturing industrial, commerce and services).

Hypothesis				Industrial Manufacturing	Commerce	Service	Chi-square (X^2) Difference
				SE	SE	SE	p
H5a	EO	→	CP	0.420	0.255	0.741	***
H5b	MO	→	CP	0.178	0.391	0.509	***
H5c	KM	→	CP	0.401	0.472	−0.205	***
H5d	CP	→	SCA	0.707	0.945	0.705	ns
	EO	↔	MO	0.585	0.197	0.300	***
	MO	↔	KM	0.612	0.764	0.760	***
	EO	↔	KM	0.489	0.446	0.534	***

ns (Not significant).
***Significance level $p < 0.001$.

Table 6
Hypothesis test – Company size (small enterprises and medium enterprises).

Hypothesis				Small Enterprises	Medium Enterprises	Chi-square (X^2) Difference
				UE	SE	p
H6a	EO	→	CP	0.369	0.358	***
H6b	MO	→	CP	0.157	0.244	ns
H6c	KM	→	CP	0.382	0.437	***
H6d	CP	→	SCA	0.763	0.563	ns
	EO	↔	MO	0.502	0.521	***
	MO	↔	KM	0.787	0.519	***
	EO	↔	KM	0.563	0.457	***

ns (not significant).
***Significance level $p < 0.001$.

Table 7
Research hypotheses.

Hypothesis		Results
H1	EO is positively related to CP	Confirmed
H2	MO is positively related to CP	Confirmed
H3	KM is positively related to CP	Confirmed
H4	CP is positively related to SCA	Confirmed
H5a	Activity Sector (Industrial Manufacturing, Commerce and Services) has a moderating effect on the relationship between EO and CP	Confirmed
H5b	Activity Sector has a moderating effect on the relationship between MO and CP	Confirmed
H5c	Activity Sector has a moderating effect on the relationship between KM and CP	Confirmed
H5d	Activity Sector has a moderating effect on the relationship between CP and SCA	Not Confirmed
H6a	Company Size (Small and Medium Enterprises) has a moderating effect on the relationship between EO and CP	Confirmed
H6b	Company Size has a moderating effect on the relationship between MO and CP	Not Confirmed
H6c	Company Size has a moderating effect on the relationship between KM and CP	Confirmed
H6d	Company Size has a moderating effect on the relationship between CP and SCA	Not Confirmed

CP practice use. The MO→CP relationship is more intense in Medium Enterprises (SE = 0.244), but there is no statistic difference among the respondents, showing that this relationship is low both for the Small and the Medium Enterprises, which demonstrates the low market influence over the CP practices. As we evaluate the KM→CP relationship, we notice that the Medium Enterprises show a more intense relation (SE = 0.437) when compared to the Small Enterprises (SE = 0.382), which supports the evidence of a statistical difference among the Company Size, since larger enterprises have a formal structure for management and knowledge promotion. However, in the CP→SCA relationship there is no statistic difference among the X^2, considering Small and Medium Enterprises for, no matter the enterprise's size, they show a high level of CP influence over SCA.

5. Conclusion

The framework (Fig. 1) for analysis between the constructs is an important research contribution for the advancement of scientific studies since it helps to identify the strategic drivers which antecede and influence the success in the CP practices. The hypotheses tests (Table 3) show that KM presents the highest influence over CP. Therefore, it is of fundamental importance that the enterprises develop formal structure for the management and promotion of knowledge produced in the organization, which supports the studies by De Guimarães et al. (2016), Li et al. (2017) and Lopes et al. (2017) that highlight the use of KM as a means for the rational use of resources and for the development of innovations which improve business competitiveness and sustainability in the economic and socio-environmental areas.

The correlations between the CP antecedent constructs (EO<–>MO; MO<–>KM; EO<–>KM), found in the Final Integrated Model (Fig. 2), contribute to the researches since they present managerial implications, on which we notice the advice for the enterprises to use a set of strategic guides (EO, MO, KM) in a smooth way to be more successful with CP and, consequently, reach some meaningful improvement in the differential development which generates a sustainable competitive advantage when compared to the competitors. We notice that, regarding the correlations between the constructs, the CP→SCA relationship increased the SE in 29% and the UE in 42%, showing the importance of strategic blend antecedent to CP.

The analysis of the moderating effect from the activity sector (H5) highlights that KM is better applied in Commerce and Services with averages higher than Industrial Manufacturing, which can be attributed to the low management complexity and low hierarchical levels in Commerce and Services. As for the moderating effect on the enterprise's size (H6), we notice that the small enterprises are able to better manage KM and MO, influencing CP a little more.

Based on the framework analysis results (Figs. 1 and 2), we find that the H1, H2, H3 and H4 hypotheses have been confirmed. However, the H5 and H6 hypotheses have been partly accepted, for the H5a, H5b, H5c, H6a and H6c hypotheses were supported, whereas the H5d, H6b and H6d hypotheses have not been proved. Table 7 expresses the research hypotheses' final results.

From this study results we suggest new research questions, such as: How can the regional economic factors interfere the relationships between the constructs? What are the main actions the enterprises researched use to identify the market demands and turn them into sustainable practices? What are the CP actions the enterprises use to create a sustainable competitive advantage? These questions can contribute to understanding the dynamics between the constructs researched and, thus, the managers can focus on actions which maximize the CP practices and result in a higher organizational performance.

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