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ISO 14001 certification in Brazil: motivations and benefits

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Abstract

Why do firms seek the ISO 14001 certification? This study presents a survey with 63 Brazilian companies from the chemical, mechanical and electronic industries. A Structural Equations Model (SEM) analyzed the relations between motivations and benefits related to the certification. An exploratory factor analysis identified four sources of motivation: reaction to pressures from the external stakeholders; proaction in expectation of future business concerns; legal concerns; and internal influences. Four dimensions characterized the benefits of an ISO 14001 certification: operational changes; financial impacts; relationship with business stakeholders (customers, competitors, suppliers); and relationship with societal stakeholders (government, society and NGOs). The motivations appear in two levels. Internal and legal motivations are the first level (antecedents), while reactive and proactive motivations are second level (consequents). Internal motivations explain reactive and proactive motivations and production benefits. Legal motivations explain proactive motivations, financial benefits, and benefits in relationships with societal stakeholders.

Keywords: Sustainability; Environmental management systems; ISO 14001; Brazil

1. Introduction

In 1996, the International Organization for Standardization introduced the ISO 14000 series of global standards of voluntary procedures that companies should adopt in their environmental management systems (EMS). The initial reaction to these standards was lukewarm at best: In 1999, three years since its inception, the number of sites ISO 14001 certified was about 10,000 worldwide. However, by 2002 there were over 46,000 and by 2005 there were more than 88,000 certified sites around the world; that is almost 100% growth in 3 years.[1] Most of the certifications have occurred in developed countries. After a slow start, the number of certifications in emerging nations is increasing at a pace greater than 100% per year, and already accounts for more than 20% of all certifications today.

The motivation for this rapid growth in ISO 14001 certification is not clear. Morrow and Rondinelli [1] observed that German energy and gas firms implemented EMS in order to improve regulatory compliance, develop environmental documentation of their processes and to increase efficiency. Andrews et al. [2,3] identified the North American companies' environmental behavior based on six dimensions: Environmental Performance, Regulatory Compliance, Economic Performance (costs and benefits), Implementation of Pollution Prevention, Interested Party Involvement, and Environmental Condition Indicators.

Some anecdotal evidence shows that regulatory compliance is a less pressing issue in emerging nations than it is in most developed nations. However, some corporations in emerging markets have realized that it could be to their advantage to maintain higher standards of environmental compliance to enjoy better business opportunities. This can be observed in Brazil, the fourth-ranked emerging economy according to

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[1] Source: http://www.ecology.or.jp/isoworld/english/analy14k.htm

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the number of certified environmental management systems in 2002. The number of certifications tripled in that year, which motivated this survey. Our study was designed to identify the main drivers and the consequences of ISO 14001 certification, as perceived by Brazilian companies. Ammenberg and Sundin [4] produced a similar study analyzing ISO 14001 adoption in an industrialized economy. However, studies proposing causal connections between motivations and benefits of the EMS certification are rare. Thus, this study helps to fill this void by analyzing the relationship between corporate motivations and the effects and benefits associated with ISO 14001 implementation in companies in Brazil.

In the following sections, we discuss the related literature grouped in three main subjects: Strategies of Environmental Operations, Environmental Capabilities and ISO 14000-Based EMS.

1.1. Strategies of environmental operations

Klassen and Whybark [5] proposed a typology of three operation management approaches that companies have been using to address environmental impacts: pollution prevention, environmental management systems and pollution control. In this context, the mission of operations is to translate the respective operational approach into eco-efficient capabilities. Klassen and Whybark [5,6] called these capabilities the *environmental operations technologies*. They developed a taxonomy of three managerial orientations that affect the corporate environmental policies: obedience, opportunism and leadership. These frameworks are neither mutually exclusive nor redundant. One classifies these policies focusing on the technologies adopted and the other classifies them based on the motivation of the firms, but both can be analyzed empirically.

- *Pollution controls* are the structural investments made to deal with process emissions after they have been generated. They do not always reduce the amount of pollutants that are released or discarded by the site, but they reduce the risk associated with them [5]. Using quality management as a reference, pollution control is the equivalent to adopting end-product inspection as the basis for the quality management system: defects are not avoided, but they are not released to the market either. Likewise, the use of pollution controls does not improve the process and it does not eliminate pollution, but it may prevent the pollution from affecting the surrounding environment. Pollution controls are often costly and bring no direct benefits to the operation.
- *Pollution prevention* requires structural investments that involve changing the operation, improving the environmental performance of the final product and throughout the production process. This combination may generate significant economic benefits for the company by finding and eliminating or reducing the sources of environmental impact, which may be related to avoidable process losses and energy and material's inefficiencies.
- *Environmental management systems* (*EMS*) are infrastructural investments made in a collection of operational procedures designed to reduce the generation of wastes; to prevent the generation of waste caused by accidents; and to safely and effectively manage non-conforming amounts of waste. EMS may include the formalization of operating processes, cross-functional coordination, involvement of stakeholders, monitoring, internal and external disclosure of results, training, certification, and other activities related to the environmental impact of the organization [5]. The International Organization for Standardization (ISO) first introduced ISO 14001 in 1996, and the current version of the standard was updated in 2004.

Hart [7] indicated that pollution prevention is the environmental equivalent to total quality management (TQM). Both types of program are designed to eliminate losses and wastes in the whole process: total quality management strives to reduce material losses associated with poor production, pollution prevention includes redesigning the products and processes to reduce the generation of waste and to reduce risks from the entire life cycle of the production and products. Pollution prevention programs associate pollution with losses in the form of excessive materials and energy consumed in the process. Hence, the resources and capabilities that a firm develops in the introduction of a quality management system such as TQM might be useful and supportive in the adoption of a pollution prevention program.

Angell and Klassen [8] suggest that there are two environmental strategy perspectives: *external constraint* and *operational component*. Firms that treat the environment as an external constraint will make environmental decisions independently of the operational decisions. Since decisions made separately are locally optimized, it is unlikely that they are also globally optimal. In fact, we believe that environmental decisions that are made without considering their impact in the operations will generally be more costly, since only by chance may they bring operational benefits. Firms that treat the environment as an operational component recognize them as legitimate operational factors that must be integrated in all operational decisions. In this case, opportunities for process improvement and cost reduction may be uncovered when the firm adopts environmentally friendly process changes. Angell and Klassen [8] indicated that sustainable operations decisions might be structured in the same fashion as the manufacturing decision categories of Wheelwright [9] and Wheelwright and Hayes [10]. The operational decision-making model is sufficiently robust to incorporate the new sustainability concerns into the manufacturing strategy framework. The environmental concerns affect all areas of operations management, reinforcing the coherence of the operational component perspective.

St. John et al. [11] proposed environmental responsibility and natural resource limitations as some of the main drivers of change in today's manufacturing strategy. Many authors have conjectured that it is possible to combine environmental

and economic sustainability. Therefore, a company may be competitive at the same time it protects the natural resources [7,11–13]. This dual objective has proven to be an elusive target to most managers [5,14,15]. We believe that the company may secure competitive benefits with the environmental capabilities that result from its competitive choices: we hypothesize that the motivations for EMS certification can explain the benefits that a company obtains from it.

1.2. Environmental capabilities

Many authors have stated that a manufacturing organization should determine the competitive alternatives that would best contribute to achieve superior performance. Porter [16,17] indicated that the source of superior performance in competitive markets is the competitive advantage of the firm. He stated that strategic choices are determined by the industry's attractiveness and the firm's competitive position within the industry. However, the competitive advantage derives from the value that a company can generate to its customers. Therefore, industrial attractiveness per se is not sufficient to explain a firm's performance. In fact, Grant [18] showed that there is greater performance variance among the companies within industries than across industries. Consequently, the source of competitive advantage lies in the firm's resources rather than in the industry's attractiveness. The firm's resources should be coordinated to raise barriers to entry, improve bargaining power with customers and suppliers, prevent the introduction of substitutes, and manage the competitive process.

Generally, we consider resources as the internal elements that make up the firm. Hart [7] proposed that natural resources should not be considered part of a firm's resources: they are contingencies, because they are not connected to the firm, but to the wider environment to which the firm belongs. Access to natural resources, however, is one of the firm's resources, as is the firm's reputation for making good use of the environment. Grant [18] stated that the main objective of formulating a resource utilization strategy is to maximize the revenues generated by these resources. Resources themselves do not generate revenue until they are utilized. However, different applications of these resources may generate different returns and different levels of risk. An organization can generate earnings from the utilization of its portfolio of resources, coordinated by a complex pattern of organizational routines, applied to the operational capabilities of the organization [18,19].

The strategic capabilities of a firm make up the outcome of the coordinated use of resources; the goods and services offered by a firm exist because of this set of capabilities. They are the visible results of resource utilization. Hence, if the firm's products become obsolete, the same may occur with its capabilities. Therefore, the strategic capabilities are the source of competitive advantage of the firm [18,20].

Sharma and Vredenburg [21] proposed a framework for environmental capabilities based on a study of the Canadian oil and gas industry. These capabilities included *stakeholder involvement*, *continuous high-order learning*, and *continuous innovation*, which are in agreement with concepts proposed by Hart [7] and others. We define them as follows:

- *Stakeholder involvement* is the ability to establish long-term relations with stakeholders, such as local community leaders, environmental groups, non-governmental organizations (NGO), the media and regulators.
- *Continuous high-order learning* is the ability to exploit the challenges presented by the deployment of environmental strategies as an opportunity for additional learning about the business and its operational processes [21].
- *Continuous innovation, or improvement,* is the ability to continuously generate a stream of innovations, including new products, product updates and new processes. We propose that the *leadership in regulatory compliance* is another environmental capability that should be considered.

Internal capabilities alone, however, are not enough to explain the environmental strategy of the firm: external drivers are also important aspects. Andrews et al. [2,3] identified the seven top motivations for EMS adoption: environmental performance improvement, regulatory compliance, cost reduction, consistency with the firm's principles, competitive advantage, regulatory benefits expectation, and employee participation. Of those, two drivers refer to external issues and are associated with the regulatory system.

1.3. ISO 14001-based environmental management systems

ISO 14000 is the family of management standards created by the International Organization for Standardization (ISO) to guide managers in the development of best practices of environmentally conscious policies and practices. Adoption of ISO 14001, the EMS standard, is the only one that can be certified. The series also includes ISO 14011 (guidelines for auditing an EMS with regard to its conformance to ISO 14001), the ISO 14040 series (guidelines for performing life-cycle assessments) and others. The Organization states (Source: www.iso.org):

> *The whole ISO 14000 family provides management tools for organizations to control their environmental aspects and to improve their environmental performance. Together, these tools can provide significant tangible economic benefits, including:*

- *reduced raw material/resource use;*
- *reduced energy consumption;*
- *improved process efficiency;*
- *reduced waste generation and disposal costs, and*
- *utilization of recoverable resources.*

Of course, associated with each of these economic benefits are distinct environmental benefits too. This is the contribution that the ISO 14000 series makes to the environmental and economic components of sustainable development…

The International Organization for Standardization defines environmental management systems, and the role played by ISO 14001:

An Environmental Management System (EMS) is a structured approach to addressing the environmental bottom line. ISO 14001 is the world's most recognized EMS framework … that helps organizations both to manage better the impact of their activities on the environment and to demonstrate sound environmental management.

Some studies, like Babakri et al. [22] evaluated the recycling performance of firms after ISO 14000 adoption. Babakri et al. [23] also analyzed the critical factors for adoption of the system in the US. This type of study is still rare in emerging economies.

We selected ISO 14001 as the certification standard in our study because it provides a standard language adopted by all environmental managers that we surveyed. Not surprisingly, we found that all firms in the study had well-developed environmental policies prior to its adoption. However, their strategies varied significantly between the three strategies proposed by Angell and Klassen [8]. Although it is not common to use ISO 14001 certification as a proxy for strategic environmental decisions, nor was ISO certification intended to be used in this fashion, there are theoretical propositions that help the company to integrating its efforts to obtain certification with its environmental strategy [24].

2. Method

The questionnaire was based on the concepts identified in the literature. Environmental managers from three sites, one from a petrochemical firm and two from mechanical fabrication companies, analyzed the first version of the questionnaire to validate it in the original Portuguese language. All three sites where they worked, respectively, were subject to intense environmental risk.

At the time of the study, there were 182 sites in the chemical, mechanical and electronics industry with ISO 14001 certification. They were initially contacted by phone, and 130 sites were identified as appropriate and willing to participate. The questionnaires were sent by e-mail to the manager responsible for environmental protection and control. This respondent was chosen because it could link top management ideas and strategy with the environmental practices (or capabilities) in the site. We received 63 usable responses, achieving a response rate of 48.5%. The high response rate possibly had multiple causes. One is related to the social exchange during the field research [25]. The second cause was the multiple ways of receiving and replying to the survey, as proposed by Klassen and Jacobs [26]. Thirdly, the companies seemed to be quite open and frank about their environmental practices, without concern for protection of proprietary knowledge, market gains or potential liabilities.

We analyzed the data using Principal Components Analysis (PCA) with Varimax rotation to assess the construct validity. Internal reliability was assessed using Cronbach-α. Each set of items belonging to the same dimension was then reduced to a summated scale by means of a weighted-average score of their values. The scale was purified, according to the procedure proposed by Churchill [27]. We entered the scales in a path analysis model. We selected path analysis to exploit the holistic and systemic features in the technique, despite sample size limitation. The path analysis provides the appropriate and most efficient estimation technique for a series of separate multiple regression equations estimated simultaneously [28].

The sample size was lower than the suggested ten-to-one ratio to variables in the PCA, and below the 100 cases generally suggested as minimum for path analysis. However, the 7.8:1 ratio well exceeds the minimum level at which Kline [29] states that stability would be problematic, at 5:1. Monte Carlo studies analyzing sample size variation and its influence on goodness-of-fit measures showed that some measures – such as adjusted goodness-of-fit index (AGFI) – are sensitive to incremental changes in the sample sizes. Consequently, one must be careful generalizing these results, and recognize that this is an exploratory research for the basic understanding of the motivation behind the ISO 14001 certification.

2.1. Sample profile

The firms in our sample were distributed as follows: 70.8% of large sites (more than 500 employees), 20.9% of medium sites (100–500 employees), and 8.3% of small sites (less than 100 employees). Most of the sites in the sample were market leaders: 62% declared being the first or second largest player in their respective markets. Similarly, the majority of the sites in the sample (71.0%) belonged to *multinational corporations* (MNCs). The remainder were distributed as *private*[2] sites (17.7%) or state- or partially *state-owned* sites (11.1%).

We asked the respondent which market was targeted by their products. Using a six-point scale (from "not a customer" to "main customer"), the majority reported that MNCs (59.0%) and private companies (51.0%) were among their main customers, followed by the *export market* indicated by 40% of respondents. A large number of respondents indicated that state-owned companies (43.5%) and private companies (25%) were not among their customers.

[2] In this paper, we call "private" the Brazilian companies that are not owned by the state. They may or may not have shares negotiated in the stock exchange.

This response suggests that if customers are drivers for certification, this pressure is more intense from the international market.

We probed the age of the structural investments in the site, measured by the plant age and the time since the last plant update [5,6]. We found that, although the plants were not new (only 25% of the plants under 17 years-old), 75% of respondents reported plant updates in the last 4 years.

Regarding quality policies, 95.2% of the companies reported having ISO 9000 certifications. The quality certification was, on average 3.88, years older than ISO 14001 certification, suggesting that their ISO 9000 capabilities may have helped the companies to obtain their ISO 14001 certification.

2.2. Scale construction

We propose two scales in this study: one for motivations and another for benefits. The motivations to obtain the ISO 14001 certification comprises the antecedents that influenced the decision makers to seek the EMS certification. The benefits scale is related to the capabilities enhanced or created by the certification process. The benefits may also include performance improvements obtained from those capabilities. A summary and a description of the dimensions can be found in Table 1.

The scale validation and the reliability study of the proposed dimensions are presented in Tables 2 and 3 (see Appendix). An approximate translation from Portuguese of the questions in the survey can be found in the same tables.

2.3. Path analysis

The proposed path analysis identified four dimensions of motivations within two levels, explaining the four dimensions of perceived benefits for the company. In this model, internal and legal motivations are the lower level motivations. Internal motivations explain reactive motivations and perceived productivity benefits. Legal motivations explain proactive motivations, financial benefits and societal benefits. This finding opens a new perspective on the reactive/proactive debate. Until now, environmental strategies were taken as either reactive or proactive [21,30]. The relationship between both motivations was tested and no significant result was found. We found no empirical evidence that reactive or proactive corporate environmental strategies are correlated. According to the respondents' answers to our survey, the firm may have both types of motivations, with different intensities. The intensity of these motivations is explained by their legal and internal motivations.

Reactive and proactive motivations explain other perceived benefits. Proactive motivations explain perceived market benefits, while legal motivations join both reactive and proactive motivations to explain perceived financial benefits. Notice that proactive motivations have an inverse relationship with the financial perceived benefits, suggesting that companies in the sample that have high scores on proactive motivations and low scores on reactive motivations tend to perceive less financial benefits from the certification and maybe from the whole EMS. A possible explanation for this result is that

Table 1
Motivation and benefit dimensions of ISO 14001 certification

Name	Description	Definition	Reference
AREATIVO	Reactive motivations	The site seeks an ISO 14001 certification in reaction to an external situation.	Angell and Klassen [8] Klassen and Whybark [6] Azzone and Noci [30]
AINTERNO	Internal motivations	Internal variables influence the site to obtain ISO 14001 certification.	Angell and Klassen [8]
APROATV	Proactive motivations	The site seeks a certification to prevent potential problems with external stakeholders.	Angell and Klassen [8] Klassen and Whybark [6] Azzone and Noci [30] Sharma and Vredenburg [21]
ALEGAL	Legal motivations	The site seeks a certification to help comply with current or future regulations.	Angell and Klassen [8] Klassen and Whybark [6] Azzone and Noci [30]
BPROD	Productivity benefits	Perceived productivity benefits, from the operations perspective.	Angell and Klassen [8]
BFINC	Financial benefits	Perceived financial benefits derived from the ISO 14001 certification.	Hart [13] Porter and Van der Linde [12] Melnyk et al. [14,15]
BMACRO	Societal benefits	Perceived benefits in the relationship with external stakeholders (government and society).	Angell and Klassen [8] Ammenberg and Sundin [4]
BIMED	Market benefits	Perceived benefits in the relationship with business relations (customers, competitors and suppliers).	Hart [13] Porter and Van der Linde [12] Ammenberg and Sundin [4]

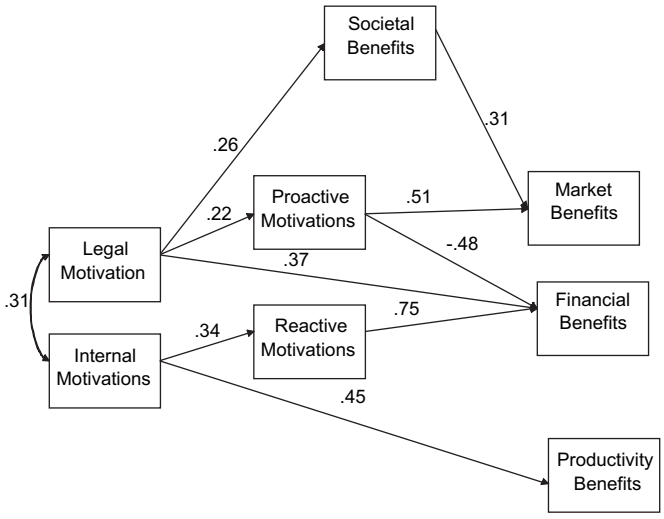

Fig. 1. Path analysis graphical representation.

higher levels of proactiveness may lead to a higher level of expected benefits.

Other relevant observation is that perceived societal benefits explain perceived market benefits. We believe that this causal relationship occur because companies with better relationships with government and non-governmental organizations also enjoy better relationships with customers, suppliers and competitors. These aspects may improve the firm's competitive advantage.

Fig. 1 shows a graphical representation of these causal relationships, indicating the regression and covariate estimates. The parameter estimates, standard errors (S.E.), critical ratios (C.R.) and *P*-values appear in Table 4, and finally the model summary and fit measures can be fount at Table 5 (see Appendix). The results show all the measures of goodness-of-fit at acceptable levels. Chi-squared equals to 12.83 ($p < 0.80$) and all goodness-of-fit measures (GFI, AGFI, CFI and NFI) value above 0.90 and are at the expected levels [28]. Other rival models were considered but the proposed model presented the best fit.

3. Limitations and future research propositions

One clear limitation of this study is the small sample size. Due to the small number of certified sites in the target industries in Brazil at the time of the data collection, and considering the absence of a centralized database with the list of certified sites, we were forced to work with just the 63 cases in our sample, which is fewer than the recommended minimum for data analyses. Future studies with larger samples will allow better generalization of results.

More important is the sample bias: we surveyed only ISO 14001-certified sites. Despite the advantage gained with a homogeneous sample that can be surveyed with a specific questionnaire, it raises questions regarding the management system bias. Future research could address this problem designing a questionnaire appropriate to survey two parallel samples, made of sites with and without ISO 14001 certification. This would help to understand the business strategies under different approaches to environmental management systems.

Another limitation of this study is the focus in sites of a single country. It is possible that some macroeconomic or cultural bias influenced the results, given that the Brazilian economy is very dependent of the export market, and our results showed that our respondents are very active in the international market. Future research involving other countries with distinct levels of international dependence may bring new insights and consistent explanations on the implications of the EMS to the corporate and manufacturing/operations strategy.

Finally, the survey was aimed at the environmental manager in the certified sites. The inclusion of other respondents, such as chief executives and board members, might bring another perspective on the impacts of the environmental management systems on the companies' corporate and manufacturing strategies.

4. Conclusions

This study sought to analyze the relationship between operations management, operations strategy and environmental management. Two main concepts were explored: the motivations for ISO 14001 certification and perceived benefits enjoyed with the certification.

The motivations were divided in four dimensions: internal, legal, reactive and proactive. Causal analysis showed that those motivations may be divided in two levels: internal and legal, at the lower level, and reactive and proactive at the top level, explained by the lower level motivations. The analysis also showed that reactive and proactive motivations were not correlated, indicating that both motivations may be present independently in the same organizations.

The analysis showed that the perceived benefits may be divided in two major groups: internal and external. Internal benefits are related to the financial performance and the productivity. External benefits are related to the relationship with stakeholders belonging to the societal and to the competitive environment. Internal motivations presented strong relationship with the perceived internal benefits and legal motivations. Societal benefits – better relationship with government, NGOs and other members in the society – presented a positive influence in the relationships with other members of the competitive environment – customers, suppliers and competitors.

The results also brought some initial insights about the relationship between the environmental management and operations strategy, suggesting that environmental management is not clearly connected to the operations strategy in the sampled organizations.

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Appendix

Table 2
Scale validation and reliability – motivations

	Factor			
	AREATIVO	ALEGAL	AINTERNO	APROATV
A16 To obtain technical support from public institutions	*0.861*	0.173	0.232	−0.056
A20 In response to a demand from government environmental agencies	*0.841*	0.034	0.031	0.130
A15 To obtain fiscal benefits	*0.827*	0.006	0.358	−0.191
A19 In response to demands from environmental protection groups	*0.827*	0.144	−0.029	0.026
A14 To gain access to reduced interest rates	*0.818*	0.081	0.366	−0.169
A21 In response to demands from suppliers	*0.733*	0.315	−0.053	0.149
A24 In response to demands from class associations	*0.665*	0.221	0.023	0.027
A22 To reach the competitors' performance level	*0.653*	−0.019	−0.115	0.254
A18 In response to demands from customers	*0.512*	−0.140	−0.199	0.264
A21 To improve the environmental performance	−0.136	*0.760*	0.350	−0.047
A26 To enhance process and product environmental innovation	0.198	*0.733*	−0.030	−0.009
A3 To motivate employees	0.319	*0.691*	0.072	0.131
A25 In response to internal decision in the site	0.028	*0.649*	0.196	0.053
A2 To identify better uses of energy sources	−0.012	*0.645*	0.208	−0.049
A13 To obtain production cost reductions	0.278	*0.595*	0.208	0.002
A6 To improve compliance with environmental regulations	0.010	0.373	*0.801*	0.148
A10 To reduce the risk of environmental liabilities	0.006	0.166	*0.738*	0.136
A8 To protect against changes in the environmental legislation	0.006	0.147	*0.709*	0.128
A9 To comply with the current environmental law	0.316	0.212	*0.687*	0.142
A23 To anticipate competitors' actions	0.118	−0.085	0.027	*0.826*
A5 To improve company image with customers	0.033	−0.055	0.349	*0.813*
A4 To improve company image with society in general	0.048	0.304	0.258	*0.702*
%Variance	30.66	16.36	9.99	6.70
Cumulative %Variance	30.66	47.02	57.01	63.70
Eigenvalue	6.75	3.60	2.20	1.47
Cronbach-α	0.9044	0.8150	0.7765	0.7109

Table 3
Scale validation and reliability – benefits

	Factor			
	BPROD	BFINC	BMACRO	BIMED
B7 Resource usage reduction: energy	*0.886*	−0.019	−0.169	0.028
B8 Resource usage reduction: raw material	*0.865*	−0.044	0.044	0.104
B9 Resource usage reduction: water	*0.827*	−0.003	−0.168	0.061
B12 Optimization of process flows	*0.777*	0.107	0.083	−0.040
B15 Production costs reduction	*0.745*	0.074	0.098	−0.056
B6 Better employee motivation	*0.515*	0.183	0.216	0.205
B19 Opportunity to obtain investment funds from governmental organizations	−0.007	*0.935*	−0.021	0.087
B17 Access to special credit, with reduced interest rates	0.056	*0.927*	−0.018	0.180
B18 Reduction of insurance premia	0.139	*0.760*	0.332	−0.105
B4 Improved corporate image for the society in general	−0.036	−0.094	*0.773*	0.066
B3 Reduced environmental liability	−0.077	0.119	*0.745*	−0.031
B13 Improved cooperation from environmental authorities	0.229	0.245	*0.694*	0.273
B16 Competitive advantages	−0.025	−0.041	−0.098	*0.832*
B14 Positive effects on the market and with the customers	−0.055	0.066	0.212	*0.799*
B11 Opportunity to set the example for suppliers	0.312	0.190	0.126	*0.610*
%Variance	27.51	18.27	11.74	10.14
Cumulative %Variance	27.51	45.79	57.52	67.66
Eigenvalue	4.13	2.74	1.76	1.52
Cronbach's Alpha	0.8635	0.8534	*0.5751*	0.6387

Table 4
Parameter estimates

	Regression weights			
	Estimate	S.E.	C.R.	*P*-value
BMACRO ← ALEGAL	0.262	0.072	3.613	0.000
APROATV ← ALEGAL	0.221	0.086	2.585	0.010
AREATIVO ← AINTERNO	0.342	0.155	2.202	0.028
BFINC ← AREATIVO	0.751	0.109	6.883	0.000
BIMED ← APROATV	0.505	0.127	3.989	0.000
BIMED ← BMACRO	0.313	0.143	2.184	0.029
BPROD ← AINTERNO	0.452	0.103	4.387	0.000
BFINC ← APROATV	−0.485	0.178	−2.716	0.007
BFINC ← ALEGAL	0.368	0.126	2.925	0.003
	Covariances			
	Estimate	S.E.	C.R.	*P*-value
ALEGAL ↔ AINTERNO	0.312	0.094	3.336	0.001

Table 5
Model summary and fit measures

Model summary	
Chi-square	12.830
Degrees of freedom	18
Probability level	0.802
Fit measures	
GFI	0.951
AGFI	0.901
CFI	1.000
TLI	1.080
RMSEA	0.000

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