



<http://www.ijmp.jor.br>
ISSN: 2236-269X
DOI: 10.14807/ijmp.v10i1.825

v. 10, n. 1, January - February 2019

ISO 14001 AND INTERNATIONAL TRADE

Cicera Maria Gomes dos Santos
Universidade Nove de Julho - UNINOVE, Brazil
E-mail: cissagomes@hotmail.com

Alexandre de Oliveira e Aguiar
Universidade Nove de Julho - UNINOVE, Brazil
E-mail: aaguiar@uni9.pro.br

Submission: 16/04/2018

Accept: 14/05/2018

ABSTRACT

The purpose of this paper is to study potential association between international trade and ISO 14001 certification. The study is based upon a search conducted by International Organization for Standardization (ISO) performed in 2013, which includes responses from 110 countries in 11 languages. At this time, among all topics from the research, the variables studied were motivations for implementation and the benefits achieved. These data were crossed with features of international business trade to identify its real outcome. The null hypothesis to be tested is that there was no correlation or association between international trade and the studied variables. Results show that there were 16 weak correlations between motivations to implement ISO 14001 and international trade. The survey result shows that there are weak correlations among countries international trade and motives to get certification. Because the degrees of correlation are low, there is reason to further studies, what could probably include multivariate techniques. Anyway, the study suggests that some of the expected results and benefits for the business were not achieved or were achieved at degrees lower than expected in countries where trade is higher. Regarding motivations to implement the survey confirmed that attending to customers' and stakeholders' interests is an important driver for companies that export.



[<http://creativecommons.org/licenses/by/3.0/us/>]
Licensed under a Creative Commons Attribution 3.0 United States License

Keywords: Environmental management system; certification; motivation; international trade; ISO 14001

1. INTRODUCTION

The ISO 14001 standard was first published by International Organization for Standardization (ISO) in 1996, and was further updated in 2004 and 2015. Its intent is to allow businesses to be registered or certified for implementing an environmental management system (EMS). It was designed to help organizations to reduce environmental impact while improving financial and environmental performance (BANSAL; HUNTER, 2003). By holding ISO 14001 certificate companies enhance stakeholders' reliability (ISO, 2015). According to ISO, there have been more than 300,000 ISO 14001 certificates issued around the world and most of them in Europe and East Asia & Pacific regions.

Organizations seek to implement ISO 14001 standard for environmental, organizational and financial reasons, including: improvement of environmental performance, obtaining access to new and international markets, reducing general and insurance costs as much as environmental liabilities, improving industry-government relations and enhancing public image and competitive advantage (EDWARDS, 1999).

After its first issue in 1996, ISO 14001 standard has undergone two versions ISO 14001:2004 and ISO 14001:2015. Before promoting changes to the 2004 version in order to publish the 2015 version, ISO performed a survey to understand the view of the standard users on motivations, results and expectations for next revision.

Several authors remarked the importance of exports on the trends of companies in specific countries to seek ISO 14001 certification.

According to Berliner and Prakash (2013) countries adopted ISO 14001 when customers and stakeholders overseas recognized this approach and internally environmental regulations were poorly enforced. According to Goedhuys and Sleuwaegen (2016) EMS matters more to firms that export. Potoski and Prakash (2006) observed that countries, which export destinations, had higher levels of ISO 14001 certifications showed also higher certification levels. Based on that, they affirmed that ISO 14001 adoption was not about the quantity companies had been



exporting but which countries had received these exports. Both groups Chung *et al.* (2005) and Zeng *et al.* (2005) affirmed that China started its adoption to enter in the international market and to satisfy customers' requirements.

Some authors show that not always the ISO 14001 certification in countries is related to the direction of trade – export or import. For example, Potoski and Prakash (2004) identified among nongovernmental companies in 59 countries that level of ISO 14001 adoption was higher when its international trading partners also had adopted this regime. Mohamed (2001), Quazi *et al.* (2001), Fryxell and Szeto (2002), Pan (2003) and Zutshi and Sohal (2004) indicated that reduction or elimination of international trade barrier was a motivation to implement it.

The point of view of importers has also been studied. Bellesi *et al.* (2005) through a survey with six European countries discovered that importers feel more confident engaging a new supplier awarded with ISO 14001 because it means the supplier administrates well its business and it is environmentally friendly. According to Nishitani (2010), companies which aimed to export to environmental conscious markets needed ISO 14001 certification. This can also be seen in studies that dealt with the supply chain in international markets. For example, To and Lee (2014) showed that developed countries, due to the higher availability of resources, adopted first ISO 14001 and through close cross-country supply chain diffused it from west to east (TO; LEE, 2014).

Finally, the importance of ISO 14001 in international trade is pointed out for the possibility of recovering a country from the crisis by reinforcing trade, and the potential of ISO 14001 as a market opener. Iatridis and Kesidou (2016) affirmed that companies in middle crises, like Greek firms, seek ISO 14001 to restore their reputation in foreign markets and to stimulate their competitiveness.

This article's purpose is to investigate possible correlations between ISO 14001 implementation and international trade in the countries where organizations operate.

2. LITERATURE REVIEW

As a preliminary information, it is important to describe the context of ISO 14001 continuous improvement research.

2.1. Motivations to implement ISO 14001 and the potential benefits

The early adopters had their motives to implement the standard. Edwards (1999) recognized six areas that encouraged companies to pursue certification: environmental performance, regulatory effectiveness, management effectiveness, competitive advantage, financial impacts and stakeholders' interest. Bansal and Hunter (2003) through a US firms study identified that companies could differentiate their business in their sector creating a competitive advantage or signaling to stakeholders that a heavy polluter was concerned about environment. Besides that, they found evidence proving that ISO 14001 facilitated international trade.

The literature has been saying that, through ISO 14001, institutions can access specific markets, achieve better public image, among others (MOREIRA, 2001; ABNT, 2004). Improvement on environment performance was met by several organizations in Mexico (DASGUPTA et al., 2000), United States (POTOSKI; PRAKASH, 2005), and Japan (ARIMURA et al., 2008). It also says that companies significantly performed better in environmental issues after ISO 14001 certification than they did before (MATELA, 2006); besides that, it can bring to organizations financial benefits besides good environmental practices (ALBERTON; COSTA JR, 2007).

De Oliveira, Serra and Salgado (2010) researched Brazilian companies to identify which benefits were achieved. They found that development of preventive responses, reduction of energy, gas and oil consumption were the main benefits. Morrow and Rondinelli (2012) studied German companies and collected answers on improvement on documentation, organization and image, boost in staff morale, reduction in resources usage and gas emission. German companies were proud to be a benchmark for suppliers, even if they had achieved it on their own process optimization only partially.

Institutional theory seems to be the predominant theory referential when discussing why companies go to ISO 14001 certification. Table 1 summarizes some of the categories of motivations found in scientific literature.

Table 1: Motivations to implement ISO 14001 and literature sources

Motivation	Authors
Public Image	Fryxell and Szeto (2002), Pan (2003), Yiridoe <i>et al.</i> (2003), Zutshi and Sohal (2004), González and González (2005), Schylander and Martinuzzi (2007), Salomone (2008), Arena (2012), ISO (2014), Mariotti <i>et al.</i> (2014), Singh <i>et al.</i> (2015), Iatridis and Kesidou (2016).
Customer requirement	Tuppura <i>et al.</i> (2015), Quazi <i>et al.</i> (2001), Fryxell and Szeto (2002), Yiridoe <i>et al.</i> (2003), Schylander and Martinuzzi (2007), ISO (2014), Djekic <i>et al.</i> (2014), Zeng <i>et al.</i> (2005).
Government requirement	Gavronski <i>et al.</i> (2013), Biondi <i>et al.</i> (2000), Quazi <i>et al.</i> (2001), Fryxell and Szeto (2002), Poksinska <i>et al.</i> (2003), Yiridoe <i>et al.</i> (2003), Jiang and Bansal (2003), Zutshi and Sohal (2004), González and González (2005), Schylander and Martinuzzi (2007), Arena (2012), To and NF Tang (2014), Singh <i>et al.</i> (2015).
Environment protection	Morrow and Rondinelli (2002), Schylander and Martinuzzi (2007), Arena (2012), Psomas <i>et al.</i> (2011), ISO (2014), Mariotti <i>et al.</i> (2014), Bellesi <i>et al.</i> (2005).
Reduction of environmental impact	Schylander and Martinuzzi (2007), ISO (2014), Singh <i>et al.</i> (2015).
Financial benefit	Quazi <i>et al.</i> (2001), Fryxell and Szeto (2002), Pan (2003), Zutshi and Sohal (2004), Schylander and Martinuzzi (2007), Salomone (2008), Djekic <i>et al.</i> (2014), Singh <i>et al.</i> (2015).
Integration ISO management standards	No source found
Other	Heras-Saizarbitoria (2011), Qi <i>et al.</i> (2012), Matela (2006), Orbegozo <i>et al.</i> (2012), Chung <i>et al.</i> (2005), Bansal and Hunter (2003), Berliner and Prakash (2013), Goedhuys and Sleuwaegen (2016), Potoski and Prakash (2004), Prakash and Potoski (2006), Mohamed, (2001), Nishitani (2010), To and Lee (2014).

2.1.1. Literature that remarks benefits achieved

Literature is not always consistent regarding real benefits and results from the implementation of ISO 14001. Some literature authors say results are good, others say results are not any different from the non-certified companies.

A number of papers have been published bringing positive results in companies that implemented ISO 14001. The papers include results in countries such as USA, Canada, Italy, Portugal, Sweden, Greece, East Asia, China, Brazil, New Zealand and Nigeria. Benefit categories have been chosen as a way to make the overview easier to understand.

Some specific issues to be remarked is that the specific environmental issues that have been reported as improvements were waste management (ZUTSHI; SOHAL, 2004; PSOMAS *et al.*, 2011; DJEKIC *et al.*, 2014; OWOLANA; BOOTH, 2016; TESTA *et al.*, 2016; MELNYK, 2002; MELNYK, 2003), natural resources usage (SANTOS *et al.*, 2016) and toxic releases (SZYMANSKI; TIWARI, 2004).

Supply chain relationship improvements have been reported as well (ZENG *et al.*, 2005).

Table 2: Categories of benefits perceived in ISO 14001 implementation according to several sources.

Benefit category	References
Improving in legal compliance, monitoring and avoiding liabilities	Chin and Pun (1999); Biondi <i>et al.</i> (2000); Arena <i>et al.</i> (2012); Yiridoe <i>et al.</i> (2003); To and Tang (2014); Djekic <i>et al.</i> (2014); Santos <i>et al.</i> (2016); Testa <i>et al.</i> (2016)
Improved image	Chin and Pun (1999); Biondi <i>et al.</i> (2000); Arena <i>et al.</i> (2012); Melnyk <i>et al.</i> (2002); Pan (2003); To and Tang (2014); Djekic <i>et al.</i> (2014)
Employee morale, motivation and awareness	Chin and Pun (1999); Morrow and Rondinelli (2002); Pan (2003); To and Tang (2014); Santos <i>et al.</i> (2016); Owolana and Booth, (2016)
Work environment safety	Yiridoe <i>et al.</i> (2003)
Managerial efficiency	Biondi <i>et al.</i> (2000); Pan (2003); Zeng <i>et al.</i> (2005); To and Tang (2014); Simon <i>et al.</i> (2013)
Better environmental performance	Arena <i>et al.</i> (2012); Montabon <i>et al.</i> (2000) (waste reduction); Melnyk <i>et al.</i> (2002 and 2003) (reduced waste); Pan (2003); Szymanski and Tiwari (2004) (toxic emissions); Zutshi and Sohal (2004) (waste reduction); Link and Naveh (2006); Psomas <i>et al.</i> (2011); Djekic <i>et al.</i> (2014); Santos <i>et al.</i> (2016); Owolana and Booth, (2016); Testa <i>et al.</i> (2016)
Better production performance	Melnyk <i>et al.</i> (2002); Pan (2003); Yiridoe <i>et al.</i> (2003); Gavronski <i>et al.</i> (2008)
Financial: profit margins, cost reduction and general business profitability	Melnyk <i>et al.</i> (2002); Morrow and Rondinelli (2002); Pan (2003); Zutshi and Sohal (2004); Link and Naveh (2006); Wahba (2008); Gavronski <i>et al.</i> (2008); Simon <i>et al.</i> (2013); Testa <i>et al.</i> (2016)
Benefits related to customer and market	Melnyk <i>et al.</i> (2002); Poksinska <i>et al.</i> (2003); Pan (2003); Yiridoe <i>et al.</i> (2003); Gavronski <i>et al.</i> (2008); Psomas <i>et al.</i> (2011); Santos <i>et al.</i> (2016)
Relationship with stakeholders	Poksinska <i>et al.</i> (2003); Zeng <i>et al.</i> (2005); Gavronski <i>et al.</i> (2008); Psomas <i>et al.</i> (2011)

Regarding management tools, cleaner production was the only specific management tool cited (ZENG *et al.*, 2005). Examples of specific internal improvement in management were the assistance to management in environmental matters (TO; TANG, 2014), emergency preparedness activities (DJEKIC *et al.* (2014) and the improvement in work environment (YIRIDOE *et al.*, 2003).

Some studies remark that there are conditions to perceive benefits. For example, Gavronski *et al.* (2013) said that Brazilian companies with external motivations improved processes efficiency and environmental management.

2.1.2. Literature that remarks no benefits, or no significant difference

Bansal and Hunter (2003) differed from the majority of authors saying that in the United States ISO 14001 secured a competitive advantage, but only for first

moves. ISO 14001 attracted new customers that demanded it, but only few of them were from the domestic market. Potoski and Prakash (2004) found that countries with high numbers of ISO 9001 certifications also had high numbers of ISO 14001 certifications and there was a non-linear relationship between wealth (per capita GDP) and number of ISO 14001 certifications, showing adoption decrease tendency for the wealthiest countries. Cañón and Garcés (2006) detected in Spain a benefit and a problem; there was a positive financial performance and a negative impact of certification on pioneer, middle polluting and lower size firms.

3. MEASURING INTERNATIONAL TRADE

Gross National Income based on purchasing-power-parity (GNIPPP), import and export figures were extracted from World Bank (2016) in US dollars on <http://databank.worldbank.org/data/reports.aspx?source=world-development-indicators#>.

3.1. Methods Description

3.1.1. Data Collection

The survey performed by ISO, between 2012 and 2013, used an electronic questionnaire, which was produced by ISO team. The details of the process are described in public report. The questionnaire was posted online in 11 languages, involving an ad-hc group with members from 10 different countries. The questionnaire was online from 30 January – 30 April 2013. The topics treated in the questionnaire-included information on the respondent. These pieces of information are about level of knowledge on ISO 14001, responsibility and interaction with management system and if he/she was answering from his/her personal point of view or as a view of the company, as well as information on the company and its environmental management system – size of company, sector, how long it had been certified, scope of certification and some implementation details. The opinions collected were divided in the following dimensions: motivations for implementation, benefits for the business, benefits for environmental performance, and on at which degree some concepts and requirements on sustainable development, corporate social responsibility, and product life cycle among others should be included in ISO 14001 revision (ISO, 2014a).

A total of 4925 answers have been received by ISO. However, from all these, 1749 were the respondents that were qualified as experienced users (current users

or past users) and that answered as a member of a company and not from his/her individual view. These are the answers taken for the current work. From all respondents those that have never been involved in the practice with ISO 14001 management system and those who were not talking on behalf of a company have been removed from the basis, as well as those that did not answer to a full section.

ISO supplied the raw data, which provided the research team with a raw .xls file that included all answers. These are the most recent data available, once no other similar survey has been conducted. The sections of the questionnaire and the assertive used are described in table 3.

Table 3: Questionnaire sections used for this paper

Theme	Specific assertions	Scale
Motivations	Public image	1 – 8 (1 most important, 8 less important)
	Customer requirement	
	Government/regulatory agency requirement	
	Commitment to environmental protection and conservation	
	Reduction of risk related to adverse environmental impact	
	Cost savings/financial benefit	
	Opportunities for integration with other management standards applied by the organization (such as ISO 9001, ISO 50001, ISO 26000, OHSAS 18001)	
	Other factors	
Benefits environmental management	Meeting stakeholder requirements	1 – 6 (0 – no value, 1 – low, 2 – moderate, 3 – high, 4 – very high and 5 – don't know)
	Achieving strategic objectives	
	Providing a competitive advantage	
	Improving public image	
	Integrating with the business management system(s)	
	Providing a financial benefit	
Business management	Management commitment to environmental management	1 – 6 (0 – no value, 1 – low, 2 – moderate, 3 – high, 4 – very high and 5 – don't know)
	Employee engagement in environmental management	
	Communication with stakeholders	
	Stakeholder satisfaction	
	Ability to meet legal requirements	
	Improvement of the organization's environmental performance	
	Improvement in supplier environmental performance	

The used answers were related to respondents work country and their motivations to adopt ISO 14001: public image, customer requirement, government requirement, environmental protection, environmental impact risk reduction, financial benefits and integration with other ISO management standards. Each answer has been associated with trade information of the country of operation of the firm.

In order to represent features of international trade in several countries, some variables have been used and their descriptions are in table 4.

Table 4: Variables used to understand country's international trade.

Name	Description
GNIPPP2012	Gross national income, standardized according to purchase power parity in 2012 (chosen because of the data of survey) in US dollars
EXPORT	Total exports of the country in US dollars
IMPORT	Total imports of the country in US dollars
BALANCE OF TRADE	Result of the balance of trade of the country in US dollars
Cert/ GNIPPP	Relation between certifications ISO 14001 and GNIPP
%Exp/GNIPPP	Percentage from relation between exports ISO 14001 and GNIPP
%Imp/GNIPPP	Percentage from relation between imports ISO 14001 and GNIPP
%Balance/GNIPPP	Percentage from relation between balance of trade ISO 14001 and GNIPP

3.2. Data Analysis

Correlations were tested for each assertive about motivation to implement, benefit to environmental management and benefit to business management.

Correlations have been tested using Spearman's "rho" coefficient by Spearman. This choice is justified because the data distribution was not a normal one. The test has been performed under the significance level of 5% ($p < 0,05$) (MYERS, 2006).

The distribution of the answers according to the countries has not been balanced, what can introduce some bias. However, the gains in this case would not bring significant benefit because the choice of balancing by trade weight or weighting by certification numbers in each country would be arbitrary.

4. RESULTS

4.1. Motivations to implement

The results from 48 possible correlations among international trade and motives to implement ISO 14001, presented on table 5, showed 16 significant ones, although all of them were weak. The motive customer requirement was negative with export amount ($\rho = -0,0955$; $p = 0,0001$), import amount ($\rho = -0,0799$; $p = 0,0008$) and balance of trade ($\rho = -0,0473$; $p = 0,048$). Proportion import/GNIPPP correlated positively ($\rho = 0,0476$; $p = 0,0466$) with com customer requirement and other five items. Environmental protection resulted the highest positive correlations with proportional of export, import and balance of trade with GNIPPP and certifications/GNIPPP. Because the motivation scale is inverted (higher motivation is lower score) the conclusion is that higher importance of customer requirements were associated with higher exports and with higher balance of trade. On the other hand, higher importance of customer requirements is correlated with lower imports of the

countries where the companies operate. It is also remarkable that public image, government requirement and financial benefits correlated with one single variable, showing that probably these benefits have very little role in the environmental management within international trade context.

Table 5: Spearman's Rho correlations among international trade and motives to implement

Spearman Correlation		Public Image	Customer requirement	Government requirement	Environment protection	Envimpact reduction	Financial Benefits	Integration	Others
GNIPPP2012	Coef. Corr	0,0222	-0,0695	-0,0068	-0,0181	-0,0332	-0,0398	0,0624	0,0177
	Signif. P	0,3540	0,0037	0,7769	0,4504	0,1651	0,0959	0,0091	0,4609
	N	1748	1747	1743	1748	1749	1749	1745	1746
EXPORT	Coef. Corr	0,0360	-0,0955	-0,0205	-0,0016	-0,0296	-0,0522	0,0633	0,0005
	Signif. P	0,1320	0,0001	0,3932	0,9456	0,2159	0,0290	0,0081	0,9826
	N	1748	1747	1743	1748	1749	1749	1745	1746
IMPORT	Coef. Corr	0,0279	-0,0799	-0,0087	0,0107	-0,0063	-0,0276	0,0654	0,0282
	Signif. P	0,2429	0,0008	0,7167	0,6552	0,7924	0,2485	0,0062	0,2394
	N	1748	1747	1743	1748	1749	1749	1745	1746
BALANCE OF TRADE	Coef. Corr	0,0744	-0,0473	0,0082	-0,1140	-0,0450	-0,0018	0,0021	0,0105
	Signif. P	0,0018	0,0480	0,7315	0,0000	0,0598	0,9397	0,9294	0,6607
	N	1748	1747	1743	1748	1749	1749	1745	1746
a%Exp/GNIPPP	Coef. Corr	-0,0170	0,0120	0,0425	0,0830	0,0203	0,0229	0,0222	0,0212
	Signif. P	0,4785	0,6154	0,0763	0,0005	0,3967	0,3377	0,3536	0,3766
	N	1748	1747	1743	1748	1749	1749	1745	1746
%Imp/GNIPPP	Coef. Corr	-0,0319	0,0476	0,0510	0,1220	0,0566	0,0455	0,0540	0,0622
	Signif. P	0,1829	0,0466	0,0333	0,0000	0,0179	0,0570	0,0240	0,0093
	N	1748	1747	1743	1748	1749	1749	1745	1746
%Balance/GNIPPP	Coef. Corr	0,0170	-0,0090	-0,0181	-0,0576	-0,0305	-0,0080	-0,0239	-0,0069
	Signif. P	0,4767	0,7066	0,4499	0,0161	0,2027	0,7393	0,3190	0,7742
	N	1748	1747	1743	1748	1749	1749	1745	1746

4.2. Benefits for business

When looking at the correlations of international trade variables and the benefits for business, it is clear that a higher number of correlations occurred, as shown in table 6. Correlations occur both with import and export variables, what means that as a general rule more intense international trade is associated with higher perceived benefits from the business point of view. The correlations coefficients are still low, showing in general a weak correlation.

Table 6: Spearman's Rho correlations among international trade and benefits for business

		GNIPPP1 2	EXPORT	%Exp/GN IPPP	Country_ import	%Imp/GN IPPP	Country_ balan	%Balan/G NIPPP
Meeting stakeholder requirements	Correlation	-0,100	-0,113	-0,049	-0,130	-0,081	0,012	0,032
	Coefficient							
	Sig. (2-tailed)	0,000	0,000	0,043	0,000	0,001	0,631	0,190
	N	1,673	1,673	1,673	1,673	1,673	1,673	1,673
Achieving strategic objectives	Correlation	-0,083	-0,110	-0,074	-0,122	-0,104	0,052	0,032
	Coefficient							
	Sig. (2-tailed)	0,001	0,000	0,002	0,000	0,000	0,034	0,197
	N	1,667	1,667	1,667	1,667	1,667	1,667	1,667
Providing a competitive advantage	Correlation	-0,150	-0,170	-0,057	-0,187	-0,086	-0,015	0,020
	Coefficient							
	Sig. (2-tailed)	0,000	0,000	0,019	0,000	0,000	0,554	0,410
	N	1,663	1,663	1,663	1,663	1,663	1,663	1,663
Improving public image	Correlation	-0,156	-0,195	-0,059	-0,191	-0,058	-0,029	0,028
	Coefficient							
	Sig. (2-tailed)	0,000	0,000	0,016	0,000	0,017	0,238	0,261
	N	1,662	1,662	1,662	1,662	1,662	1,662	1,662
Integrating with the business management system(s)	Correlation	-0,193	-0,211	-0,010	-0,217	-0,040	0,026	0,067
	Coefficient							
	Sig. (2-tailed)	0,000	0,000	0,672	0,000	0,100	0,295	0,007
	N	1,663	1,663	1,663	1,663	1,663	1,663	1,663
Providing a financial benefit	Correlation	-0,062	-0,080	-0,062	-0,094	-0,086	-0,010	-0,004
	Coefficient							
	Sig. (2-tailed)	0,012	0,001	0,012	0,000	0,000	0,673	0,863
	N	1,660	1,660	1,660	1,660	1,660	1,660	1,660

4.3. Benefits for environmental management

In the case of benefits for management, the results are in table 7. All surveyed benefits correlated with exports, imports and gross national product. This shows that in countries with higher GNIPPP, countries with higher exports and countries with higher imports have perceived fewer benefits for the environmental management. However, regarding balance of trade, only there were correlations between management commitment to environmental management and improvements in suppliers' environmental performance.

Table 7: Spearman's Rho correlations among international trade and benefits for business

Spearman Correlation		Management to commitment to environmental management	Employee engagement in environmental management	Communication with stakeholders	Stakeholder satisfaction	Ability to meet legal requirements	Improvement of the organization's environmental performance	Improvement in supplier environmental performance
GNIPPP2012	Coef. Corr	-0,072	-0,082	-0,167	-0,172	-0,156	-0,159	-0,215
	Signif. P	0,003	0,001	0,000	0,000	0,000	0,000	0,000
	N	1,677	1,673	1,659	1,661	1,664	1,665	1,661
EXPORT	Coef. Corr	-0,086	-0,115	-0,193	-0,188	-0,165	-0,175	-0,240
	Signif. P	0,000	0,000	0,000	0,000	0,000	0,000	0,000
	N	1,677	1,673	1,659	1,661	1,664	1,665	1,661
IMPORT	Coef. Corr	-0,111	-0,113	-0,201	-0,203	-0,184	-0,194	-0,238
	Signif. P	0,000	0,000	0,000	0,000	0,000	0,000	0,000
	N	1,677	1,673	1,659	1,661	1,664	1,665	1,661
BALANCE OF TRADE	Coef. Corr	0,128	0,012	-0,013	-0,010	-0,028	0,038	-0,073
	Signif. P	0,000	0,628	0,593	0,683	0,255	0,120	0,003
	N	1,677	1,673	1,659	1,661	1,664	1,665	1,661
%Exp/GNIPPP	Coef. Corr	-0,087	-0,065	-0,028	-0,027	0,024	-0,013	-0,028
	Signif. P	0,000	0,007	0,260	0,280	0,327	0,589	0,260
	N	1,677	1,673	1,659	1,661	1,664	1,665	1,661
%Imp/GNIPPP	Coef. Corr	-0,154	-0,082	-0,057	-0,069	0,000	-0,057	-0,037
	Signif. P	0,000	0,001	0,019	0,005	0,991	0,019	0,131
	N	1,677	1,673	1,659	1,661	1,664	1,665	1,661
%Balance/GNIPPP	Coef. Corr	0,091	0,042	0,054	0,061	0,076	0,091	0,021
	Signif. P	0,000	0,084	0,028	0,012	0,002	0,000	0,384
	N	1,677	1,673	1,659	1,661	1,664	1,665	1,661

5. DISCUSSION

The first result is that correlations, when existing, are low, showing that the influence of international trade in the motivations and benefits for the implementation of ISO 14001 are less important than literature such as Goedhuys and Sleuwaegen (2016); Both groups Chung *et al.* (2005) and Zeng *et al.* (2005); Bellesi *et al.* (2005) and Nishitani (2010) proposed.

5.1. Motivations for implementation

One of the issues that is more important is the customer requirements, which are quoted as an important driver for the implementation of ISO 14001. In the international trade context, the results show that it does have an importance, because as seen in table 5 the correlations show that the higher the numbers of international trade, both in absolute volume and as proportion of GNIPPP, the more the importance of customer requirements as a motivation for implementation of ISO 14001. This confirms the inclusion of customer requirements as a motivation for implementation, as proposed by Tuppara et al. (2015), Quazi et al. (2001), Fryxell and Szeto (2002), Yiridoe et al. (2003), Schylander and Martinuzzi (2007), ISO (2014), Djekic et al. (2014), Zeng et al. (2005) as a general rule and Bellesi *et al.* (2005), To and Lee (2014) specifically regarding international trade.

When looking at the specific variables, %ImportGNIPPP was correlated positively with six different motivations. Because of the inverted scale that means that there is a trend that the more important imports in the country's economy, the less important are these motivations.

5.2. Benefits for the business

It is noteworthy that most trade variables are negatively correlated to the surveyed benefits. That means that the more the country exports or imports, both as absolute numbers or proportion of GNP, the less benefits for the business are perceived. That is contradictory with the theory because it would be expected that as a general rule they would perceive benefits such as financial benefits as reported e.g. by Morrow and Rondinelli (2002) or in marketing by Poksinska *et al.* (2003), or specifically for international trade satisfying stakeholders' requirements as noted by Bellesi *et al.* (2005).

5.3. Benefits for Environmental Management

All surveyed environmental management benefits were negatively correlated with GNIPPP, exports and imports volumes, that means that in countries with larger economies and in countries with larger volumes of imports and exports the perceived environmental benefits tend to be lower than in countries with less GNIPPP and less international trade. However, there was a slightly positive correlation between

perceived benefits and the proportion of trade balance at the country, that means, in countries with a higher importance of positive trade balance the benefits are more perceived. Although only two of the benefits had some correlation with exports proportion, most of them had negative correlation with imports. Although the correlation coefficients are low, this also challenges expectations and literature that argues that these benefits occur and give reason to the skeptics.

6. CONCLUSIONS

The intention of this project was to identify the relation between ISO 14001 certification and its affect in import and export volume. The survey result shows that there are weak correlations among countries international trade and motives to get certification. Because the degrees of correlation are low, there is reason to additional studies, what could probably include multivariate techniques. Anyway, the study suggests that some of the expected results and benefits for the business are not being achieved, or are achieved at degrees lower than expected in countries where trade is higher.

Regarding motivations to implement the survey confirmed that attending to customers and stakeholders' interests is an important driver for companies that export.

Because the correlations are low this study suggests that importance of ISO 14001 certification in international trade is smaller than expected by hypotheses in scientific literature.

7. ACKNOWLEDGEMENTS

This study received funding of the National Council on Scientific and Technological Development (Conselho Nacional de Desenvolvimento Científico e Tecnológico – CNPq, Brazil).

We also thank ISO – International Organization for Standartization for making the survey data available.

REFERENCES

ABNT, N. (2004) 14001: 2004. **Sistema de gestão ambiental–requisitos com orientações para uso**, p. 1-24.

ALBERTON, A.; COSTA JR, N. C. A. D. (2007) Meio ambiente e desempenho econômico-financeiro: benefícios dos Sistemas de Gestão Ambiental (SGAs) e o



impacto da ISO 14001 nas empresas brasileiras. **RAC-Eletrônica**, v. 1, n. 2, p. 153-171.

ARENA, M.; AZZONE, G.; PLATTI, M. (2012) ISO14001: Motivations and benefits in the Italian metal industry. **International Journal of Engineering Business Management**, v. 4, p. 41.

ARIMURA, T. H.; DARNALL, N.; GANGULI, R.; KATAYAMA, H. (2016) The effect of ISO 14001 on environmental performance: Resolving equivocal findings. **Journal of environmental management**, v. 166, p. 556-566.

BANSAL, P.; HUNTER, T. (2003) Strategic explanations for the early adoption of ISO 14001. **Journal of Business Ethics**, v. 46, n. 3, p.289-299.

BELLESÌ, F.; LEHRER, D.; TAL, A. (2005) **Comparative advantage: The impact of ISO 14001 environmental certification on exports.**

BERLINER, D.; PRAKASH, A. (2013) Signaling environmental stewardship in the shadow of weak governance: The global diffusion of ISO 14001. **Law & Society Review**, v. 47, n. 2, p. 345-373.

BIONDI, V.; FREY, M.; IRALDO, F. (2000) Environmental management systems and SMEs. **Greener Management International**, v. 29, n. 29, p. 55-69.

CAÑÓN DE FRANCIA, J.; GARCÉS AYERBE, C. (2006) **Repercusión económica de la certificación medioambiental ISO 14001.**

CHIN, K. S. (1999) Factors influencing ISO 14000 implementation in printed circuit board manufacturing industry in Hong Kong. **Journal of Environmental Planning and Management**, v. 42, n. 1, p. 123-134.

CHUNG, S. S.; FRYXELL, G. E.; LO, C. W. (2005) Corporate environmental policy statements in mainland China: to what extent do they conform to ISO 14000 documentation?. **Environmental management**, v. 35, n. 4, p. 468-482.

DADDI, T.; FREY, M.; DE GIACOMO, M. R.; TESTA, F.; IRALDO, F. (2015) Macro-economic and development indexes and ISO14001 certificates: a cross national analysis. **Journal of Cleaner Production**, v. 108, p. 1239-1248.

DASGUPTA, S.; HETTIGE, H.; WHEELER, D. (2000) What improves environmental compliance? Evidence from Mexican industry. **Journal of Environmental Economics and Management**, v. 39, n. 1, p. 39-66.

DE OLIVEIRA, O. J.; SERRA, J. R.; SALGADO, M. H. (2010). Does ISO 14001 work in Brazil?. **Journal of Cleaner Production**, v. 18, n. 18, p. 1797-1806.

DELMAS, M. A. (2000) Barriers and Incentives to the Adoption of ISO 14001 by Firms in the United States. **Duke Envtl. L. & Pol'y F.**, v. 11, p. 1.

DJEKIC, I.; RAJKOVIC, A.; TOMIC, N.; SMIGIC, N.; RADOVANOVIC, R. (2014) Environmental management effects in certified Serbian food companies. **Journal of Cleaner Production**, v. 76, p. 196-199.

EDWARDS, B. (1999) **The effectiveness of ISO 14001 in the United States.** Dissertation (Doctorate). Santa Barbara: University of California, Available: <http://www.sciencedirect.com/science/article/pii/S0959652614004181>. Access: 26/09/2016.

- FRYXELL, G. E.; SZETO, A. (2002) The influence of motivations for seeking ISO 14001 certification: an empirical study of ISO 14001 certified facilities in Hong Kong. **Journal of Environmental Management**, v. 65, n. 3, p. 223-238.
- GAVRONSKI, I.; FERRER, G.; PAIVA, E. L. (2008) ISO 14001 certification in Brazil: motivations and benefits. **Journal of Cleaner Production**, v. 16, n. 1, p. 87-94.
- GAVRONSKI, I.; PAIVA, E. L.; TEIXEIRA, R.; DE ANDRADE, M. C. F. (2013) ISO 14001 certified plants in Brazil—taxonomy and practices. **Journal of Cleaner Production**, v. 39, p. 32-41.
- GHISELLINI, A.; THURSTON, D. L. (2005) Decision traps in ISO 14001 implementation process: case study results from Illinois certified companies. **Journal of Cleaner Production**, v. 13, n. 8, p. 763-777.
- GOEDHUYS, M.; SLEUWAEGEN, L. (2016) International standards certification, institutional voids and exports from developing country firms. **International Business Review**, v. 25, n. 6, p. 1344-1355.
- GONZÁLEZ BENITO, J.; GONZÁLEZ BENITO, O. (2005) An analysis of the relationship between environmental motivations and ISO14001 certification. **British Journal of Management**, v. 16, n. 2, p. 133-148.
- HERAS-SAIZARBITORIA, I.; ARANA LANDÍN, G.; MOLINA-AZORÍN, J. F. (2011) Do drivers matter for the benefits of ISO 14001? **International Journal of Operations & Production Management**, v. 31, n. 2, p. 192-216.
- IATRIDIS, K.; KESIDOU, E. (2016) What Drives Substantive Versus Symbolic Implementation of ISO 14001 in a Time of Economic Crisis? Insights from Greek Manufacturing Companies. **Journal of Business Ethics**, p. 1-19.
- ISO – International Organization for Standardization (2014a) ISO 14001 Continual Improvement Survey 2013: Survey Design. Available: https://www.iso.org/files/live/sites/isoorg/files/archive/pdf/en/iso_14001_survey_2013_-_survey_design_report.pdf. Access 23 Aug 2017.
- ISO – International Organization for Standardization (2014b) **ISO 14001 Continual Improvement Survey 2013 – Supplemental Results**. Available: http://www.iso.org/iso/iso_14001_survey_2013_-_supplemental_results.pdf. Access: 05/08/2016.
- ISO – International Organization for Standardization (2015) **ISO 14001 Key Benefits**. Available: www.iso.org/iso/iso_14001_-_key_benefits.pdf. Access: 05/08/2016.
- JIANG, R. J.; BANSAL, P. (2003) Seeing the need for ISO 14001. **Journal of Management Studies**, v. 40, n. 4, p. 1047-1067.
- LINK, S.; NAVEH, E. (2006) Standardization and discretion: does the environmental standard ISO 14001 lead to performance benefits? **IEEE transactions on engineering management**, v. 53, n. 4, p. 508-519.
- MARIOTTI, F.; KADASAH, N.; ABDULGHAFFAR, N. (2014) Motivations and barriers affecting the implementation of ISO 14001 in Saudi Arabia: an empirical investigation. **Total Quality Management & Business Excellence**, v. 25, n. 11-12, p. 1352-1364.
- MATELA, P. S. (2006) **ISO 14001 environmental performance as a stand-alone tool and back up requirement from other environmental tools for enhanced**

performance: South African case study. Dissertation (Doctorate in Engineering and Built Environment), Johannesburg: University of the Witwatersrand, Available: <http://wiredspace.wits.ac.za/handle/10539/2075>. Access: 23/09/2016.

MELNYK, S. A.; SROUFE, R. P.; CALANTONE, R. J. (2003) A model of site-specific antecedents of ISO 14001 certification. **Production and Operations Management**, v. 12, n. 3, p. 369-385.

MELNYK, S. A.; SROUFE, R. P.; CALANTONE, R. L. (2002) Assessing the effectiveness of US voluntary environmental programmes: an empirical study. **International Journal of Production Research**, v. 40, n. 8, p. 1853-1878.

MOHAMED, S. T. (2001) The impact of ISO 14000 on developing world businesses. **Renewable Energy**, v. 23, n. 3, p. 579-584.

MONTABON, F.; MELNYK, S. A.; SROUFE, R.; CALANTONE, R. J. (2000). ISO 14000: assessing its perceived impact on corporate performance. **Journal of Supply Chain Management**, v. 36, n. 1, p. 4-16.

MOREIRA, M. S. (2001). Estratégia e implantação do sistema de gestão ambiental. **Modelo ISO 14000**, n. 3.

MORROW, D.; RONDINELLI, D. (2002) Adopting corporate environmental management systems: Motivations and results of ISO 14001 and EMAS certification. **European Management Journal**, v. 20, n. 2, p. 159-171.

MYERS, L.; SIROIS, M. J. (2006) Spearman correlation coefficients, differences between. **Wiley StatsRef: Statistics Reference Online**.

NISHITANI, K. (2010) Demand for ISO 14001 adoption in the global supply chain: An empirical analysis focusing on environmentally conscious markets. **Resource and Energy Economics**, v. 32, n. 3, p. 395-407.

ORBEGOZO, U. T.; MOLINA, M. A. V.; OLAIZOLA, J. I. (2012) La gestión de residuos en la empresa: motivaciones para su implantación y mejoras asociadas. **Investigaciones Europeas de Dirección y Economía de la Empresa**, v. 18, n. 3, p. 216-227.

OWOLANA, V. O.; BOOTH, C. A. (2016) Stakeholder Perceptions of the Benefits and Barriers of Implementing Environmental Management Systems in the Nigerian Construction Industry. **Journal of Environmental Engineering and Landscape Management**, v. 24, n. 2, p. 79-89.

PAN, J. N. (2003) A comparative study on motivation for and experience with ISO 9000 and ISO 14000 certification among Far Eastern countries. **Industrial Management & Data Systems**, v. 103, n. 8, p. 564-578.

POKSINSKA, B.; JÖRN DAHLGAARD, J.; EKLUND, J. A. (2003) Implementing ISO 14000 in Sweden: motives, benefits and comparisons with ISO 9000. **International Journal of Quality & Reliability Management**, v. 20, n. 5, p. 585-606.

POTOSKI, M.; PRAKASH, A. (2004) Regulatory Convergence in Nongovernmental Regimes? Cross-National Adoption of ISO 14001 Certifications. **Journal of Politics**, v. 66, n. 3, p. 885-905.

POTOSKI, M.; PRAKASH, A. (2005) Covenants with weak swords: ISO 14001 and facilities' environmental performance. **Journal of policy analysis and management**, v. 24, n. 4, p. 745-769.

- PRAKASH, A.; POTOSKI, M. (2006) Racing to the bottom? Trade, environmental governance, and ISO 14001. **American journal of political science**, v. 50, n. 2, p. 350-364.
- PSOMAS, E. L.; FOTOPOULOS, C. V.; KAFETZOPOULOS, D. P. (2011) Motives, difficulties and benefits in implementing the ISO 14001 Environmental Management System. **Management of Environmental Quality: An International Journal**, v. 22, n. 4, p. 502-521.
- QI, G.; ZENG, S., LI, X.; TAM, C. (2012) Role of internalization process in defining the relationship between ISO 14001 certification and corporate environmental performance. **Corporate Social Responsibility and Environmental Management**, v. 19, n. 3, p. 129-140.
- QUAZI, H. A.; KHOO, Y. K.; TAN, C. M.; WONG, P. S. (2001) Motivation for ISO 14000 certification: development of a predictive model. **Omega**, v. 29, n. 6, p. 525-542.
- SALOMONE, R. (2008) Integrated management systems: experiences in Italian organizations. **Journal of Cleaner Production**, v. 16, n. 16, p. 1786-806.
- SANTOS, G.; REBELO, M.; LOPES, N.; ALVES, M. R.; SILVA, R. (2016) Implementing and certifying ISO 14001 in Portugal: motives, difficulties and benefits after ISO 9001 certification. **Total Quality Management & Business Excellence**, v. 27, n. 11-12, p. 1211-1223.
- SCHYLANDER, E.; MARTINUZZI, A. (2007) ISO 14001—experiences, effects and future challenges: a national study in Austria. **Business Strategy and the Environment**, v. 16, n. 2, p. 133-147.
- SIMON, A.; BERNARDO, M.; KARAPETROVIC, S.; CASADESUS, M. (2013) Implementing integrated management systems in chemical firms. **Total Quality Management & Business Excellence**, v. 24, n. 3-4, p. 294-309.
- SINGH, N.; JAIN, S.; SHARMA, P. (2015) Motivations for implementing environmental management practices in Indian industries. **Ecological Economics**, v. 109, p. 1-8.
- SZYMANSKI, M. I. C. H. A. L.; TIWARI, P. (2004) ISO 14001 and the reduction of toxic emissions. **The Journal of Policy Reform**, v. 7, n. 1, p. 31-42.
- TESTA, F.; HERAS-SAIZARBITORIA, I.; DADDI, T.; BOIRAL, O.; IRALDO, F. (2016) Public regulatory relief and the adoption of environmental management systems: a European survey. **Journal of Environmental Planning and Management**, p. 1-20.
- TO, W. M.; LEE, P. K. C. (2014) Diffusion of ISO 14001 environmental management system: global, regional and country-level analyses. **Journal of Cleaner Production**, v. 66, p. 489-498.
- TO, W. M.; NF TANG, M. (2014) The adoption of ISO 14001 environmental management systems in Macao SAR, China: Trend, motivations, and perceived benefits. **Management of Environmental Quality: An International Journal**, v. 25, n. 2, p. 244-256.
- TUPPURA, A.; TOPPINEN, A.; PUUMALAINEN, K. (2015) Forest certification and ISO 14001: Current state and motivation in forest companies. **Business Strategy and the Environment**, v. 25, n. 5, p. 355-368.

WAHBA, H. (2008) Does the market value corporate environmental responsibility? An empirical examination. **Corporate Social Responsibility and Environmental Management**, v. 15, n. 2, p. 89-99.

YIRIDOE, E. K.; CLARK, J. S.; MARETT, G. E.; GORDON, R.; DUINKER, P. (2003) ISO 14001 EMS standard registration decisions among Canadian organizations. **Agribusiness**, v. 19, n. 4, p. 439-457.

ZENG, S. X.; TAM, C. M.; TAM, V. W.; DENG, Z. M. (2005) Towards implementation of ISO 14001 environmental management systems in selected industries in China. **Journal of Cleaner Production**, v. 13, n. 7, p. 645-656.

ZUTSHI, A.; SOHAL, A. (2004) Environmental management system adoption by Australasian organisations: part 1: reasons, benefits and impediments. **Technovation**, v. 24, n. 4, p. 335-357.