

EURASIAN JOURNAL OF BUSINESS AND MANAGEMENT

www.eurasianpublications.com

THE IMPACT OF ENVIRONMENTAL MANAGEMENT SYSTEMS (EMSs) AND ISO 14001 STANDARDS ON CORPORATE PERFORMANCE: A SYSTEMATIC LITERATURE REVIEW

Dajana Grandic

University of Rome Tor Vergata, Italy. Email: dajanagrandic@yahoo.com

Abstract

This paper is based on the systematic literature review method and investigates the impacts of the EMS and ISO 14001 Standards towards corporate performance. Two units are considered through the methodology of research; firm size and market orientation. The evidence comes from the analysed dataset of 19 papers. Aggregated search results show that global firms orientated towards export have a higher probability to achieve product and process innovation than companies who focus primarily on regional and local markets due to higher competition in the global market. Moreover, firms who adopted EMS and ISO 14001 standard have a greater impact on performance, a positive influence on innovation and commitment to the environment related to company targets than those firms who did not apply it. The results of this research could be interesting for both investors and academics to know how the voluntary adoption of these two standards affects corporate performance.

Keywords: Firm's Performance, Environmental Regulations, ISO 4001, EMS, Voluntary Policies, Economic Performance

1. Introduction

The structure of the paper is divided into the introduction part, a framework explaining what the standards are, and the methods and results based on the research methods. Studying how environmental performance influences and changes firms' behaviour and performance might be very useful for additional research by scholars, academics and investors. Scholars still argue that implementing environmental and quality standards does not necessarily bring clear benefits, while others agree that implementing those standards positively affect firms and corporate performance, society, clients and suppliers. Consideration of specific country sector, industry/business sector, business orientation of products/services (national/international), and the willingness of the whole unit of employees those are ready to adapt to changes inside their organization needs to be taken into account. Understanding the implementation of environmental and quality standards requires long periods in order to realize positive and evident changes; in other words, adapting those two standards into corporate performance needs to be considered not as a goal but as a process of continuous improvement.

2. Theoretical Framework

The ISO 14001 Standard is based on the Plan-Check-Do-Review-Improve cycle. The Plan cycle deals with the initial stages of the firms becoming ISO 14001 compliant. The Check cycle deals with verifying and correcting the errors. The Do cycle is a general review of the complete process by the firm's top management. The last cycle is the rotation cycle of Review and Improve that never ends, so firms are constantly seeking ways to develop their EMS. Depending on the firm's size the entire process may last from a couple of months up to several years.

A key concept of the EMS may be described as an "aspect of an organization's environmental policy" (Tibor and Feldman, 1996). The EMS has a role to define how a firm will manage its potential impact on the natural environment and this consists of internal policies, assessments, plans and implementation actions which impact on the entire organizational unit (Coglianese *et al.* 2008).

Generally, the 14000 Series are international standards for voluntary management with the opportunity to impact globally on environmental policy-making. The Series is applicable to both private and public firms and is based upon the idea that environmental management strategies may improve a firm's performance. Over the past decade, environmental policy-making has risen and gained recognition due to market-based regulatory approaches, such as tradable emission permits.

The benefits which ISO 14001:2004 and 14004:2004 provide to organizations include reduced cost of waste management, lower distribution costs, better corporate image, savings in consumption of energy and materials and overall improvement of environmental performance. Indeed, these standards are ideally designed for proactive managers with the idea of understanding how implementing EMSs may bring returns on investment.

EMS is an integral "part of the overall management system that includes organizational structure, planning activities, responsibilities, practices, procedures, processes and resources for developing, implementing, achieving, reviewing and maintaining the environmental policy", (ISO 14001, Section 3.6.). Globally there are three major EMS standards; ISO 14001 Standard of the ISO 14000 Series, British Standard 7750 and the EU's Eco-management and Audit Scheme (EMAS). Those standards all act as complements to regulations.

3. Methods

3.1. Background information

In this paper the "systematic literature review" method adopted as the research design most suitable for the aims of this review. The results might be particularly helpful to those researchers who are primarily interested in the "what" and "how" (rather than the "why") questions of their literature reviews.

As stipulated by Bettany-Saltikov (2012), systematic reviews, are designed to be replicable, transparent, comprehensive and should minimize selection bias. Systematic literature review follows a specified protocol, which documents all the decisions and steps involved in the process. This systematic review methodology was subdivided into various sections which include the following; development of a searching criterion, development of an inclusion/exclusion criteria and data screening, data extraction and synthesis of the extracted data.

The identified studies were assessed and given a score with specific regards to validity, quality and applicability. Assessment of evidence was also undertaken on the studies with the highest score in order to determine those studies that have valid and substantial information with regards to the impact of environmental management systems and ISO 14001:2004 on corporate performance. Greater emphasis was placed on studies with high scoring, but also, those studies with low scores were also included in the analysis in order to reinforce the understanding of the impact of EMS and ISO 14001 on corporate performance.

3.2. Development of searching criteria

According to Petticrew and Roberts (2006), developing of a search criterion in undertaking a systematic literature review can be described as the process of systematic identification of all the relevant literature and studies that supports the topic under review. Searching for the relevant literature requires the development of a search criterion. The first step of the review involved the identification of the relevant articles and studies in peer reviewed journals. A total of four databases were searched (i.e. EBSCO, RePec, Sage, SSRN) with the aim of identifying articles in peer reviewed journals. Table 1 indicates the databases that were searched.

General selection criteria are based on title, abstract, year of publication and journal publication. During the research process, the title and abstract should contain keywords, while the year of article publication is considered from 1996 onwards when the International Organization for Standardization introduced the first edition of ISO 14001:2004.

In order to obtain the best search results, five keywords were identified from the research questions (i.e. “EMS”, “ISO 14001:2004”, “environmental regulation”, “corporate performance”, “mining industry”. The keywords were grouped into three major categories which are “Keyword 1”, “Keyword 2” and “Keyword 3”. EMS and ISO 14001:2004 were categorized as keyword 1. Environmental regulation and mining industry were categorize as keyword 2, while corporate performance was grouped as keyword 3. Keyword 3 was used in order to refine the search within the database. The first searching strategy involved pairing of keyword 2 words with keyword 1 words at least once. This eventually produced more search results of 260+ references. Thus, in order to refine the search, a third keyword was introduced into the search results. Two logical operators were used in the search criteria in order to obtain the relevant references from the databases: EMS OR ISO 14001:2004 AND keyword 2; EMS OR ISO 14001:2004 AND keyword 2 AND corporate performance. A log of the search strings used and the results obtained were kept. In cases where the search strings yielded more than 250 references from the combination indicated in Table 1, a third control (i.e. keyword 3” was added to the string (Table 2).

Table 1. Indicating the search criteria for keyword 1 + keyword 2

Keyword 1	Keyword 2
Environmental management system	Mining industry
Environmental management system	Environmental regulation
ISO 14001:2004	Mining industry
ISO 14001:2004	Environmental regulation

Source: Elaboration on the dataset

Table 2. Indicating a search strategy for keyword 1 + keyword 2 + keyword 3

Key word 1	Key word 2	Key word 3
Environmental management system	Mining industry	Corporate performance
Environmental management system	Environmental regulation	Corporate performance
ISO 14001:2004	Mining industry	Corporate performance
ISO 14001:2004	Environmental regulation	Corporate performance

Source: Elaboration on the dataset

This was undertaken in order to achieve more refined, specific and relevant references. Initial searches, those that involved any of keyword 1 and keyword 2 yielded more than 300 references. In order to reduce the references to a manageable number that was relevant and for the purposes of online screening, the search string was re-defined to include a control keyword 3. The combination search that included a control keyword 3 yielded references less than 300. These references were selected for eligibility in the screening process to determine their

relevance to the research question.

3.3. Types of literature

Only peer-reviewed journal articles published in English were eligible for inclusion in the data set. The search did not take into account books, chapters in books, conference proceedings, unpublished papers or working papers that deal with any of the above mentioned key words. Also, all selected articles contained at least one of the five following sets of keywords in their abstract or title: "mining industry", or "EMS", or "ISO 14001:2004", or "environmental regulations", or "corporate performance".

3.4. Types of case studies

Those experimental case studies that included at least one of the above mentioned keywords were also eligible for inclusion into the study (Bronson and Davis, 2011). The case studies were included in the data set in order to provide a scientific framework and analysis of the impacts of environmental management system and ISO 14001:2004 on corporate performance.

3.5. Data screening and development of an inclusion/exclusion criteria

As postulated by Booth *et al.* (2012), the inclusion criteria can be generally defined as a systematic approach of identifying parameters that will enhance extracting references that are relevant to the topic under review. In identifying the inclusion parameters, a researcher should effectively and exhaustively determine parameters that will enhance extraction of relevant references (Bronson and Davis, 2011). The search results obtained were screened in order to determine the peer reviewed articles that were eligible for inclusion as well as exclusion from the data set. The inclusion and exclusion criterion was inherent from the main research review question. The following indicates a summary of the inclusion and exclusion criterion that was deployed in the systematic review.

a) Inclusion criteria

- Only peer-reviewed journal articles published in English
- Were published from 1996 onwards
- Focus on environmental management system and corporate performance
- Focus on ISO 14001:2004 and corporate performance
- Focus on environmental management system, mining industry and corporate performance
- Focus on ISO 14001:2004, mining industry and corporate performance
- Focus on environmental management system, environmental regulation and corporate performance
- Focus on ISO 14001:2004, environmental regulation and corporate performance

b) Exclusion criteria

According to Bronson and Davis (2011), exclusion criteria will involve the process of eliminating those references that fall outside the specified inclusion criteria. Exclusion criteria are an important aspect in the sense that, it will enable a researcher to exclude irrelevant references in a systematic literature review. As suggested, this enhances the quality of the systematic review process in the sense that, irrelevant references are left out of the analysis. The following indicates a summary of the exclusion criteria.

- Books, chapters in books, conference proceedings, unpublished papers or working
- Papers and journal articles that are not peer reviewed either published in English or any other language.
- Were published before 1996

- Literature and studies that do not focus on environmental management system and corporate performance
- Literature and studies that do not focus on ISO 14001:2004 and corporate performance
- Literature and studies that do not focus on environmental management system, mining industry and corporate performance
- Literature and studies that do not focus on ISO 14001:2004, mining industry and corporate performance
- Literature and studies that do not focus on environmental management system, environmental regulation and corporate performance
- Literature and studies that do not focus on ISO 14001:2004, environmental regulation and corporate performance.

From the initial search, a total of 573 references were obtained. This indicated a large number of references, which could have made the screening process difficult. As a result, the search string was refined in order to reduce the number of search results and ensure reference suitability for the screening process. All the articles selected in the previous phase are scanned by reading their abstracts to ensure substantive context. The articles' relevance is controlled by reading the text of all the articles selected through the previous screening of abstracts. This allowed for a conclusive alignment between the chosen works and the research aims. Screening by abstract, title, and full-text encompassed the process of removing all the references that met at least one of the exclusion criteria into one of the nine databases that, corresponded to the exclusion criteria as defined in the exclusion criteria 1-9 above. Articles were excluded in a hierarchical manner in the sense that, references were excluded on the foundation of the first criterion met.

All those references that met most of the inclusion criteria were exported in a database named 'selected references'. At this point, the total number of selected reference for inclusion into the analysis was 19 references (Table 3). Full texts of the references were obtained from available information centres like the university library and other libraries.

Table 3. Summary of the results

Phase EBSCOhost	Description	Number of articles
I	All those articles containing at least one of the five primary sets of keywords in their abstract or title	573
II	All those articles containing at least one of four additional keywords in their abstract or title	187
III	According to the "fit for purpose" method, all those articles whose abstracts are substantively relevant	45
IV	According to the chosen "fit for purpose" method, all those articles whose text is effectively relevant?	19
V	"Snowballing" technique	19

Source: Elaboration on the dataset

4. Results

As Table 4 shows, the dataset is composed of a final population of 19 papers, all published between 1996 and 2016.

Table 4. Indicates the total number of references that were included in the final list of data set

No	Author(s), (year)	Type of Analysis	Sample	Statistical technique	Management outcomes (specific observation)	Results*
1.	Zobel (2016)			Regression model, correlation analysis	No statistical significant differences between certified and non-certified firms concerning the change in the rate of improvement could be found in any of the six areas.	N/A
2.	Arimura <i>et al.</i> (2015)	Theoretical			ISO 14001 may be more effective when there are clear cost-saving opportunities	N/A
3.	Nishitani <i>et al.</i> (2012)	Quantitative	/	Correlation Analysis	Improves productivity and reduces environmental impact	Y
4.	Awuah-Offei & Adekpediou (2011)	Theoretical	/	/	Life cycle Assessment (LCA) Methodology	/
5.	Botta & Comoglio (2011)	Case Study	/	/	Improvement in Env. Performance and cost reductions	Y
6.	Brorson <i>et al.</i> (2009)	Case Study	29 questionnaire	/	ISO 14001 improves close relations	Y
7.	Iraldo <i>et al.</i> (2009)	Case Study	156 public authorities	Regression model	No significant relation among ISO 14001 and GPP (green public procurement)	N/A
8.	Yin & Schmeidler (2008)	Quantitative	3,196 companies	Multivariate Regression Analysis	Environmental performance improvement	Y
9.	Deltas <i>et al.</i> (2008)	Quantitative	254 firms	Prohibit Estimation Results	Greater emphasis on social responsibility	Y
10.	Russo (2007)	Quantitative	/	Regression model	Longer adoption of ISO 14001, lower emissions	Y
11.	Bracke & Albrecht (2007)	Case Study	436 companies	Regression Analysis	Country location and sector matters, usually bigger firms adopting EMAS	N/A
12.	Montabon <i>et al.</i> (2007)	Theoretical	/	/	Improved documentation, ensure compliance with government regulations	Y
13.	Newbold (2006)	Theoretical	92 papers	/	Higher level of commitment to employees, clients, stakeholders	Y
14.	Bansal & Hunter (2003)	Quantitative	197 facilities	Correlation Analysis	Firms reluctant to adopt ISO 14001	N
15.	Eng Ann <i>et al.</i> (2006)	Quantitative	159 sites	Correlational Studies	Certification impacts positively on environmental and economic performances	Y
16.	Hilson & Nayee (2002)	Theoretical	/	/	It might contribute to cleaner production	N/A
17.	Rondinelli & Vastag (2000)	Case Study	/	/	Improvements in operational efficiency	Y
18.	Ofori <i>et al.</i> (2000)	Case Study	/	/	/	N/A
19.	Smith & Melnyk (1996)	Theoretical	/	/	EMS as an corporate paradox	N/A

Notes: *According to the evidences from the articles, (Y) is used to express a positive relationship between ISO 14001 /EMS and firms' performance; (N) is used when this relationship has not been found as relevant in a coded observation; and, (N/A) is used where this relationship was not directly applicable to the article

Source: Elaboration on the dataset

Further, Table 5 shows the results according to their distribution per journal, while Figure 1 illustrates their distribution over time.

Table 5. Article distribution per journal - The impact of an EMS and ISO 14001

No.	Journal	Articles
1	Journal of Business Ethics	1
2	International Journal of Mineral Processing	1
3	Journal of Cleaner Production	4
4	Journal of Operations Management	1
5	International Journal of Quality Science	1
6	Business Strategy and the Environment	1
7	Management of Environmental Quality	1
8	Government and Policy Journal	1
9	The International Journal of Life-Cycle Assessment	1
10	Applied Economics	1
11	Construction Management and Economics	1
12	European Management Journal	1
13	Journal of Environmental Management	1
14	Journal of Supply Chain Management	1
15	Journal of Environmental Management	1
16	Journal of Environmental Planning and Management	1

Source: Elaboration on the dataset

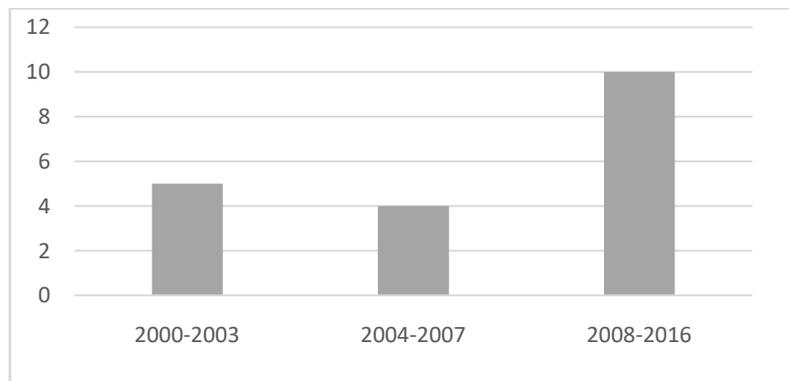


Figure 1. Number of Articles Published per Period

Source: Elaboration on the dataset

5. Discussion of the Findings

The goal is to analyse whether the environmental and quality standards of these ISO standards affect corporate performance. Indeed, there are two major views in the scientific literature. The first view of the impact of EMSs on a firm's performance is based on positive relations, i.e. when firms adopt ISO 14001:2004 they are capable of improving their environmental image and subsequently this confers external legitimacy (Bansal and Hunter 2003). Coglianese *et al.* (2008) state that this has a potential to increase internal efficiencies and provides an opportunity for competitive advantage and economic benefits. Continuous improvement of environmental policies may reduce pollution; lowering the risk of costly environmental accidents, lowering of a firm's liability exposure, better market access and higher competitiveness in the market are just some of the benefits of an EMS (Adams 1999). The negative aspects are also considered, such

as time spent implementing the standards, higher initial cost investments for firms, long training processes, high registration fees, etc. (Petroni 2001).

Authors, who have contributed to a significant body of literature through qualitative and quantitative analyses on this topic, reveal that the number of firms adopting an EMS since 1996 has risen dramatically. The literature also reveals these firms are pursuing certification for a number of reasons, such as efficiency and cost savings (Koop and Tole 2008), dealing with natural environmental challenges (Sinding 1999), or to implement environmental objectives and competitive targets (Iraldo *et al.* 2009). In particular, Eng Ann *et al.* (2006) show that ISO 14001 certification can have positive impacts upon a firm's competitive performance from customer satisfaction, economic and environmental points of view. Although evidence suggests certification of firms does not assure outstanding business results, and making certification is seen as a continuous process of the firm, the study shows that there is a strong impact on and benefits for the overall image of the firm. In addition, there is the possibility of increasing profitability and market share of a firm if consumers are aware of the firm's standards, which leads to influencing purchasing decisions if environmental certification labels on packaging are used. Armour *et al.* (2013) arguing ISO 14001's effectiveness at reducing pollution varies across countries and at reducing pollution varies across environmental impact.

In conclusion, the positive impact of ISO 14001 and EMSs may also depend on how much a firm is willing to invest in resources and time to enhance its environmental performance. Many scholars agree that larger global firms that are oriented towards export have a higher probability to realize product and process innovation than companies who are mainly focused on regional/local markets due to the higher competition in the global market (e.g. Ebling and Janz 1999). Indeed, certified firms have a positive influence on innovations and commitment to environmentally related company targets (Montabon *et al.* 2007). With regard to firm performance, Smith and Melnyk (1996) through their research have shown that firms who adopted an EMS have seen a greater impact on performance than firms who did not apply it. Aggregated search results show that implementation of an EMS and the ISO 14001 Standard is adopted more often by larger global corporations or firms who are oriented towards international export markets. Moreover, these global firms are more likely to certify their products or services with EMS standards than firms who only trade locally. One explanation may be the higher initial cost for firms when adopting ISO 14001 and EMS. Khanna *et al.* (2008) argue that integrating voluntary adoption of an EMS is due to consumer pressure, investors and society, which drives firms to switch from regulation driven management objectives to proactive strategies. Their study has also shown that companies producing higher levels of pollution are especially interested in adopting a more comprehensive EMS. Firms who are dealing with large toxic releases feel that promoting the adoption of an EMS may be considered as an effective policy tool. Pressure coming from consumers and clients increases the willingness and need for firms to adopt a more comprehensive EMS. Public policy creating regulatory and market based pressures can also play a significant role in the willingness of a firm to adopt EMS. Furthermore, firms applying the ISO 14001 Standard into their organization may also create some potential problems, such as costs related to EMS implementation, as studied by Chin and Pun (1999) and Montabon *et al.* (2007), staff training (Ofori *et al.* 2000) and difficulties in documentation (Rondinelli and Vastag, 2000). A time lag is considered to play a crucial role within the first steps of environmental efforts and the realization of economic performance. In the first few years, the effect of EMS implementation is weaker in its improvements to productivity than through increases in demand (Nishitani *et al.* 2012). It is important that all environmental management activities are considered in estimation models; otherwise they may become insignificant during the process of improvement in productivity.

When talking about staying competitive in the market for Small and Medium enterprises (SMEs), Fassoula and Rogerson (2003) say that in order to survive SMEs need to effectively manage cost reduction and ensure continuous performance improvement. Specifically, the authors explored the barriers for SME growth and found the output is hidden in environmental management system guides covering areas of environmental issues, safety and quality. An EMS may be a good guide for SMEs in their preparation for the adoption of ISO 14001 certification, in

order to stay competitive.

Furthermore, elements such as planning activities, procedures, processes, resources, organizational structure, practices, responsibilities, need to work together in order to ensure the continuous improvement of environmental performance. The implementation of an EMS into the organizational structure of a firm and its subsequent benefits may also depend on the time it takes to implement those changes, as changes of operational and managerial structures over time may impede the intended improvement of the organization's performance.

Utilising a large sample of electronics manufacturing facilities and data from 1996, i.e. when the Standard became law, until 2001, Russo (2007), found that the longer a manufacturing facility operated under the ISO 14001 Standard, the lower its emissions were. Yin and Schmeidler (2008) state that the international adoption of voluntary environmental activities, such as ISO 14001, can benefit developing countries. The developed countries, where they are operating with car industries etc. and have social marketing programmes that initiate greener production, may then influence and motivate the developing countries to perform the same voluntary actions. International 'green' clients are constantly putting pressure on the industry to operate in more environmentally sustainable ways.

It is important to emphasize that adopting voluntary actions does not necessarily improve companies' compliance with existing environmental regulations (Brorson *et al.* 2009). There is no agreement on whether an EMS may aid performance within firms, so it is more useful to research how it will affect performance and whether or not firms choose to implement an EMS or not based on these criteria. The second point is that the author noticed in the literature is whether the study evaluates EMSs according to the company's own goals or by some other criteria. Brorson *et al.* (2009) state that all research methods have some strengths and weakness so, depending on which research approach is used, one can expect to reach different results. Management styles, objectives, company habits, culture, operating environment and stakeholders will all play a significant role, so must be considered in order to obtain more definitive results of how an EMS may affect a firm's environmental performance.

There are some researchers who have analysed the financial performance of environmental quality standards, for example Heras-Saizarbitoria *et al.* (2011), who used the approach of five-year analyses to compare the financial performance of firms in Spain before and after certification. The results of this research show that there is no clear evidence that certification directly results in improvement of performance. A similar analysis of Japanese manufacturing firms from 1996 until 2007, where the implementation of EMS strategies is seen as value added for firms, and where there is higher demand and improvement in productivity, but specifically among different industry levels, the effect of EMS implementation also varies among different industries. The theoretical model shows there are plural paths for EMS implementation in order to increase companies' economic performance. Export-oriented firms which implement an EMS are more likely to experience an increase in demand and improvement in productivity. Yin and Schmeidler (2008) argue that implementation of an EMS is different across firms.

Export-oriented firms are seen as those who may benefit most from implementing EMS, while industrial firms do not necessarily directly see an increase in demand and improvement in productivity. Firms with higher environmental impacts, such as industries in paper, steel, rubber, glass or pulp manufacture, tend to be more environmentally harmful, and as such the implementation of an EMS in these firms is a logical environmental management strategy. The appliance manufacturing industry of such items as electrical appliances, transportation machinery and general machinery, when adopting an EMS earlier than competitors are able to reach a competitive advantage from their improved productivity. Nishitani *et al.* (2012) conclude that it is important for firms who are operating in an industry to realize how the adoption of EMS strategies can influence their particular economic performance in order to acquire competitive advantage.

When considering SMEs during the process of assessing the environmental standards' effects on firms, Ayoub *et al.* (2004) agree that ISO 14001 implementation has increased awareness among SME employees by creating a better image of the company, improving documentation and procedures and generally within the overall management structure. Their research was conducted using a survey questionnaire and was spread out among 59 SME firms in the United Kingdom. The emphasis is that SMEs gain benefits from the Standard in the longer

term, such as financial savings in areas of energy, water consumption, waste recycling and legal compliance. The problem is that SMEs have less capital to invest in EMSs than larger companies during the process of implementing the Standards. Kirkland and Thompson (1999) agree that introducing an effective EMS into the organization of the firm may be a complex and long process. Moreover, they see differences between the introducing and implementing phases of EMSs. According to Ayoub *et al.* (2004), this problem may be solved through assistance from government bodies, environmental NGOs and other business groups. Publicity and promotion during the process of implementation of ISO 14001 may encourage SMEs to follow the procedure. Another suggestion is the provision of financial assistance grants to SMEs who are following ISO 14001 Standards, through tax incentives or breaks.

A further topical article is that of Newbold (2006) who explored ISO 14001 adoption in the mining industry in Chile. Croatia and Chile both became democratic governments at the beginning of 1990, and many operating in the mining industry have already certified their firms, while others are still working towards that goal. In entering a new democratic government system, both countries were challenged by new environmental laws and regulations, while certification and new standards brought a higher level of commitment to employees, clients, stakeholders, backers and other countries, which then may help in achieving, financing and accepting new projects. In the trade agreement, certification was seen as crucial. Improved environmental standards led to a decline in frequency of accidents at the large scale mines. Large investments in Chile resulted in employee training and greater safety of workers, and the environmental co-benefits of some of this are clearly visible; examples include decreased sulphur-dioxide emissions, reduced arsenic emissions, and reduced water and energy usage. Continuous improvements and changes within the mining industry have led to higher investment opportunities. Escondida, the largest copper mine in the world, wanted to remain a leading force on environmental issues in Chile, so being one of the first ISO 14001 certified companies was to be expected. Escondida used certification ISO 14001 accreditation to begin the programme of implementation of EMSs in Chile.

Recent research by Awuah-Offei and Adekpediou (2011), found that the mining industry is increasingly adopting ISO 14001 certified environmental management systems, and the key requirements are continuous improvement, together with life cycle thinking (LCA-life cycle assessment). Hilson and Nayee (2002) discuss how the implementation of an EMS may help the mining industry to deal more efficiently with environmental regulations, improve corporate environmental policies and identify technical and economic benefits. EMSs are composed of organizational procedures, processes, environmental responsibilities in management systems, all of which may bring the mining sector to the level of better efficiency and greater productivity. Moreover, in order to adopt and process an EMS correctly into the mining industry, there is a need for local government to provide the necessary assistance, for regional universities to provide EMS educational assistance, and for international organizations to help in forwarding EMS information to mine managers and staff.

Iraldo *et al.* (2009) discuss two variables among environmental regulations and competitiveness: firstly, under what conditions do environmental regulations have positive or negative effects upon competitiveness and secondly, what variables concerning complication to nail down of forms of regulations by business Sector division and business orientation are two factors which may also vary the relationship among environmental regulations, policies, performance and competitiveness. Since there are various ways of defining and measuring their effects, understanding these factors may be important in order to understand the relationship among environmental regulations and competitiveness. There is evidence to suggest that EMS implementation and ISO 14001 provide environmental, economic and social benefits, whilst some studies claim that those benefits may not be so obvious.

Authors such as Botta and Comoglio (2011) have shown that introducing and implementing EMS and ISO 14001 Standards in the mining industry sector can play a significant role in the identification of environmental issues and may increase the production of high quality aggregates, which is one of key elements for environmental sustainability. Indeed, the effects of the implementation of EMS and ISO 14001 Standards, regulations and legal requirements increase the awareness of environmental sustainability.

6. Implications for the Research and Practice

As this study is based on environmental and quality standards and how they affect corporate performance by implementing EMSs and ISO 14001 Standards, it should be emphasized that adoption of those two schemes into the organization/firm does not guarantee better firm performance or any increases in its competitiveness in national and international markets. It is important to understand that continuous improvement by the implementation of EMS and ISO 14001 Standards inside the firm may bring results such as better competitiveness. Those schemes are voluntary-based and by continuous planning, practices and operational and organizational activities, may in time bring change towards better operations.

The second important point of view is based on the sector classification and business selection. More precisely, the improvement level of competitive performance by adopting the EMS and ISO Standards depends on it. Some studies emphasize the positive effects of implementation of those voluntary schemes, while other studies provide no visibly clear or positive effects after implementation. When organizations set clear and specific objectives and planning activities for better continuous performance, and where staff and managers are appropriately trained and are implementing better environmental practice, this may provide a better organizational structure towards achieving an EMS and competitiveness goals in a competitive market.

In order to evaluate a firm's competitive performance by the implementation of voluntary schemes, we must explore its size and market orientation. There is a high probability that organizations which orient their products/services toward international markets have a higher willingness to make continuous changes inside their organization in order to stay competitive in the market. The second element is in firm size, which means that the higher the number of employees inside the organization, the more detailed the planning activities should be, as well as more detailed organizational changes in order to make sure that every department is efficient.

7. Conclusions

Since there are increasing numbers of firms every year who are adopting ISO 14001 and EMSs into their business organization, it is obvious that they will face challenges from the natural environment. Then it becomes a process of financial cost investment and management efforts. The main lessons from the papers are following: the firms who are implementing an EMS and certification may improve their reputation or provide a better image of the firm. Bracke and Albrecht (2007, p. 3) argue that "country classification based on the degree of statism of the collective agency and the degree of the corporatism of society organization may play a significant role in getting different results. Statist organisations may be more suspicious in adopting the private alternatives, while countries with more societal organization of authority are more enthusiastic in adopting alternatives."

There are still insufficient empirical studies regarding how ISO 14001 Standards and EMSs may affect corporate performance but researchers who have studied this field tend to agree that implementation of these standards may positively influence corporate performance, from economic and environmental perceptions or from customer satisfaction. Indeed, the factor which plays a significant role is connected to the idea that implementation of certification is not the goal but rather a continuous improvement in time, effort, and resources, as a result of the continuous process.

The results expected are that firms who adopt ISO 14001 and EMS Standards deal both with tangible and intangible benefits, and firms who are actively and continuously dealing with these Standards may achieve competitive advantage. Furthermore, increasing regional and national governments' efforts and assistance toward the adoption of EMSs in industry may positively improve the implementation of those EMSs, in addition to continuous education among managers and staff, educational materials and advanced technology know-how for the implementation of effective EMSs. Regional governments may be in position to provide tax breaks or interest-free loans, and payback schemes may help the sector to operate in a more

productive way (Hilson and Nayee, 2002). For companies to stay competitive in the market, either in local, national or international areas, useful factors are the continuous improvement and education of EMS principles and regulations, and ensuring the equal dissemination of education and information amongst all employees. Effective implementation of EMS into the industry may also bring with it the environmental co-benefits of cleaner production. Adoption of environmental regulations, together with corporate environmental policies, may equally bring long-term benefits not only to the sector employees, but also to local society, regional governments, suppliers, clients, stakeholders and to all those who are directly or indirectly connected with the mining sector.

There is still a gap in the literature review around how industry implements and adopts ISO 14001 Standards and EMS principles; questions remain about whether they will provide industry with competitive advantage, how they influence corporate performance, and what the benefits are, or the negative aspects. Therefore this research provides an opportunity to analyse the implementation of EMSs in the sector, and to analyse whether firms who have already implemented ISO 14001 Standards and EMSs did so as a result of suppliers' pressures, competitive markets, export orientation, or for any other reason. Also it can explain why there are mining firms who are yet to apply these Standards.

A further gap in the literature is the lack of exploration of how environmental and quality standards overall affect corporate performance; more precisely, what are the benefits for firms, how they will decide to implement the standards, and how this changes their organizational structure. The expected results may also be seen in the country factor. This research provides a good basis from which to analyse how those standards will affect corporate performance. Furthermore, this paper is also a good basic point from which to analyse a firm's corporate structure by the implementation of environmental and quality standards and to evaluate how industries prepare themselves for increased competition from the wider EU market. Other factors which may influence whether or not the adoption of EMS may be hidden in the firm's size, are the firm's overall competitiveness and market orientation. There are higher possibilities that firms oriented on the international global market may have a greater willingness to certify companies in order to be more competitive in the market.

References

- Adams, R. 1999. ISO 14001: a key ingredient of competitive advantage. *Environmental Law and Management*, 11(3), pp.103-114. [https://doi.org/10.1002/\(SICI\)1099-0941\(199905/06\)11:3<103::AID-ELM139>3.0.CO;2-L](https://doi.org/10.1002/(SICI)1099-0941(199905/06)11:3<103::AID-ELM139>3.0.CO;2-L)
- Arimura, T.H., Darnall, N., Ganguli, R., and Katayama, H., 2015. The effect of ISO 14001 on environmental performance: resolving equivocal findings. *Journal of Environmental Management*, 166, pp.556-566. <https://doi.org/10.1016/j.jenvman.2015.10.032>
- Armour, J.D., Nelson, P.N., Daniells J.W., Rasiah, V., Inman-Bamber, N.G., 2013. Nitrogen leaching from the root zone of sugarcane and bananas in the humid tropics of Australia. *Agriculture, Ecosystems & Environment*, 180, pp.68–78. <https://doi.org/10.1016/j.agee.2012.05.007>
- Awuah-Offei, K. and Adekpediou, A., 2011. Application of life cycle assessment in the mining industry. *The International Journal of Life Cycle Assessment*, 16(1), pp.82-89. <https://doi.org/10.1007/s11367-010-0246-6>
- Ayoub, G., Azar, N., Fadel, M.E., and Hamad B., 2004. Assessment of hydrogen sulphide corrosion of cementitious sewer pipes: A case study. *Urban Water Journal*, 1(1), pp.39–53. <https://doi.org/10.1080/15730620410001732062>
- Bansal, P. and Hunter, T., 2003. Strategic explanations for the early adoption of ISO 14001. *Journal of Business Ethics*, 46(3), pp.289-299. <https://doi.org/10.1023/A:1025536731830>
- Bettany-Saltikov, J., 2012. *How to do a systematic literature review in nursing: A step-by-step guide*. UK: McGraw-Hill Education.
- Booth, A., Papaioannou, D. And Sutton, A., 2012. *Systematic approaches to a successful literature review*. London: Sage Publication.

- Botta, S. and Comoglio, C., 2011. The use of indicators and the role of environmental management systems for environmental performances improvement: A survey on ISO 14001 certified companies in the automotive sector. *Journal of Cleaner Production*, 20(1), pp.1-11.
- Bracke, R. and Albrecht, J., 2007. Competing environmental management standards: how ISO 14001 outnumbered EMAS in Germany, the UK, France, and Sweden. *Environment and Planning C: Government and Policy*, 25(4), pp.611-627. <https://doi.org/10.1068/c0602j>
- Bronson, D.E. and Davis, T.S., 2011. Finding and evaluating evidence: Systematic reviews and evidence-based practice. New York: Oxford University Press. <https://doi.org/10.1093/acprof:oso/9780195337365.001.0001>
- Bronson, T., Lindhqvist, T., and Nawrocka, D., 2009. ISO 14001 in environmental supply chain practices. *Journal of Cleaner Production*, 17(16), pp.1435-1443. <https://doi.org/10.1016/j.jclepro.2009.05.004>
- Chin, K.S. and Pun, K.F., 1999. Factors influencing ISO implementation in the printed circuit board manufacturing industry in Hong Kong. *Journal of Environmental Planning and Management*, 42(1), pp.123-134. <https://doi.org/10.1080/09640569911334>
- Coglianesi, C., Nash, J., and Howard-Grenville, J., 2008. Constructing the license to operate: Internal factors and their influence on corporate environmental decisions. *Law and Policy*, 30(1), pp.73-107. <https://doi.org/10.1111/j.1467-9930.2008.00270.x>
- Deltas, G., Khanna, M., and Ramirez Harrington, D., 2008. Striving to be green: the adoption of total quality environmental management. *Applied Economics*, 40(23), pp.2995-3007. <https://doi.org/10.1080/00036840600994005>
- Ebling, G. and Janz, N., 1999. Export and innovation activities in the German service sector: Empirical evidence at the firm level, *ZEW Discussion Paper*, No. 1999-53.
- Eng Ann, G., Zailani, S., and Wahid, N.A., 2006. A study on the impact of environmental management system (EMS) certification towards firms' performance in Malaysia. *Management of Environmental Quality: An International Journal*, 17(1), pp.73-93. <https://doi.org/10.1108/14777830610639459>
- Fassoula, E.D. and Rogerson, J.H., 2003. Management tools for SMEs. *Total Quality Management*, 14(10), pp.1114-1119. <https://doi.org/10.1080/1478336032000107708>
- Heras-Saizarbitoria, I., Molina-Azorin, J.F., and Dick, G.P.M., 2011. ISO 14001 certification and financial performance: selection-effect versus treatment-effect. *Journal of Cleaner Production*, 19(1), pp.1-12. <https://doi.org/10.1016/j.jclepro.2010.09.002>
- Hilson, G., and Nayee, V., 2002. Environmental management system implementation in the mining industry: a key to achieving cleaner production. *International Journal of Mineral Processing*, 64(1), pp.19-41. [https://doi.org/10.1016/S0301-7516\(01\)00071-0](https://doi.org/10.1016/S0301-7516(01)00071-0)
- Iraldo, F., Testa, F., and Frey, M., 2009. Is an environmental management system able to influence environmental and competitive performance? The case of the eco-management and audit scheme (EMAS) in the European Union. *Journal of Cleaner Production*, 17(16), pp.1444-1452. <https://doi.org/10.1016/j.jclepro.2009.05.013>
- Khanna, V., Bakshi, B.R., and Lee, L.J., 2008. Carbon nanofibers: Life cycle energy consumption and environmental impact. *Journal of Industrial Ecology*, 12(3), pp.394-410. <https://doi.org/10.1111/j.1530-9290.2008.00052.x>
- Kirkland, L.H. and Thompson, D., 1999. Challenges in designing, implementing and operating an environmental management system. *Business Strategy and the Environment*, 8(2), pp. 128-143. [https://doi.org/10.1002/\(SICI\)1099-0836\(199903/04\)8:2<128::AID-BSE193>3.0.CO;2-N](https://doi.org/10.1002/(SICI)1099-0836(199903/04)8:2<128::AID-BSE193>3.0.CO;2-N)
- Koop, G. and Tole, L., 2008. What is the environmental performance of firms overseas? An empirical investigation of the global gold mining industry. *Journal of Productivity Analysis*, 30(2), pp.129-143. <https://doi.org/10.1007/s11123-008-0101-y>
- Montabon, F., Sroufe, R., and Narasimhan, R., 2007. An examination of corporate reporting, environmental management practices and firm performance. *Journal of Operations Management*, 25(5), pp.998-1014. <https://doi.org/10.1016/j.jom.2006.10.003>

- Newbold, J., 2006. Chile's environmental momentum: ISO 14001 and the large-scale mining industry-case studies from the state and private sector. *Journal of Cleaner Production*, 14(3-4), pp.248-261. <https://doi.org/10.1016/j.jclepro.2004.05.010>
- Nishitani, K., Kaneko, S., Fujii, H., and Komatsu, S., 2012. Are firms' voluntary environmental management activities beneficial for the environment and business? An empirical study focusing on Japanese manufacturing firms. *Journal of Environmental Management*, 105, pp.121-30. <https://doi.org/10.1016/j.jenvman.2012.03.054>
- Ofori, G., Briffett, C., Gang, G., and Ranasinghe, M., 2000. Impact of ISO 14000 on construction enterprises in Singapore. *Construction Management and Economics*, 18(8), pp.935-947. <https://doi.org/10.1080/014461900446894>
- Petroni, A., 2001. Developing a methodology for analysis of benefits and shortcomings of ISO 14001 registration: lessons from experience of a large machinery manufacturer. *Journal of Cleaner Production*, 9(4), pp.351-364. [https://doi.org/10.1016/S0959-6526\(00\)00077-9](https://doi.org/10.1016/S0959-6526(00)00077-9)
- Petticrew, M. and Roberts H., 2006. *Systematic reviews in the social sciences: a practical guide*. Malden, MA: Blackwell Publishing. <https://doi.org/10.1002/9780470754887>
- Rondinelli, D. and Vastag, G., 2000. Panacea, common sense, or just a label? The value of ISO 14001 environmental management systems. *European Management Journal*, 18(5), pp.499-510. [https://doi.org/10.1016/S0263-2373\(00\)00039-6](https://doi.org/10.1016/S0263-2373(00)00039-6)
- Russo, V.M., 2007. Explaining the Impact of ISO 14001 on emission Performance: a dynamic capabilities perspective on process and learning. *Business Strategy and the Environment*, 18(5), pp.307-319. <https://doi.org/10.1002/bse.587>
- Sinding, K., 1999. Environmental impact assessment and management in the mining industry. *Natural Resource Forum*, 23(1), pp.57-63. <https://doi.org/10.1111/j.1477-8947.1999.tb00238.x>
- Smith, R.T. and Melnyk, S.A., 1996. Green manufacturing: Integrating the concerns of environmental responsibility with manufacturing design and execution. *Society for Manufacturing Engineering*, Dearborn, MI.
- Tibor, T. and Feldman I., 1996. The development of ISO 14000, ISO 14000. *Electronic Green Journal*, 1(6), pp. 27-42.
- Tranfield, D., Denyer, D., and Smart, P., 2003. Towards a methodology for developing evidence-informed management knowledge by means of systematic review. *British Journal of Management*, 14(3), pp.207-222. <https://doi.org/10.1111/1467-8551.00375>
- Yin, H., and Schmeidler, P.J., 2008. Why do standardized ISO 14001 environmental management systems lead to heterogeneous environmental outcomes? *Business Strategy and the Environment*, 18(7), pp.469-486. <https://doi.org/10.1002/bse.629>
- Zobel, T., 2016. The impact of ISO 14001 on corporate environmental performance: a study of Swedish manufacturing firms. *Journal of Environmental Planning and Management*, 59(4), pp.587-606. <https://doi.org/10.1080/09640568.2015.1031882>