The effects of analytical and business process orientation approaches the on performance of small and medium industrial and service enterprises in Brazil

Os efeitos da abordagem analítica e da gestão orientada para processos sobre o desempenho organizacional de micro e pequenas empresas brasileiras dos setores da indústria e de serviços

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Abstract: The paper compiles the results of a study which addressed the effects of business process orientation and business analytics on the performance of small and medium companies in Brazil, as well as the importance of size as a moderator of these effects. A survey was conducted with 469 companies from various segments of Brazil's industrial and services economies. Data analysis included descriptive analysis, reliability tests, and structural equation modeling. A significant portion of the companies' performance variation (47.5%) was explained by the regressors of the structural model, and the findings also indicate significant statistical disparities between medium and small companies, suggesting size might be a moderator in the investigated relationships, reinforcing the potential for future research on the theme.

Keywords: Analytical approach; Business process orientation; Organizational performance; Company size; Structural equation modeling.

Resumo: *Este artigo apresenta os resultados de um estudo cujo objetivo foi o de avaliar os efeitos da abordagem analítica e da gestão orientada para processos sobre o desempenho organizacional de pequenas e médias empresas brasileiras, bem como a importância do porte (tamanho da firma) como variável moderadora de tais efeitos. No trabalho de campo, foi realizado um survey com 469 empresas participantes de diferentes segmentos da economia industrial e de serviços do Brasil. O tratamento dos dados incluiu testes descritivos, de confiabilidade de escalas e a modelagem de equações estruturais. Uma parcela importante da variação do desempenho das empresas estudadas (47,50%) foi explicada pelos regressores do modelo estrutural. Os achados da pesquisa também evidenciaram diferenças estatisticamente significativas quando confrontados os resultados das médias e pequenas empresas da amostra, sugerindo que o porte pode ser um elemento mediador das relações investigadas, ampliando o potencial de futuras pesquisas sobre o tema.*

Palavras-chave: *Abordagem analítica; Gestão orientada para processos; Desempenho organizacional; Porte da firma; Modelagem de equações estruturais.*

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1 Introduction

The Business Process Management (BPM) and the analytical approach procedures are effective initiatives in promoting the performance of organizations and supply chains (Hammer, 2007a; Reijers, 2006; Davenport, 2006; Lambert et al., 2005; Croxton et al., 2001), set in two important areas of scientific knowledge and best practice of contemporary business management.

BPM consists of a set of theories, concepts, practices and technological artifacts which, in different ways, support the goal of managing business processes and effectiveness in the implementation of corporate strategies (Skrinjar & Trkman, 2013; Trkman, 2010; Trkman et al., 2010; ABPMP, 2009).

There are various interaction points between the BPM (Business Process Management) approach and the guidance regarding business processes, the BPO (Business Process Orientation). BPO is multi-dimensional, a unique and complex field comprised of various heuristics that reinforce and promote the logic of customer centrality. Commonly, BPO is associated with the design of organizational structures characterized by more effective business processes through commitment to permanent analytic efforts that promote incremental improvements and optimization of business processes (Kohlbacher & Gruenwald, 2011; Smith & Fingar, 2003).

Along with BPO, analytical capabilities are also enablers to leverage effective performance results. Analytical capabilities can be considered as powerful weapons at the service of business strategy, especially involving extensive use of critical data, explanatory and predictive models, and management based on facts used to guide decision-making. Despite studies that indicate clear associations between BPO and organizational performance (Sidorova & Isik, 2010; Hammer, 2007a, b; Mansar & Reijers, 2007; Grover & Malhotra, 1997), there is lack of research that addresses the problem of quantifying the jointly effects of both BPO and analytical capabilities over organizational performance (Trkman, 2010).

This study aims to cover those gaps by providing empirical evidences of the relationships comprising the level of BPO, the analytical capabilities, and effects of these variables over organizational performance, considering a sample of small and medium companies in Brazil, and identifying whether such effects are moderated by company's size.

The structure of this paper is as follows. First, the dimensions of BPO, Analytical Indicators and Organizational Performance are presented. Then, the conceptual model and the research hypothesis are identified, followed by measurement scales and the structural model composition. In the methodological section, the research strategy is described as well as the procedures adopted for collecting and treating the data. The next part presents the descriptive statistics and the structural equation modelling results for the global sample and for the sample subsets (i.e. size and sector of activity - industry vs. commerce/services). Results are discussed and, in the last section of the paper, study limitations and potential areas for further research on the theme are presented.

2 Theoretical background, hypothesis and research questions

2.1 Business processes orientation

The BPO is a complex and multidimensional construct, especially since it involves contents from sub-areas of knowledge from operations, marketing, and industrial engineering.

Business processes can be considered as a set of interrelated activities based on inputs and transformative resources, conducted to produce a good, service, or both. Value delivery itself, as the result of a process, is the condition for its effectiveness, and it is nearly always the result of an effort from multiple functional areas of a company (Hammer & Stanton, 1999; Davenport & Short, 1990).

Process-oriented organizations are named with various terms: horizontal organization (Ostroff, 1999; Byrne, 1993), process-centered organization (Doebeli et al., 2011; Hammer, 1996), process-focused organization (Gardner, 2004), and customer-centric organization (Bergh et al., 2012) to name a few. A point in common for the designations is the fact that the BPO approach implies transformation of traditional structures. For this transformative potential, the BPO approach depends on an extensive repertory of knowledge related to BPM, involving design and analysis of processes, management of process performance, and new IT and systems needed to sustain organizational structures (Skrinjar & Trkman, 2013).

The BPO construct domain could come to be delimited from some dimensions, such as those referenced in the works of McCormack et al. (2003), Kohlbacher & Gruenwald (2011), and Willaert et al. (2007): i) the role of leadership in the construction of a vision of processes in the organization; ii) the development and implementation of methodologies for mapping and documentation of processes; iii) the establishment of performance targets for the processes, aligned to the strategic objectives of company business units; iv) the implementation of a personnel management policy geared towards the development of recognized competence aligned to or

suitable to models of management processes; v) the presence of more horizontal organizational structures, in which resource coordination principles value the integration of the value stream in the organization's key processes; vi) the development of values and a culture positively identified with the principles of process management; vii) the management of relationships and integration of value streams (goods and information) with external customers; viii) the management of relationships and integration of value streams (goods and information) with the organization's suppliers; and ix) the intensive utilization of new information technologies, promoting assertiveness of the decision-making processes, further integration of the value stream and more effective control over the performance of business processes. Given the potential relevance and recognition of the BPO construct for the competitiveness of companies, Hypothesis 1 of the research is presented:

> *H1:* There is a positive and statistically significant association between business process orientation (BPO) and organizational performance.

2.2 Analytical indicators

A considerable number of organizational performance results depend on the capabilities to be more agile, proactive, and responsive. These requirements—already important presently—are predicted to be even more critical in the near future, indicating analytical capabilities imbedded in business processes, in systems of IT governance, and in decision-making will be preconditions for future organizational success and sustainability. There are also indications that new capabilities to identify data patterns, anticipate events, to stimuli and optimize information from the business environment will constitute bases for competition in the future (Davenport, 2006, 2013; Peterson, 2013; Oliveira et al., 2012; Lovett, 2012; Trkman et al., 2010).

The analytical approach (Business Analytics - BA) also proves to be a difficult concept term and its definition includes a set of iterative actions of collection, treatment and utilization of data relating to the business processes of companies, or their supply chains. It is strongly dependent upon a quantitative approach in the treatment of such data by means of statistical tests, both descriptive and multivariate in nature.

BA capabilities can be directed to several goals such as greater effectiveness of organizations in describing their reality (i.e., descriptive analytics), analysis of problems (i.e., diagnostic analytics), predicting future results based on present decisions or

actions (i.e., predictive analytics), and prescription of best practices for scenarios or company actions (i.e., prescriptive analytics) (Peterson, 2013; Davenport, 2013; Lovett, 2012; Davenport & Harris, 2007).

BA solutions combine disparate components for effective implementation: people, processes, and technological platforms. These components interconnect to make extraction of value from large masses of data existing in a company's business environment viable. Implementation of BA solutions by an organization indicates that it recognizes the importance of a culture of measurement in business and developing capabilities, whether to measure customer preferences or interact with consumers more deeply. The scope of applications for these solutions is extremely varied, including minimizing process costs, improving assertiveness in predictive models, growing market share, among others (Peterson, 2013; Lovett, 2012; Hedgebeth, 2007; Azvine et al., 2005).

In this sense, BA applications could be used to exploit data in order to discover new patterns and relationships between them, or use quantitative analysis to explain why certain specific results occurred for the organization. BA solutions could also contribute to an organization's knowledge repository to simulate effects of certain business decisions, or in the anticipation of possible results of a decision using predictive models, important in competitive scenarios marked by growing uncertainty and turmoil.

Due to the convergence of proposals, we assume a strong, positive relationship between development of analytical capabilities and organizational performance. We argue that extensive use of analytic indicators, combined with BPO, influences performance decisively. Nevertheless, despite the fact that the potential associations between these concepts are very clear, it remains necessary, from a scientific and business practices point of view, to quantify, measure and validate these associations. Given the relevance of the analitical approach and its potential association with the processes approach, Hypothesis 2 of the research is presented:

> *H2:* There is a positive and statistically significant association between business process orientation (BPO) and the use of analytical indicators by companies.

Hypothesis 3 has also been tested in this study in view of the increasing evidence demonstrating the possible associations between the analytical approach and organizational performance:

H3. There is a positive and statistically significant association between the use of analytical indicators and organizational performance.

2.3 Competitive performance and BSC Model

An impressive turning point occurred in recent decades, regarding organizational performance measurement systems. In an extensive bibliographical review, Kennerley & Neely (2003) point out that traditional performance measures were developed with strong financial-accountability biases, and although companies valued them for decades, they are no longer appropriate from a contemporary perspective.The reasons for this statement can be justified since traditional financial measurement systems are: (i) unable to supply important information concerning future business performance. Instead, they are committed to generating short-term results (Kaplan, 1986; Hayes & Abernathy, 1980); (ii) not necessarily oriented to competitors and customers, but can have an intrinsic focus on functional performance (Neely et al., 1995; Kaplan & Norton, 1992); (iii) devoid of strategic focus (Skinner, 1974); and (iv) potential inhibitors of innovation (Richardson & Gordon, 1980).

Among diverse performance measurement systems that have been disseminated broadly in business and scientific communities, the importance assumed by the Balanced Scorecard (BSC) over the last 30 years is distinct. Bourne et al. (2002) argue that BSC could be elevated to one of the most important management tools developed in the last hundred years.

We discuss indicators that link to each of the four BSC dimensions. These indicators can be customized according to the specifics of each business model in which the BSC is implemented: (i) Financial perspective: Profit margin; cash flow; revenue; return on assets (ROA); (ii) Customer/market perspective: perception of product or service quality by the organization's clients; degree of customer loyalty; degree of success in attracting new clients; total value of property; (iii) Process perspective; waste reduction; reduction of service lead times; reduction of the development time for new products; development of processes with customers and suppliers; flexibility to respond to quantitative and qualitative variations in final demand; reduction of unit cost of production; reduction of costs of logistical services; technological and human capabilities embedded in business processes; (iv) Learning and growth perspective:. quality of human resources; potential for professional growth of employees in their areas of competence; level of the workforce's commitment; convergence between human capabilities available in the company and strategic demands of the organization; organization's ability to generate knowledge from the execution of their business processes.

By considering the synergistic associations of BPO and the use of analytical indicators on organizational performance, we pose the fourth hypothesis of this study:

H4: Both business process orientation and the use of analytical indicators affect positively the BSC dimensions of performance.

2.4 Small and medium businesses

In almost all national economies, small and medium-sized companies play an important role in terms of job creation and the growth of economic wealth of countries (Koh et al., 2007). Compared to large organizations, small and medium ones have specific characteristics in terms of resource scaling, organizational structures and management models, among other characteristics. It would be inappropriate to approach them as a "miniature" or "reduced scale" version of structures and business models of large corporations (Beaver & Prince, 2004; Welsh & White, 1981; D'Amboise & Muldowney, 1988).

Small and medium enterprises are potentially likely to face greater barriers or obstacles in certain contexts. In the case of innovative products and processes, for example, particular difficulties may arise: (i) the lack of sufficient financial resources to carry out isolated activities of research and development of new products or processes (Carpenter & Petersen, 2002); (ii) the limited diversity of forms or mechanisms to induce other companies to promote joint investments necessary for innovation (James et al., 2013; Teece, 1986); (iii) access to physical assets and third-party capabilities required for the commercialization of innovations (Gans & Stern, 2003; Teece, 1986), among other relevant issues.

It is not because they are smaller companies that resource management processes in small and medium companies are less complex. Yet given the particular needs or specificities of small and medium-sized organizations (in terms of their capabilities or constraints), many solutions developed for large companies, in respect to the management of resources and processes, development of techniques, heuristic and modeling design may not fully adhere to the needs of smaller companies (Huin et al., 2002; D'Amboise & Muldowney, 1988).

Two aspects are particularly interesting in the study of Huin et al. (2002). First, the fact that the containment of hierarchical levels - characteristic of small and medium structures – demands that their chief officers get directly involved in many strategic and operational business decisions, and with different stakeholders of the organization (intermediate customers, end users, suppliers and line employees, among others). This research also corroborates the fact that functional boundaries are not clearly defined in business models and structures of small and medium-sized businesses, often requiring the same management professional, for example, in the coordination of resources and processes in an interfunctional approach.

Harris & Rae (2009) highlighted the immense opportunities for smaller companies following the development of the internet, in particular the access to critical information in different formats and methods of communication. Small businesses' accesss to the huge mass of data found in social networks, blogs, forums and virtual networking groups allows, in exponential progression, them to get and make strategic use of information relevant to the future performance of their businesses. The authors argue in this regard that the development of analytical approaches for small and medium companies is a real phenomenon and that has been favored by the power and growing relevance of online communities.

In addition to the relationship between company and customer, there is growing evidence that internet-based solutions can enable companies, regardless of size, to increase the efficiency and efficacy of management in electronic markets, and intermediaries (Adebanjo et al., 2006). Different studies (Loukis et al., 2012; Cheng et al., 2010; McIvor & Humphreys, 2004; Ranganathan et al., 2004; Lancioni et al., 2000), among others, recognize that new types of information technology (especially solutions based on the internet) define relevant structural conditions in order to emulate collaborative practices between companies. Considering then, on the one hand, the specificities of smaller organizations vis-à-vis the structures of large corporations, but also stressing that disparities in size exist and are important among small and medium organizations, the fifth hypothesis of this investigation is identified as follows:

> *H5:* Disparities exist among small and medium companies when comparing business process orientation, the use of analytical indicators and their impact on organizational performance.

3 Conceptual research model and indicators

3.1 The model

The conceptual hypothetical model for the study consists of three constructs: BPO, Analytical Indicators and Organizational Performance.

The BPO construct is represented in the structural model as a second-order latent variable, consisting of nine latent variables of the first order. The measurement models of these nine first order latent variables present a reflective nature, totaling 37 indicators. The first-order constructs of BPO and its respective traits were adapted from the models validated by McCormack et al. (2003), Kohlbacher & Gruenwald (2011) and Willaert et al. (2007).

The Analytical Indicators construct, also reflective in nature, is represented in the model as a first-order latent construct comprising 9 indicators extracted from the BPO model and process maturity model developed by Lockamy & McCormack (2004), and are detailed in McCormack (2007).

Finally, the Organizational Performance construct, represented in the model as a second-order latent variable, consists of four first order constructs, also reflective in nature, with all its 15 indicators, was comprised of traits based on the four dimensions of performance that are traditionally developed on BSC models (Kaplan & Norton, 1992, 1996).

Both the first order latent variables and the measurements items for all these constructs are summarized on Charts 1, 2 and 3, on the Appendix A of this document.

4 Research design

4.1 Sampling design and large-scale data collection

In our study, the population consisted of small and medium companies from the industrial and commerce/services production sectors of the Brazilian economy. For the characterization of size, it was adopted the IBGE methodology (Brazilian Institute of Geography and Statistics), and that resonates with methodologies of research institutions in other countries: number of formal employees directly linked to the business and annual gross operating revenue.

The study's target population was a diverse group of small and medium organizations from various Brazilian States. A sample was defined using criteria of accessibility, and was extracted from companies linked to Fundação Dom Cabral (Dom Cabral Foundation - FDC), the largest school of corporate education in Brazil and Latin America, the 16th largest school for executive education and

business consulting worldwide and the first school for executive education in Latin America (Financial Times, 2013).

The use of key informants in research for obtaining organizational data is a widely used approach. Several pieces of research in organizations have relied on an approach based on key informants in order to capture the understanding of organizational functioning (Braunscheidel & Suresh, 2009; Cao & Zhang, 2011; Carr & Smeltzer, 1999; Carter & Jennings, 2002; Kiessling et al., 2012; Oliveira, 2009). Key informants are different from typical respondents to questionnaires. They are usually chosen for their formal position in the organization and their knowledge of key issues of the study, favoring the contribution of generalizations about behavior patterns and investigated organizational phenomena (Gupta et al., 2000; Kumar et al, 1993; Seidler, 1974).

Using a database of companies linked to executive education programs from the Fundação Dom Cabral, which included approximately 2200 companies, a pre-test was conducted to validate the instrument and generate an estimated standard deviation for the population, further used for sampling calculation. The pre-test was conducted with 35 companies, selected randomly from the FDC database.

Based on an analysis of standard deviation indices (obtained from a sum of indicators from each of the three constructs of the model), the parameter selected for final calculations in the sample was BPO since it had the standard deviation with greatest variance. The final size calculation for the sample involved specifying a confidence interval of 95% (z = 1.96), and a maximum sampling error of 3. The value of the error corresponded to a 2.34% range for BPO during the pre-test, which rose to 128 points. Based on parameters from Anderson et al. (2009) and considering the reliability and error estimates specified for the study, statistics from the pre-test identified a recommended sample size - a minimum of 448 cases.

Access to data involved face-to-face application of questionnaires. The questionnaire was developed based on the literature with structured questions based on the Likert five-point scale (Likert, 1932). A strategy to make data collection possible was to collect it during executive courses sponsored by the FDC. From August 2013 to January 2014, over several weeks of classroom courses of FDC executive education, participants were presented with the concepts and operational definitions of the variables in the model.

After 06 months of data collection, respondents from 476 companies had answered the questionnaire, surpassing the number of cases recommended in the sample planning (448 cases).Prior to calculating descriptive statistics, scale reliabilities were analyzed, combined with an analysis of missing data and outliers.

Prior to calculating descriptive statistics, scale reliabilities were analyzed, combined with an analysis of missing data and outliers. Reliability was assessed using Cronbach's alpha coefficient for the reflective constructs. Values exceeded 0.75 in all cases, suggesting reliability and convergent validity.

Regarding missing data, univariate tests showed that for seven organizations, the number of non-responses was higher than 10% of the total variables in the model. Given the importance of this percentage, we eliminated these 7 companies from the sample, reducing it to 469 cases. Due to their low percentage, the remaining cases with missing data were treated using substitutes of the median of the two points neighboring the variable without a response.

Results from outliers did not suggest a non-random pattern that would necessitate removal. The final sample of 469 cases was comprised of 286 smalland 178 medium companies. Five companies did not respond to questions regarding size. The highest percentage (62.5%) was comprised of organizations from the commerce/services sector (293 companies) and the remainder from the industrial sector (144). The final sample of 469 cases was comprised of 286 small and 178 medium companies, according to the analysis of the number of formal employees and annual gross operating revenue. Five companies did not respond to questions regarding size. According to the sector, the highest percentage (62.5%) was comprised of organizations from the commerce / services sector (293 companies) and the remainder from the industrial sector (144). Of all samples, a small percentage of companies (32 companies, 6.8%) did not report their business sector.

5 Results

5.1 Statistical description of the data and correlations: global sample

Bivariate correlations were used to describe relationships among constructs. Results suggest a strong and positive correlation between the model constructs. The strongest correlations were observed in the medium-sized group of companies, but in all cases they were statistically significant (p <0.01) All this information is consolidated in Table 1, below.

Means, standard deviations, and mean errors were calculated to compare small and medium companies from the sample. Mean scores for all constructs were higher in absolute terms for medium companies

(Table 2). This finding suggests a favorable situation for larger companies.

One purpose was to discover at what point differences in mean scores from the two groups (i.e., small and medium companies) were significant. To accomplish this, a t-test comparison of means was used, the results of which suggested rejection of the null hypothesis, that there are no differences between the means of groups ($p < 0.001$).

5.2 Test of the measurement models

Since all constructs were taken as reflective, the steps recommended by Hair et al. (2014) to evaluate measurement models were followed. To test internal consistency and reliability, composite reliabilities were estimated. All of them were satisfactory, with values between 0.6 and 0.95. To evaluate discriminant validity, both cross-loadings and the Fornell-Larcker method were used. Evaluating the cross-loading table, taking all indicators' outer loadings with the associated construct and comparing with the outer loadings on other constructs, all results showed discriminant validity. The Fornell-Larcker method was used to compare the square root values of AVEs for each reflective construct with latent variable

correlation scores, which suggested no problems regarding discriminant validity (Table 3).

The bootstrapping method was used to assess measurement models. Results from the t-tests showed that all relationships between manifest variables and latent constructs were valid ($p < 0.001$). Therefore, measurement models were validated, indicating that the manifest variables represented the constructs well. The specification of the structural research model rejects the null hypothesis of absence of statistically significant associations between the level of guidance to business processes, the use of analytical indicators and organizational performance for the sample companies. This null hypothesis was rejected at a high significance level (p-value < 0.001). This indicates a low probability of obtaining a data pattern, as found in this sample, if the null hypothesis was true. After access the measurement model, Table 4 shows results of structural model test, identifying direct effects among model constructs.

The values of coefficients of determination (R^2), obtained by multiple regression of the model variables, indicate that a substantial portion of the variations in the constructs of first and second order models can be explained by variations of covariates in such constructs. The two calculated extreme values related to the latent variable performance in two of its dimensions deserve mention: financial ($R^2 = 0.40$) and capacity in processes ($R^2 = 0.72$). Importantly, the data also indicates a substantial variation in the overall performance of the sample companies (47.50%). This can be explained by variations in the structural model covariates, that is, the dimensions of BPO and analytical indicators.

The Figure 1 summarizes the results of the structural model, identifying values for coefficients of determination and direct effects (paths) between

Table 1. Correlations among model constructs.

Correlation	Small Companies	Medium Companies
BPO⇔AI	0.712*	0.768*
AI⇔OP	0.584*	0.702*
BPO⇔OP	0.565*	0.747*

N = 469 cases. * All correlations significant at p<0.01 (2-tailed).
Source: Research data.

Table 2. Cross tabulation of scores obtained on the dimensions of the research model with respect to company size: small × medium companies.

Constructs	Company Size*	Cases	Mean	Standard Deviation	Mean Error	t-test	Sig. (2-tailed)
BPO	Small companies	286	106.0	28.1	1.7	-4.125	0.000
	Medium companies	178	117.2	28.5	2.1		
AI	Small companies	286	23.5	8.2	0.5	-4.583	0.000
	Medium companies	178	27.0	8.1	0.6		
OP	Small companies	286	47.4	11.1	0.7	-3.418	0.001
	Medium companies	178	50.8	10.3	0.8		

* Five companies in the sample did not report size. Source: Research data.

Table 3. Summary of the assessment of reflective measurement models.

2nd-order Construct	1st-order Construct	Composite Reliability	AVE	Discriminant Validity
BPO	Leadership and Strategy	0.8734	0.6341	Acceptable
	Process Documentation	0.9294	0.7672	Acceptable
	Measurement of Process Performance	0.9303	0.6905	Acceptable
	Organizational Structure	0.8671	0.6204	Acceptable
	Human Resources Management	0.8558	0.665	Acceptable
	Organizational Culture and Values	0.8977	0.6374	Acceptable
	Customer Orientation	0.8729	0.6961	Acceptable
	Supplier Orientation	0.926	0.7148	Acceptable
	Information Systems and Technology	0.934	0.8251	Acceptable
AI		0.9282	0.5903	Acceptable
OP	Financial Perspective	0.8943	0.8087	Acceptable
	Customer/Market Perspective	0.8978	0.6874	Acceptable
	Process Capacity Perspective	0.8936	0.6273	Acceptable
	Learning and Growth Perspective	0.8987	0.6895	Acceptable

Source: Research data.

Table 4. Bootstrapping and the test of the structural model: direct effects.

		Original Sample	Sample mean	Standard Deviations	Standard Error	T Statistic	p-value
BPO	→ Leadership and Strategy	0.7761	0.7771	0.0187	0.0187	41.5725	0.000
BPO	→ Process Documentation	0.7512	0.7504	0.0224	0.0224	33.6075	0.000
BPO	→ Measurement of Process Performance	0.8289	0.8292	0.0174	0.0174	47.6307	0.000
BPO	→ Organizational Structure	0.7908	0.7916	0.0174	0.0174	45.4670	0.000
BPO	→ Human Resources Management	0.7585	0.7600	0.0244	0.0244	31.0595	0.000
BPO	→ Organizational Culture and Values	0.8767	0.8771	0.0113	0.0113	77.6285	0.000
BPO	→ Customer Orientation	0.6813	0.6811	0.0279	0.0279	24.4149	0.000
BPO	→ Supplier Orientation	0.7107	0.7102	0.0255	0.0255	27.8869	0.000
BPO	→ Information Systems and Technology	0.6296	0.6299	0.0307	0.0307	20.5201	0.000
BPO	→ Performance	0.3497	0.3443	0.0576	0.0576	6.0661	0.000
AI	→ Performance	0.3882	0.3938	0.0553	0.0553	7.0229	0.000
OP	→ Financial Perspective	0.6365	0.6364	0.0303	0.0303	20.9849	0.000
OP	→ Customer/Market Perspective	0.8406	0.8406	0.0181	0.0181	46.4027	0.000
OP	→ Process Capacity Perspective	0.8529	0.8534	0.0159	0.0159	53.6547	0.000
OP	→ Learning and Growth Perspective	0.8040	0.8037	0.0197	0.0197	40.8704	0.000

Source: Research data.

the main model constructs and between those and the indicators.

Path coefficients (direct effects) can be classified generally at three levels of impact; values between zero and 0.3 are weak, 0.3 to 0.7 strong, and over 0.7 very strong. Data presented by average show very strong significance of direct effects in the structural theoretical model constructs. Furthermore, it is this data that refutes the null hypothesis of differences

between model path coefficients confronted the original sample and the samples generated by bootstrapping. In other words, the structural model was supported since relationships between constructs were proven to be significant, and the direct effects were confirmed by the *bootstrapping* statistic test.

To assess how well the structural research model fits the data collected, the Goodness of Fit – GoF test was employed. This index is useful in measuring
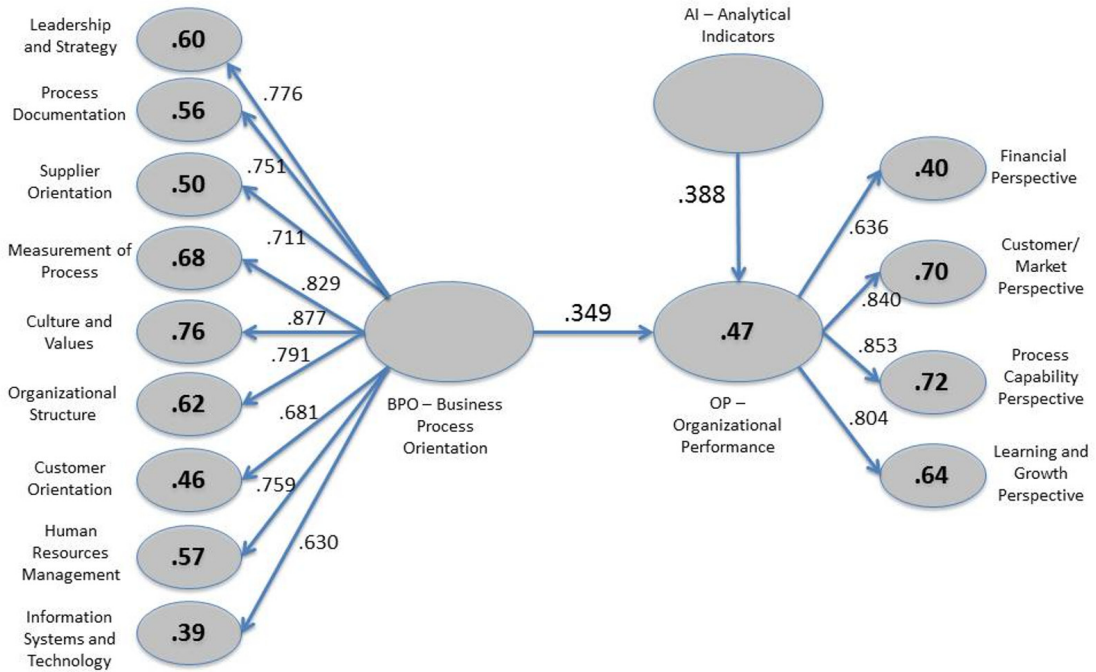
Figure 1. Structural Model Test (coefficients and path coefficients of determination): Global sample = 469 companies, including small and medium-sized organizations. Source: Research Data.

the fit of both measurement and structural modes (Vinzi et al., 2010). The GoF was calculated from the geometric mean of the commonalities and values were estimated for determining the coefficients of the model. In general, the GoF results lie between 0 and 1. Although no specific limits exist to discriminate weak, moderate and substantial value indices (relative to the overall fit of the model), conservative inferences allow show that the higher the GoF estimation, the better the model performance. As can be seen in the following Equation 1, the value of GoF estimated in the study was 0.61, indicating a good fit of the model to the data collected.

$$GoF = \sqrt{commonalities \text{ x } R^2}$$

(w1)

$$GoF = \sqrt{0.600071 \text{ x } 0.625479} = 0.612643$$

Finally, the f^2 *effect* test was employed, which produces additional information to that obtained by calculating the coefficients of determination (R^2) (Hair et al., 2014). The test allows for the omission of exogenous constructs of the model, one at a time, to identify whether they have or not a substantial impact on one or more endogenous constructs of the model (in the case of research, the performance). According Hair et al. (2014), for testing the f^2 effect, values between 0.02 and

0.15 may be taken as representative. Evaluating the f^2 effect, both BPO (0.103) and AC (0.128) were proven to influence OP.

6 Discussion and further analysis

This study's findings corroborate extant studies that purpose that both BPO and Analytical Capabilities can be taken to explain variance in organizational performance (Davenport, 2013; Klatt et al., 2011; Houy et al., 2010). The percentage of organizational performance variance that was explained by the companies of our structural model can be taken as very high (47,50%). This result has important implications from the perspective of consolidation of theories that seek to explain the effects of BPO and analytical approach to organizational performance. The result is equally relevant in a practical sense, as it allows companies to identify the best initiatives and management efforts necessary and that which can generate the greatest impact on organizational performance.

The two groups of companies in the sample (i.e., small and medium companies) were compared based on correlations among pairs of constructs i.e., (BPO *versus* Analytical Capabilities, BPO *versus* Organizational Performance, and Analytical Capabilities *versus* Organizational Performance). The strongest correlations (significant at p value <0.01) were found

in the group of medium-sized businesses, indicating that size is an important issue and should be taken as a moderator of the phenomena investigated in this study. Our analyzes indicate that the greater the size of the organization, the potentially higher are the BPO levels and the use of analytical indicators of these companies, and equally more significant the joint effects of these factors on organizational performance are.

Tests demonstrate disparities between groups (small and medium companies). The t-test comparison of means The T-test comparison of means refutes the null hypothesis (that there exist no differences between the averages of the two groups) to a very high level of significance (p value <0.001). This leads to a confident conclusion that there are statistically significant differences between the mean values found for the two groups. The more intensive use of analytical indicators and the degree of orientation to business processes, in the case of medium-sized companies (probably with concomitant higher levels of maturity of their processes), the stronger the effect on the performance of these organizations.

Examining direct effects among constructs in our study, the following evidences were identified (i) priority opportunities for management actions on the part of the investigated companies, (ii) priority opportunities for the development of scientific research on the subject of the research:

- Organizational Culture and Values: In this investigation, direct effects of BPO on cultural/value aspects were greatest among all relationships reflected by BPO; the coefficient of determination was highest among all the factors in the model. Results demonstrate that effects related to dissemination of values and of a culture of processes for organizational performance are important. This requires deliberate action and strategy by managers, promoting recognition of the importance of processes to all company employees, contributions that each process offers in providing value to an organization's customers, how various business processes interrelate, and how they are affected by the experiences of individual and group work (Kohlbacher & Gruenwald, 2011; Willaert et al., 2007; Mertens et al., 2011).

- Performance Measures: Assuring alignment between strategic business objectives and performance of organizational processes is an important for the competitiveness of companies.

Yet, in addition it represents a condition that in order to be addressed, demands improvements in measurement systems, and at times requires continuous evaluation of the quality of an organization's metric system (Hammer, 2007b; Ndede-Amadi, 2004). In our study, the direct effect of BPO on process performance and the coefficient of determination obtained from the regression reinforce the perception of the importance of a culture of measurement addressed by BPO assumptions. In particular, the need for organizations to develop measurement systems with multiple measures that reflect the scope of business objectives, and can serve the interests of the various stakeholders that are directly linked to the business (Sidorova & Isik, 2010; Yen, 2009).

- Process Documentation: Business processes must be duly specified so they can be executed correctly (Kohlbacher & Gruenwald, 2011; Hammer, 2007a; McCormack et al., 2003). In this study, the direct effects of BPO on process documentation and the percentage variance for this factor in the function of BPO were expressive.

- Information Systems and Technology: Effective integration of the physical and information flow in business processes, which are essentially inter-functional, increasingly depend on employing new information technologies. Our results suggest that the magnitude of the direct effect on the relationship between BPO and information systems and technology is significant, as well as the percentage of variance as a function of latent variable BPO in the structural model. These effects are understandable; for the greater part of organizations in the sample, IT had been effective at promoting integration of data from various organizational functions, making rapid access to data on process performance available in real time and supporting implementation of strategies.

- Customer and Supplier Orientation: BPO implementation and practices are not circumscribed within intra-organizational limits. Our findings suggest that the direct effects between BPO and both customer orientation and supplier orientation are quite important, just as the proportion of the variance of these factors as a result of the BPO latent variable in the structural model.

- Organizational Performance: Companies frequently find it difficult to define what to measure and how to measure what they need to measure (i.e., which key performance indicators and metrics, respectively) to implement strategies (Cokins, 2010). BSC dimensions (construct dependent on the structural model of this research) are useful when balancing performance areas critical to an organization, regardless of the size and sector of the activity (Sundin et al., 2010; Kaplan & Norton, 1992, 1996).

This study confirms the substantial effects of BPO and Analytical Indicators regressors on the four reflective factors that comprise the performance construct: process capabilities, customers/markets, learning/growth and financial perspective. Particularly, the financial perspective showed an effect that despite being expressive was lowest when compared to the other effects on the performance construct. All effects were considered significant at p-value <0.0001, that is, one can say with statistical confidence that the probability that these effects have occurred by chance is virtually nil.

The research findings support all five hypotheses of this study, at high level of significance (p < 0.01):

- BPO and Organizational Performance (Hypothesis1): indicating that the more process oriented a firm is the better the organizational performance in the studied dimensions (market, financial, learning and capabilities in process).

- BPO and Analytical Indicators (Hypothesis2): indicating a strong positive association between business process orientation and the use of analytical indicators by companies.

- Analytical Indicators and Organizational Performance (Hypothesis3): indicating that the greater the use of analytical indicators by companies, the better their organizational performance.

- BPO, Analytical Indicators and Organizational Performance (Hypothesis 4): business process orientation and analytical indicators have a synergistic impact and explained a considerable portion of organizational performance variance.

- The effects of BPO and analytical indicators over organizational performance were influenced by company size, as this moderator variable altered the strength of the relationships between those constructs (Hypothesis 5).

7 Limitations, future research and conclusions

The findings of this study support validation of our conceptual model and statistical tests demonstrate positive effects of processes orientation and analytical capabilities over organizational performance. The study identifies another important difference between small and medium companies, with a high level of statistical significance, showing that size can be an important moderating variable in the relationship between the studied constructs.

Although the sample were composed of a heterogeneous set of companies, Although the sample were composed of a heterogeneous set of companies, we recognize that other variables, yet not directly considered in this study, are sufficiently important to be considered in future studies. The type and degree of complexity of production of goods and services; the level of customization of products; the patterns of demand; the production strategies; the business rules and others factors cannot be ignored in their relevance to the problem addressed in this research. Therefore, a detailed examination of the importance of these factors to the relationships investigated in this study will be of value in future studies on the topic.

A relevant study in this sense, would be focused on describing the extent to which production strategies and business demand patterns affect interest in the implementation of an approach to processes or the use of analytical processes in conducting of business. In this sense, further studies may identify the existence of differences with regards to the importance and the parameters for the implementation of BPO and analytical approaches when presented with companies with production strategies in *make to stock* environments and business models operated in other conditions (for example, in make to order and engineering to order regimes). There are critical success factors in these implementations, and it would also be useful to recognize the extent to which these factors are the same, for such different business models.

Although our model regressors explained a considerable portion of performance variance, other independent variables and moderators were not considered in this study. Besides this, Another limitation is related to our exclusive dependence on quantitative tests to evaluate the relationships between the latent variables of the model, or the fact that data were collected from key informants selected by a criterion of accessibility, constituting a non-probabilistic sample.

All of these limitations are important; they adjust beneficially the scope of the study's results and make

projections and contributions restricted in some way. However,, due to the relevance of the questions and methodological rigor in work, findings are robust, reinforce theoretical knowledge accumulated on the topic, and have a potential influence on the scope of companies' management decisions. The results demonstrate the benefits obtained when organizations seek to improve simultaneously and in a synergistic way their business process orientation and their analytical capabilities, making them more assertive in their strategic planning and support of decisions – of operational or strategic nature - affecting their performance and competitiveness at the present time, but also affecting the critical results that may influence their survival in the future.

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Appendix A. Measurement model indicators.

Chart 1. BPO: latent variables and items.

2nd-order Construct	1st-order Construct	Items/Indicators
BPO	Leadership and Strategy	• Results aligned with the planned strategy. • Management committed to process improvement. • Strategies communicated throughout entire organization. • Effectiveness of strategic planning.
	Process documentation	• Level of process documentation—basic and advanced. • Definition and documentation of responsibilities for processes and tasks. • Existence of a formal and standardized method for mapping processes. • Existence of a formal and standardized method for new process design.
	Measurement of process performance	• Degree of development of performance indicators for processes. • Degree of implementation of performance goals for processes. • Usability of performance results to continuously improve processes. • Degree of alignment of process metrics with organizational strategies. • Governance on process measurement efforts • Changing processes metrics.
	Organizational structure	• Degree of integration of physical and information flows among departments. • Effectiveness of coordination of interdepartmental activities. • Formal presence in the organizational chart of the manager (owner) of the processes. • Formal inclusion in organizational chart of the office or manager responsible for managing process improvements.
	Human Resources Management	• Training organization's collaborators on process management. • Training organization's collaborators to change or implement new processes in the organization. • Degree of autonomy and responsibility of collaborators in decision-making.
	Organizational Culture and Values	• Valuing of culture of processes in the organization. • Effort to align the processes goals among functional areas. • Effectiveness in managing interdepartmental conflicts. • Frequency of meetings dedicated exclusively to the goals of process enhancement. • Clear vision of collaborators regarding the company's structural model (functional- versus process-oriented)
	Customer Orientation	• Centrality of customer in company business model. • Goods and services produced to meet customer expectations • Intensive use of customer feedback to improve quality of products and processes.
	Supplier Orientation	• Interest in developing programs to improve relationships with suppliers. • Effective integration of physical and information flows with suppliers. • Sharing information related to processes changes among contracted organizations. • CPFR initiatives. • Creation of formal teams comprised of contractors and contracted members to manage speed improvements of supply processes.
	Information Systems and Technology	• Data integration coming from various organizational areas. • Use of information systems to support and facilitate improvements to business processes. • Data accessible and reliable.

Source: The authors.

Chart 2. Analytical Indicators: latent variables and items.

1st-order Construct	Items/Indicators
Analytical Capabilities	• Evaluation of business profitability by segment of customers served. • Recognition of the demand patterns for company products. • Use of mathematical methods and statistical models to predict demand. • Strategic actions based on client demands. • Strategic actions based on customer profiles/customer segment. • Reliability of prediction methods used by the company. • Effectiveness of production planning and control (PPP) regarding business profitability goals. • Simulation of financial and operational impact of future changes on production programming. • Monitoring and analysis of forecasting errors.

Source: The authors.

Chart 3. Organizational performance: latent variables and items.

2nd-order Construct	1st-order Construct	Items/Indicators
Organizational Performance	Financial perspective	• Financial result: profitability and increased revenue in recent years. • Financial result: cost reduction in the last two years.
	Customer/Market perspective	• Efficiency in customer loyalty. • Efficiency in attracting new customers. • Evolution of company's market share. • Customer satisfaction.
	Process Capacity perspective	• Consistency in meeting promised delivery deadlines. • Reduction in time to service orders. • Reduction in time to develop new products. • Efficiency in managing inter-organizational processes with suppliers. • Efficiency in managing inter-organizational processes with customers.
	Learning and Growth perspective	• Percentage of employees with growth potential for process management capabilities. • Labor force commitment to reach process performance goals. • Advance in knowledge regarding process management among functional leaders or processes in the organization. • Labor force competencies in process management.

Source: The authors.