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**ISO 14001 CERTIFICATION: BENEFITS,
COSTS AND EXPECTATIONS
FOR ORGANIZATION**

Abstract: In the globalized market, the certification of Environmental Management Systems (EMS), according to ISO 14001 standard, introduced about 20 years ago and reviewed in 2015, is becoming increasingly strategic.

In the last decade, the implementation of the EMSs was widely “metabolized” by organizations, because in this certification scheme, the decision maker recognizes, in the face of significant economic and organizational efforts, the opportunity to enjoy significant benefits from a variety of critical success factors. In fact, all over the world, the number of certified organizations has grown steadily.

However, many organizations still tend to use the tool just because they are interested in grasping some “opportunities” (simplifications in permits, financial and banking incentives). Therefore, in some cases, there is a high risk that the certification may have the sole aim of improving the company’s image, so-called “Green washing,” while in other cases, the many changes required for the proper implementation of the certification create the belief that such a system is “much paper work and few benefits”.

In this work, we present the results of a survey of organizations certified with ISO 14001:2004 in the province of Foggia (Italy) in order to:

- deepen the elements for organizations represent the “utility” and “difficulties” in the implementation of the EMS;
- assess the level of ability of organizations to quantify both the “costs” incurred to achieve and maintain the EMS and the economic “benefits”, organizational and environmental generated from its implementation, and the related time to achieve them;
- understand the future prospects of the organizations in relation to the commitment to continue to bring additional tools for the continuous improvement of environmental performance.

Keywords: Environmental Management System, ISO 14001 certification, benefits.

JEL classification: H76, M12, Q59.

CERTYFIKACJA ISO 14001: KORZYŚCI, KOSZTY I OCZEKIWANIA ORGANIZACJI

Streszczenie: Na zglobalizowanym rynku certyfikacja systemów zarządzania środowiskowego na zgodność z wymaganiami normy ISO 14001, wprowadzona około 20 lat temu i znowelizowana w 2015 r., staje się elementem strategicznym organizacji. W ostatniej dekadzie wdrożony SZŚ był powszechnie „metabolizowany” przez organizacje, ponieważ w tym schemacie certyfikacji to decydująca, w obliczu znacznych wysiłków ekonomicznych i organizacyjnych, może osiągnąć duże korzyści wynikające z uwzględniania krytycznych czynników sukcesu. W rzeczywistości na całym świecie liczba certyfikatów ISO 14001 stale rośnie.

Jednak wiele organizacji nadal wykorzystuje to narzędzie tylko dlatego, że jest zainteresowane osiągnięciem nielicznych korzyści (uproszczenie dokumentacji, zachęty finansowe, bankowe). Dlatego też w niektórych przypadkach istnieje duże ryzyko, że certyfikat ISO 14001 może służyć tylko poprawie wizerunku firmy, tzw. „*green-washing*”, podczas gdy w innych przypadkach wiele zmian wymaganych dla odpowiedniego wdrożenia i certyfikacji SZŚ może stwarzać wrażenie, że jest to system przynoszący „dużo papierkowej pracy i niewiele korzyści”.

W niniejszym artykule przedstawiono wyniki badań organizacji posiadających certyfikat ISO 14001:2004 w prowincji Foggia w celu:

- pogłębienia elementów dla organizacji przedstawiających korzyści oraz trudności we wdrażaniu SZŚ,
- oceny poziomu zdolności organizacji do oszacowania zarówno „kosztów”, jak i ekonomicznych, organizacyjnych i środowiskowych „korzyści” poniesionych podczas wdrażania SZŚ powiązanych z osiągnięciem i utrzymaniem SZŚ,
- zrozumienia przyszłych wizji organizacji w powiązaniu z zaangażowaniem w ich kontynuację w celu przyniesienia dodatkowych narzędzi do ciągłego doskonalenia efektów działalności środowiskowej.

Słowa kluczowe: system zarządzania środowiskowego, certyfikacja ISO 14001, korzyści z wdrożenia SZŚ.

Introduction

The current historical period is characterized by the presence of a marked economic crisis and of a very serious environmental crisis. A lowest common denominator of these crises seems to be detectable in the widespread disinterest shown by the business community for an economy that gives a priority to economic, social and environmental sustainability.

In response to this dual crisis, it is crucial for a widespread adoption of strategies that aim the spread of the “culture” of Corporate Social Responsibility (CSR), and in particular of managerial tools that can deal with the critical issues relate both depletion of natural resources that environmental damages caused by production activities on a global scale, along the value chain, from raw material to final product used by end consumer, to occur. The decision to implement an environmental management system (EMS), adhering to voluntary standards most known as “ISO 14001” and the “EMAS Regulation”, is an effective CSR strategies finalized to improve the environmental performance of an organization [Commission 2001; Ronchi 2014].

The ISO 14001 certification attests the undertaking of private and public organization to adopt an EMS because it can help reduce the negative impacts on the environment and human health, while minimizing environmental damage on the ground, in the water and in the air, at all stages of the life cycle of products / services, according to the principles of the circular economy (“cradle to cradle”).

The EMS is not a product standard, but a standard of system, which is not aimed at what is produced, but “how” it is manufactured, with the prerequisite of the legislative compliance. From the methodological point of view, the basic principle of continuous improvement, through the measurement and record of environmental performance recognized, is the central element of such systems.

After decisions taken in the Earth Summit (UN Conference on Environment and Development), held in Rio de Janeiro in 1992, the first preliminary studies of the standard ISO 14001 for certification of EMS began. Four years later, the international standard ISO 14001:1996 was adopted. After eight years, the standard was updated with ISO 14001:2004 and reviewed in 2015 [ISO 2015; Şahin 2014].

The number of ISO 14001 certifications in 171 countries grew with a CAGR¹ of 25% (from around 14 thousand in 1999 to over 300 thousand in

¹Compound annual growth rate (CAGR) is an average growth rate over a period of several years.

2013). The European organizations certified amounted to 39% of the world total, and their number grew with a CAGR of 22% in the same period. In Italy, one of the 49 European countries monitored by the ISO Survey 2013, the certifications have had an excellent diffusion. Indeed, the number of certificates account for as much as 20% of the entire area (CAGR 39%, from 243 in 1999, and 24662 in 2013). Italy is ranked among the top three countries in the world after China and before Japan [Greenwood *et al.* 2014].

The success (nearly 20 years later) of ISO 14001 is rooted in the widespread awareness among organizations which the EMSs allow to achieve several benefits, even in the face of significant economic and organizational efforts. This has been repeatedly highlighted in the literature, distinguishing also the characteristics peculiar for SMEs [Chin, Chiu, and Rao Tummala 1999; da Fonseca 2015; Hibadullah *et al.* 2013; Hillary 2004; Matuszak-Flejszman 2009; Petroni 2001; Pun and Hui 2001; Raines 2002; Şahin 2014; Sambasivan and Fei 2008; Scipioni, Mazzi, and Vecchiato 2013; Tarí, Molina-Azorin, and Heras 2012; Whitelaw 2004]. The studies show that three types of benefits are mainly considered: environmental performance, efficiency and profitability. Also, other benefits have deserved attention: image improvement, customer satisfaction, performance of workers, competitiveness and relationships with stakeholders. In empirical studies, the benefits are related to increased sales, product quality and market share [Tarí, Molina-Azorin, and Heras 2012]. So, the reasons why organizations implement ISO 14001 are generally identified as:

- to gain or retain market share via a “green” corporate image;
- to attract more ethical investments;
- to reduce insurance risks;
- to reduce prosecution risks;
- to reduce costs [Whitelaw 2004].

The order of importance of the reasons varies. Many organizations still tend to use the tool just because they are interested in grasping some “immediate” opportunities, such as simplifications in permits, financial and banking incentives. In other cases, there is a high risk that the certification may have the sole aim of improving the company's image, so-called “Green washing”; in others, the many changes required for the proper implementation of the certification create the belief that such a system is “much paper work and few benefits” [Petroni 2001].

Therefore, the analysis of the “perceptions” that organizations have, in relation to the possibility of achieving the benefits, and the costs to be incurred related to the process to achieve of the ISO 14001 certification,

becomes a strategic factor. It facilitates the identification of the most significant issues on which it can act, even in relation to the company size and the territorial area, to improve environmental, organizational and economic performances.

In this work, we present the results of a survey about organizations certified in ISO 14001:2004 in the province of Foggia (Italy), conducted in the period January – April 2014, in order to:

- deepen the elements that represent the degree of “utility” and the degree of “difficulty” in the implementation of the EMS;
- assess the ability to quantify both the costs incurred to achieve and maintain the EMS and the economic, organizational and environmental benefits generated from its implementation, and the related time to achieve them;
- understand the future prospects in relation the commitment to adopt additional tools for the continuous improvement of environmental performance.

Benefits, costs and expectations

The survey was conducted at 48 of the 61 organizations certified ISO 14001:2004, in the province of Foggia. These are listed in the ACCREDIA² database in February 2014. The same questionnaire used in the survey CESQA-ACCREDIA 2013 has been given to those organizations. [Scipioni, Mazzi, and Vecchiato 2013].

The questionnaire had the following sections:

1. General information for the organization.
2. Degree of difficulty in implementing the EMS and degree of difficulty and of utility in the functioning the EMS.
3. Costs and Benefits.
4. Future prospects.

The response rate was 31%.

General information on the organization

The requested information included: the nature of the organization, public or private, and, if it is private, its business size (“large company” or “small

² http://www.accredia.it/ppsearch/accredia_companymask_remote.jsp?ID_LIN-K=266&area=7.

and medium enterprise”); accreditation sector “IAF-EA”; number of certified sites; possession of other certifications.

The main features of the organizations are:

- private in nature and 60% fall in the category of “Small and Medium Enterprises” (SMEs);
- accreditation sectors “IAF-EA” mostly represented were “Food, beverages, tobacco”, “Non-metallic Mineral Products”, “Hotels and restaurants”;
- more than 50% had more certified sites;
- 97% was in the possession of another certification (the ranking is “ISO 9001,” “OHSAS 18001,” “EMAS” and “SA 8000”).

Degree of difficulty and degree of utility

We analyzed 17 elements/aspects/requirements of ISO 14001:2004 (Table 1), for each of which has been rated the “degree of difficulty” and “degree of utility”, distinguishing between large companies (LCs) and SMEs, using the method proposed by Likert³ (Likert scale) (Table 2) [Babakri, Bennett, and Franchetti 2003].

Table 1. Elements/aspects/requirements for degree of difficulty and degree of utility

Code	Elements/aspects/requirements
1	Definition of environmental policy
2	Identification and evaluation of environmental aspects
3	Identification of relevant legal and regulatory requirements
4	Setting of objectives, targets and environmental programs
5	Definition of roles and responsibilities
6	Resource allocation
7	Competence, training and awareness
8	Internal and external communication
9	Management of documents and records
10	Preparation of documentation
11	Management of operational control
12	Emergency preparedness and response
13	Monitoring and measurement
14	Evaluation of compliance
15	Non-conformity, corrective and preventive actions
16	Internal audit
17	Management review

³ A Likert scale is the most widely used approach to scaling responses in survey research. When responding to a Likert questionnaire item, respondents specify their level of agreement or disagreement on a symmetric agree-disagree scale for a series of statements. Thus, the range captures the intensity of their feelings for a given item [Burns and Burns 2008].

For almost all of the requirements, Figure 1 shows that the implementation of the EMS is not particularly difficult, both for SMEs and for LCs. Only for SMEs did some aspects “Identification and evaluation of environmental aspects”, “Resource allocation”, “Competence, training and awareness” presented higher degree of difficulty. The aspects that turn out to be less difficult are “Definition of environmental policy” and “Definition of roles and responsibilities.” Finally, the major differences between the assessment of the “degree of difficulty” of SMEs and LCs are detected relatively to requirements “Competence, training and awareness” and “Management Review.”

Figure 2 shows that there is a convergence of views about the great utility of the implementation of the EMS. In particular, this evaluation is more relevant in LCs.

Table 2. Numeric values assigned using the Likert scale

1	2	3	4	5
strongly dis- agree	mildly disagree	neutral	mildly agree	high agree
Degree of difficulty				
very easy	quite easy	information not available	quite difficult	very difficult
Degree of utility				
useless	of little useful	information not available	useful	very useful
Degree of importance				
unimportant	moderately important	information not available	important	very important

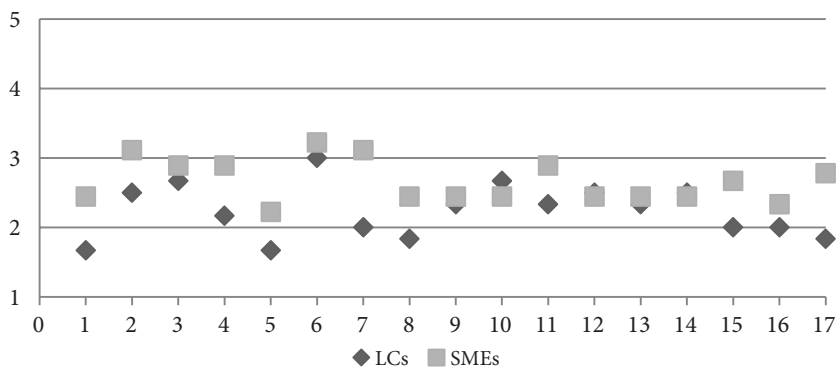


Figure 1. “Degree of difficulty”: LCs vs. SMEs

The major difference of opinion between the two types of organization is noted for the requirements “Management of operational control” and “Non-conformity, corrective and preventive actions.”

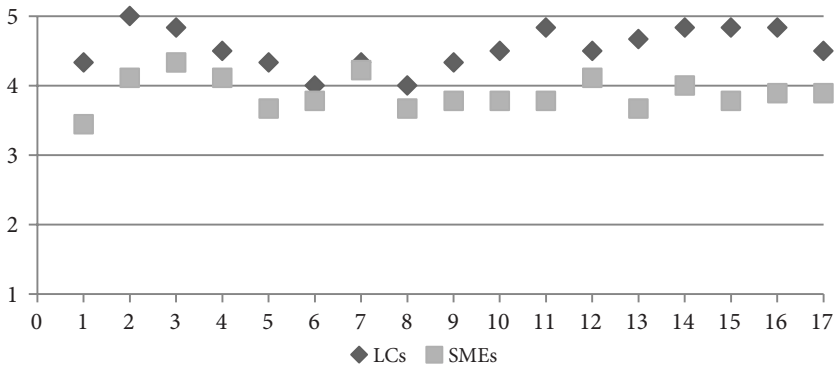


Figure 2. “Degree of utility”: LCs vs. SMEs

Costs and benefits

In the questionnaire were formulated questions on the following topics:

- ability of organizations to quantify the costs and benefits generated by the EMS;
- interventions made by the organization for which it had to incur higher costs to implement the EMS;
- “perception of importance” of the elements/aspects/factors relating to economic (Table 3), organizational (Table 4) and environmental (Table 5) benefits that the organization has achieved after the attainment of certification, analyzed using the Likert scale (Table 2).

Table 3. Elements/aspects/requirements relating to economic benefits

Code	Elements/aspects/requirements
1	Decrease of purchase costs of raw materials and semi-finished
2	Decrease of water consumption costs
3	Decrease of energy costs
4	Decrease of urban waste management costs
5	Decrease of production scraps
6	Benefits banking and/or insurance
7	Reduction of penalties
8	Obtaining financing
9	Increase in turnover
10	Facilitating customer relationships

Table 4. Elements/aspects/requirements relating to organizational benefits

Code	Elements/aspects/requirements
1	Rationalization of the production process
2	Increase staff motivation
3	Good relationships with regulatory bodies
4	Good relationships with local community
5	Good relationships with suppliers
6	Good relationships with customers
7	Decrease of risk of environmental accidents
8	Organization of environmental activities
9	Legislative conformity
10	Facilitation in permits
11	Decrease of criminal and civil risks
12	Facilitation for public contracts
13	Increase of market competition

Table 5. Elements / aspects / requirements relating to environmental benefits

Code	Elements/aspects/requirements
1	Reduction of consumption of raw materials
2	Reduction of water consumption
3	Reduction of urban waste
4	Reduction of dangerous waste
5	Decrease in the consumption of electricity
6	Decrease in the consumption of other fuel sources
7	Reduction of noise generated
8	Reduction of air emissions
9	Reduction of water discharges
10	Reduction of spills into the soil and subsoil
11	Replacement of toxic substances with other more environmentally friendly

The totality of LCs is said to be able to assess the costs and the benefits of the certification; instead, among SMEs, only 44% answered affirmatively. The “Staff training” was indicated by 47% of SMEs and 44% of LCs as the more important cost item to be incurred to achieve and maintain the certification. The indication of a specific type of intervention was not indicated by 33% of LCs and SMEs, while a little over 20% of both size classes have indicated “Changes of the production process.” No respondent indicated the cost item “Product innovation.” As for the timing relating to plant modifications to achieve and maintain the ISO 14001:2004, the survey shows that all types of interventions⁴ were implemented for “less than 6 months”

⁴ Water and gas purification, other purifying equipments, thermal energy production/supplying, electricity production/supplying.

in 67% of LCs and in only 36% of SMEs. About 50% of the latter were not able to indicate the duration of the interventions, compared with 13% of LCs. Over 80% of LCs and only 38% of SMEs claimed up to a maximum of 50,000 Euros for the action “plant modifications” generated by the adoption of the SGA. It should be noted that 60% of SMEs were not able to indicate the amount of the expenses incurred.

The environmental benefits (45%) achieved are preponderant for the LCs, followed by organizational (36%) and economic (18%) benefits. The SMEs have identified organizational and environmental benefits to the same level (50%). No SMEs highlighted the achievement of economic benefits. Figure 3 shows the full agreement of assessment between the two types of organization in the almost all aspects considered, with the exception of the aspects “Decrease of water consumption costs” and “Benefits banking and/or insurance.”

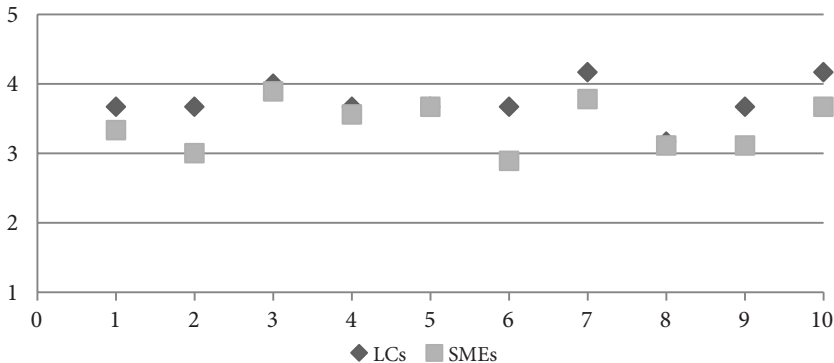


Figure 3. “Degree of importance” of economic benefits: LCs vs. SMEs

In Figure 4, it is noted that all organizations consider all aspects of organizational benefits *important*. Particularly, LCs considered most important the aspects “Decrease risk of environmental accidents” and “Legislative conformity.” Also, SMEs considered the very important latter aspect, together with “Facilitation in the permits.”

Figure 5 shows that the environmental element prevailing for the LCs is considered “Decrease in the consumption of electricity”; instead, for SMEs, it is the factor “Reduction of spills into the soil and subsoil.” The element “Reduction of urban waste” is considered *less important* for the LCs and, on the other side, for SMEs, the aspect “Reduction of consumption of raw materials” (the difference in valuation between the LCs and SMEs is the

highest). In the opposite direction, it is detected for element “Replacement of toxic substances with other more environmentally friendly.”

46% of LCs and 52% of SMEs stated that they had benefited from an overall reduction of environmental impacts by up to 20%. Over a third of SMEs said they were not able to quantify the reduction.

60% of LCs and 50% of SMEs stated that the “environmental improvements” necessary to obtain certification were achieved “within a year” from the beginning of the process of adoption of the SGA. 46% of SMEs answered they were not able to indicate the timing.

Future prospects

It was noted that the “perception of importance” was related to the “future prospects” of the organizations, in order to know their interest in reducing

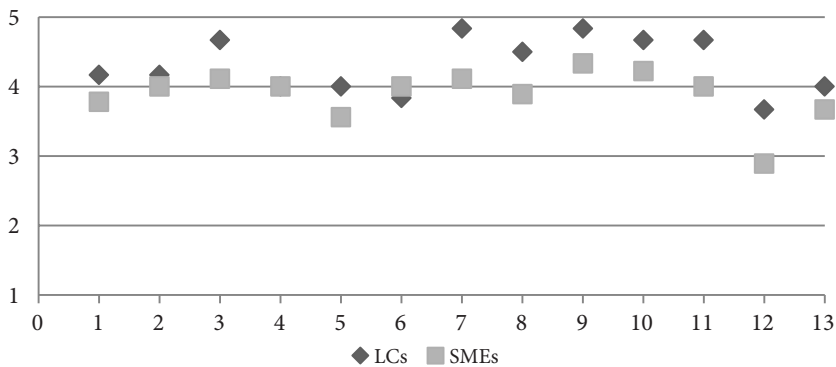


Figure 4. “Degree of importance” of organizational benefits: LCs vs. SMSs

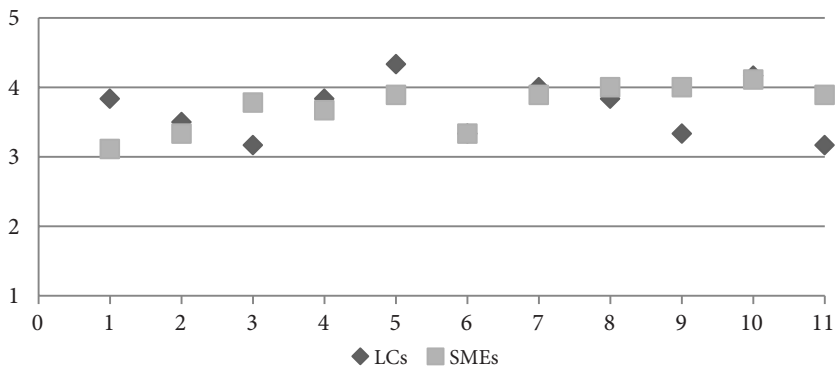


Figure 5. “Degree of importance” of environmental benefits: LCs vs. SMSs

the impacts through the implementation of new tools aimed at improving environmental sustainability (Table 6), analyzed using the Likert scale (Table 2).

Table 6. New tools for environmental sustainability

Code	New tools for environmental sustainability
1	EMAS registration
2	Environmental communication
3	Eco-labeling
4	Life Cycle Assessment (LCA)
5	Eco-design
6	Preventive technologies
7	End of pipe technologies
8	Environmental performance indicators
9	Analysis of environmental costs
10	Carbon footprint
11	Projects of energy sustainability
12	Integration with other management tools
13	Computerization of the documentation system

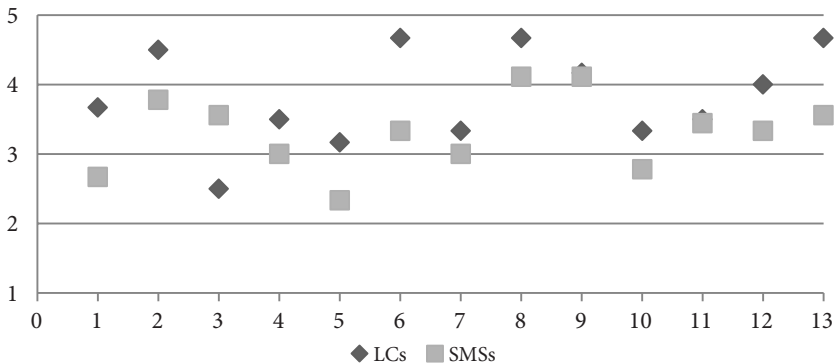


Figure 6. “Degree of importance” of new tools for environmental sustainability: LCs vs. SMEs

Different degrees of importance, highly significant, are observed for several tools (Figure 6). The LCs gave a high degree of importance to “Preventive Technologies,” “Environmental communication,” “Computerization of the documentation system,” and “Environmental performance indicators.” SMEs also considered important the latter tool, to the same extent of “Analysis of environmental costs,” to which even the LCs gave the same level of importance. The tools considered less relevant for SMEs were “Eco-

design,” “EMAS registration,” “Carbon footprint,” but for LCs, it was only “Eco-labeling.”

The major differences in valuation between the LCs and SMEs are shown for tools “Preventive technologies,” “Computerization of the documentation system,” “EMAS registration,” and “Eco-labeling.” Only this tool was considered most important by SMEs.

Conclusions

The ISO 14001 standard was published in an economic context, politically and culturally ready to transpose this voluntary instrument that was designed to complement the existent policies oriented to sustainable development. In fact, in the period 1999–2005, the increase in the number of certificates related to ISO 14001:1996 had marked a CAGR of over 40%.

The first revision of the standard took place in 2004. It was done at a time that followed the financial crisis which erupted in the late twentieth and early twenty-first century, and showed the first signs of the crisis, even more dramatic, that would explode in 2007. The reduction of the interest in issues related to sustainability has also generated a lower attraction of the environmental certifications. In fact, the increase in the number of certificates related to ISO 14001:2004, in the period 2005–2013, recorded a CAGR of just over 13%.

In the course of 2015, the second update of the standard saw the light. The revision is characterized by the following points [ISO 2015; de Fonseca 2015; Catto 2014]:

- within the process of „Strategic Environmental Management,” start an analysis of the organizational context in order to keep in mind the expectations of „relevant stakeholders”;
- identify and consider the opportunities that can generate benefits (both for the organization and for the environment);
- encourage and facilitate better management of specific risks;
- promotion of environmental management with leadership allocated through specific responsibility;
- widening the scope (moving from “pollution prevention” to “environmental protection” by adopting “risk-based thinking”);
- increased attention to environmental performance;
- important role of the „life cycle thinking”;
- emphasis on internal and external communication;

- information documented in line with the evolution of the EMS who use computers and „cloud“;
- ensure it is compatible with other management system standards such as ISO 9001.

The update of the standard seems to be aimed at strengthening a managerial tool able to address the dual economic and environmental crisis in progress, in order to stimulate the birth of a new enthusiasm for the EMS.

The survey about organizations with ISO 14001 certification in the province of Foggia (Italy) supports the need to strengthen the strategic approach to environmental management. It allows one to understand the level of awareness of the leadership of certified organizations in regards to the operation status and the level of effectiveness of their EMS, also in order to assess what are the difficulties and opportunities for manage the transition to the revision of 2015.

In this regard, the study is particularly useful to analyze the sample investigated on the basis of enterprise size, for the purpose of understanding the differences in their level of “perception.” In fact, the study highlights that the LCs demonstrated to have adequate „resources” to manage the certification process. SMEs supported major efforts to adapt to the requirements of the standard. In particular, the results revealed certain difficulties in their ability to measure both the interventions aimed at the acquisition of certification and the positive effects generated by the EMS. Among their future priorities, SMEs highlighted the need to acquire the ability to define and evaluate “Environmental performance indicators.” and the acquisition of adequate tools for the “Analysis of environmental costs.” Instead, LCs identified more significant the adoption of “Preventive technologies,” the definition of a clear “Environmental communication” strategy and the implementation of the process of “Computerization of the documentation system.”

All the organizations had at least a second certification. This finding is perfectly coherent with another essential aspect required by the 2015 revision.

While the LCs are able to pass to the new revision without great difficulties, SMEs need to receive subsidies to acquire the „resources” in order to go ahead some “internal barriers” [Hillary 2004].

Definitively, the survey findings can help policy makers to develop policies to address the current crisis, through support to interventions aimed only at SMEs related to an effective staff training be able to create the „skills” necessary for adoption of EMS.

References

- Babakri, K.A., Bennett, R.A., Franchetti, M., 2003, *Critical Factors for Implementing ISO 14001 Standard in United States Industrial Companies*, Journal of Cleaner Production, no. 11(7), pp. 749–752.
- Burns, A., Burns, R., 2008, *Basic Marketing Research*, 2nd ed., Pearson Education, New Jersey.
- Catto, E.G., 2014, *Il punto sulle norme: ISO 14001:2015 e ISO 14004:2015*, Newsletter, no. 5, Settembre, pp. 1–6.
- Chin, K., Chiu, S., Rao Tummala, V.M., 1999, *An Evaluation of Success Factors Using the AHP to Implement ISO 14001-based EMS*, International Journal of Quality and Reliability Management, no. 16 (4), pp. 341–362.
- Commission of the European Communities, 2001, Green Paper on Integrated Product Policy, COM 68 final, 7.02.2001.
- da Fonseca, L.M.C.M., 2015, *ISO 14001:2015: An Improved Tool for Sustainability*, Journal of Industrial Engineering and Management, no. 8(1), pp. 37–50.
- Greenwood, L. et al., 2014, *ISO 14001 Continual Improvement Survey 2013. Final Report and Analysis*, © ISO.
- Hibadullah, S.N. et al., 2013, *ISO 14001 Performance Efforts and Environmental Performance in Malaysian Automotive Industry*, Journal of Environmental Science, Computer Science and Engineering & Technology, no. 2(1), pp. 129–138.
- Hillary, R., 2004, *Environmental Management Systems and the Smaller Enterprise*, Journal of Cleaner Production, no. 12(6), pp. 561–569.
- ISO 14001:2015, 2015, Environmental management systems – Requirements with guidance for use, (c)ISO.
- Matuszak-Flejszman, A., 2009, *Benefits of Environmental Management System in Polish Companies Compliant with ISO 14001*, Polish Journal of Environmental Studies, no. 18(3), pp. 411–419.
- 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, no. 9(4), pp. 351–364.
- Pun, K.F., Hui, I.K., 2001, *An Analytical Hierarchy Process Assessment of the ISO 14001 Environmental Management System*, Integrated Manufacturing Systems, no. 12(5), pp. 333–345.
- Raines, S.S., 2002, *Implementing ISO 14001 – An International Survey Assessing the Benefits of Certification*, Corporate Environmental Strategy, no. 9(4), pp. 418–426.
- Ronchi, E. et al., 2014, *Le imprese della green economy. Green Economy Rapporto 2014*, Edizioni Ambiente, Milano.
- Şahin, Ş., 2014, *Environmental Management Systems (EMS) and Applications in a PVC Window and Door Production Operation*, Journal of Selçuk University Natural and Applied Science Online, ICOEST’2014 – SIDE, pp. 1001–1011.

- Sambasivan, M., Fei, N.Y., 2008, *Evaluation of Critical Success Factors of Implementation of ISO 14001 Using Analytic Hierarchy Process (AHP): a Case Study from Malaysia*, Journal of Cleaner Production, no. 16(13), pp. 1424–1433.
- Scipioni, A., Mazzi, A., Vecchiato, C., 2013, *Benefici, costi e aspettative della certificazione ISO 14001 per le organizzazioni italiane*, L'indagine CESQA-ACCREDITA, http://www.accredia.it/news_detail.jsp?ID_NEWS=1422&areaNews=22>emplate=newsletter_mailing.jsp [access: 29.03.2015].
- Tarí, J.J., Molina-Azorin, J.F., Heras, I., 2012, *Benefits of the ISO 9001 and ISO 14001 Standards: A Literature Review*, Journal of Industrial Engineering and Management, no. 5(2), pp. 297–322.
- Whitelaw, K., 2004, *ISO 14001 Environmental Systems Handbook*, 2nd ed., Elsevier Butterworth-Heinemann Ltd, Oxford.