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A Systematic Procedure to Combine the Integral Management Systems in a Services Sector Company

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Nowadays, the companies with national leadership have decided to provide services that allow the industries to give solutions for manufacturing, repair, reconstruction, maintenance and supply to the necessary tools necessary for the operation of the machinery required in the development of projects. The objective of this work is based on the identification of the relationship and points of convergence between the ISO 9001:2015, ISO 14001:2015, ISO 50001:2011, and OHSAS 18001:2007 standards, for the implementation of the IMS-HSE (Integrated Management System and Health, Safety and the Environment respectively), in companies in the metal-mechanical sector that develop their economic activity in Colombia. An analysis of the regulatory structure was conducted, identifying common and non-common aspects to find a compliance baseline that provides business leaders with a decision-making tool for implementing Geographical Information System (GIS) and HSE aimed at continuous improvement. The result of this research offers a characterization regarding scope, planning, performance evaluation and development in legal terms, applied to the systems integrated into the service company in the metal-mechanical sector. So that, the results can be used as an operational and organizational tool that provides them with a characteristic of viability, competitiveness, and profitability compared to companies in the same dynamic scenario, guaranteeing compliance with the legal commitments of the Colombian regulatory framework.
Keywords: Standards, Environment, Quality, Occupational Health, Industrial Safety, Management System.

1. Introduction

The current business dynamic has meant that the different sectors of the economy are in constant technological progress, meeting new requirements of the consumer market (Demand) and taking into account the expected scarcity of natural resources (Bamber et al., 2002). In this context, there is a need for the integration and application of the current regulations governing all processes (López-Fresno 2010), to maintain and highlight the best companies in the market (Beckmerhagen et al., 2003). Within the regulatory framework of integration are the Quality Management Systems (QMS), the Environmental Management Systems (EMS), the Occupational Health and Safety Management Systems (OSHMS) (Karapetrovic and Willborn, 2015), and with the novelty of integration to this set of regulations and in search of continuous improvement of the Energy Management Systems (EMS) based on the 50001 standards (Prias Caicedo and Campos Avella 2013), becoming the fundamental basis of competitiveness for certified quality each one of the companies in the market.

International standardization bodies such as ISO (International Organization for Standardization) have developed management models that provide a structure for certification and evaluation in various areas and functions, including the International Standard ISO 9001: 2015, ISO 14001:2015, OHSAS 18001: 2007 (New 45001: 2018), ISO 50001:2011 (Management 2011), with the sole purpose of providing companies with tools for regulated and operational competitiveness. These systems can work without interaction between them, but at the structural and organizational level, it is counterproductive (Jørgensen et al., 2016), because the results of external audits are the result of compliance with each system (Bamber et al., 2002). The foundation of the

integration of management systems has been base on a focus on synergies and common elements in all the operations, for working together, which strengthens their results, reduces time, human effort, as well as their technical and financial resources (López-Fresno 2010). This approach preceeds the common elements of the PDCA cycle (Planning, Doing, Checking and Acting) seen from the perspective of a high-level structure, and which were developed and reformulated taking into account each of them (Prashar 2017) (Sangpikul 2017).
At present, companies from the service and production sector from all over the world have undertaken their trajectory in relation to the certification of Integrated Systems, for example, companies from the food sector where the research reflected the emerging horizons of environmental management (Mezinska and Strode 2015), Colombian fertilizer companies where it has a high energy consumption (Valencia et al., 2017), among other (Pierucci et al., 2017).
The main contribution of this study, which is applied to both industry and academia, is the generation of a global mapping of four management systems with the identification of the relationship and points of convergence between the standards, as a novelty for inclusion in the ISO 50001:2011 standard, identifying the main opportunities for improvement in industrial processes and especially those that require large amounts of energy for production, is aligned to the cycle of continuous improvement mentioned above, PDCA.

2. Methodology

In convergence with the structural regulations, the methods adopted for the model regulations integration has been base on the Deming model (Hillmer and Karney 2001), which establishes clear guidelines and drive objectives for companies, to promote and maintain continuous improvement in the organizational processes of companies in the service sector, the overall methodological idea is shown in Figure 1.

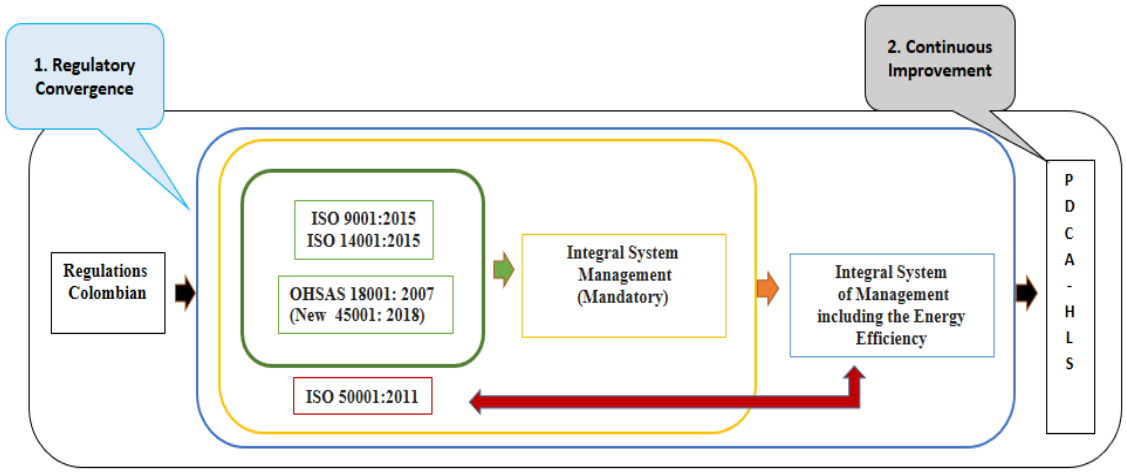

Figure 1: Inclusion Model Regulations.

Each of the standards was reviewed on an individual basis, identifying the common aspects assessed in the external and internal audits. In this way, the characters (items) of possible risks of non-compliance of each of these were identified, taking into account the requirements of the High Level Structure (HLS), (Scope, normative references, terms and definitions, context of the organization, leadership, planning, support, operation, performance evaluation, and improvement). With this identification, each of the standards was integrated into the four-step PDCA cycle as shown in Fig 1. proposed and validated in a company in the service sector in Colombia, a few companies in this sector demonstrate the orderly and systematic documentation of energy management. Despite the limitations of the study for its design, it is fair to assume that the survey is representative in the service sector industries that do not yet implement the Integrated Management System, from an Energy Management business perspective, either because of the availability of resources or because of ignorance of the importance of the application of this system in their processes.

3. Results and discussions

The methodology proposed for this study has been introducing in the companies of the service sector that have high energy consumption, located in the city of Barranquilla, Colombia. The objective of this analysis has

been to know the convergence of the different regulations including those that are not mandatory for quality certifications but they are also standards that allow for financial savings in the various systems that the company has. Additionally, seen from the Deming perspective, to propose continuous business improvement.

3.1 Analysis of regulatory convergence.

The fundamental differences between ISO 9001: 2015, ISO 14001:2015, OHSAS 18001: 2007 (New 45001: 2018), and ISO 50001:2011 has been base on the procedures that each standard requires, the characteristics of the registers. The specific requirements of each subject (Quality, Environment, Industrial Safety, Occupational Health, and Energy Management), and fundamental aspects of the same element applied in each standard.
In this way, an HLS-based allowed the inclusive comparison between the standards. Table 1 was constructed to analyze the similarity in each of the standards, allowing service company managers to identify the fundamental aspects of compliance with each standard, .

Table 1: High-Level Structural Requirements (HLS)

High Level Structure Requirements(HLS)

Standards	1. Scope			2. Normative References			3. Terms and Definitions			4. Context of the Organization			5. Leadership			6. Planning			7 . Support			8. Operation			9. Performance Evaluation			10. Improvement		
	C	N.C.	A	C	N.C.	A	C	N.C.	A	C	N.C.	A	C	N.C.	A	C	N.C.	A	C	N.C.	A	C	N.C.	A	C	N.C.	A	C	N.C.	A
ISO - 9001	4.3			2			3			4			5			6			7			8			9			10		
ISO - 14001	4.3			2			3			4			5			6			7			8			9			10		
OHSAS - 18001		4.1		2			3					X		4.4.1-4.2			4.3			4.4			4.4.6-4.4.7			4.5			4.5.3.2	
ISO - 50001		4.1b)		2			3					X		4.2.1-4.3			4.4			4.5			4.5.5			4.6			4.6.4	

C: Convergent
NC: Not Convergent
A: Absent

The results indicate that there is synergy between each standard, in each of the aspects of HLS and numerically convergent, achieving an integrated approach to each of the issues evaluated. The integration of these systems includes the service, design, production, storage, sales and final disposal of the company's finished products and waste, as well as the energy consumption established within the limits of its facilities, based on the requirements of the interested parties and in accordance with the international standards ISO 9001:2015, ISO 14001:2015, OHSAS 28001 and ISO 50001:2011, demonstrating in general commitment and leadership in the planning, implementation, and monitoring of GIS, promoting continuous improvement, customer focus, management of occupational health and safety, efficient use of energy and system resources. Additionally, the integration allows in your planning to determine the percentage of compliance with the requirements to generate actions to be agreed and the deadlines at defined intervals to update the matrix of legal requirements and other requirements, through support tools such as the identification of the needs of products and services, obtaining information from customers focused on continuous improvement of processes and thus determine, review and control changes in the needs of customers and the organization and its design and development of products and services implement and maintain a design and development process for the subsequent provision of products and services. All of the above establishes a procedure that will allow top management to take corrective action on the nonconformities presented, for which they determine the identification and registration of corrective actions (Need to correct nonconformities, action plan and those responsible), authorization of corrective actions, application of corrective actions and final follow-up and closure of corrective actions.

3.2 Vision PDCA

The PHVA methodology has been developed through 4 stages that allow the realization of an iterative exercise of permanent operation in the framework of a monitoring and feedback model that helps the decision

making based on real facts and precise data that are collected after the planned and rigorous measurement. The schematic representation is shown in Figure 2.

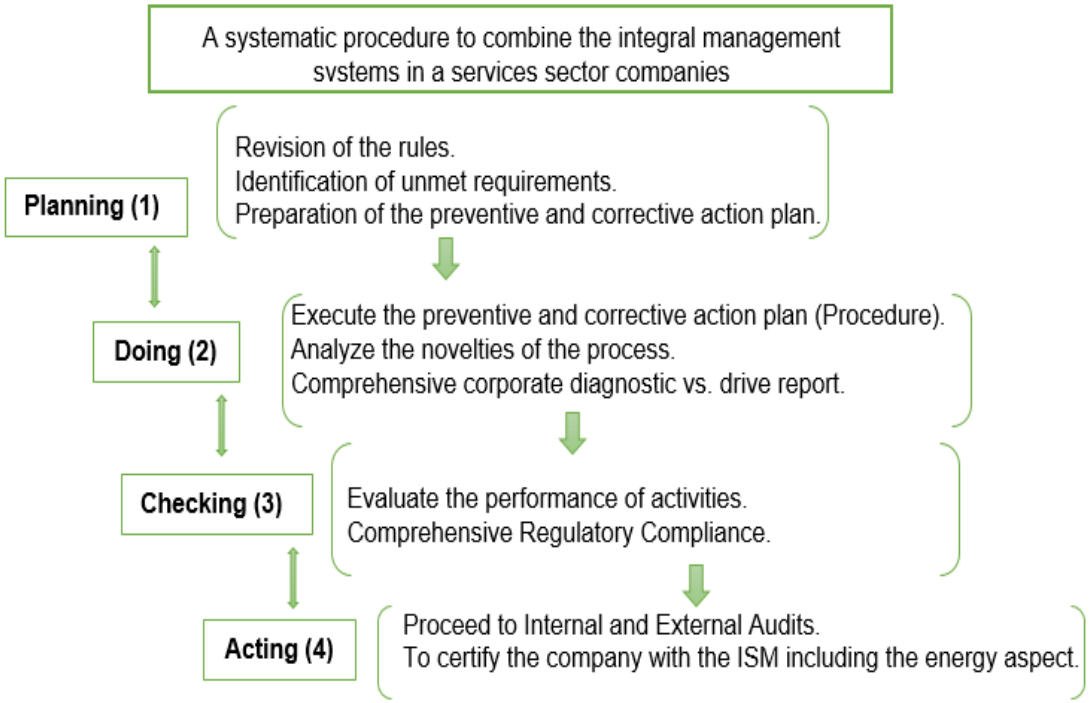

Figure 2: The inclusion of the method PDCA in the systematic procedure to combine the integrated management systems in a services sector company.

Within the framework of the processes that make up the Deming cycle (1-2-3-4), management is responsible for directing business policies, taking into account the appropriation of each of the convergent items, to carry out the regulatory integration that allows certification from any area. Thus, it is necessary to mention that the occurrence of appropriation leads to the identification of the magnitude and nature of the risks, proposing their prevention. The proposal made to the company was the following:

Planning: The planning of fundamental objectives becomes the theoretical basis for the development of policies that will lead to the improvement of processes. These objectives must focus on: a) Improving the energy efficiency of production processes, b) Improving the efficient use of resources involved in production processes, c) Reducing levels of pollutant emissions into the environment and d) Increasing the degree of customer satisfaction. In the same way as GIS programs, promote compliance with them through a) Energy efficiency program, focused on the reduction and better use of the organization's energy resources within production processes, b) Efficient use of resources, focused on the use of renewable and non-renewable resources used in production processes. c) Environmental impact program, focused on the reduction of waste generated by production processes and their final disposal, and d) Customer service program, focused on knowing customer expectations and needs, attention to information that may be required by the customer and measuring ultimate customer satisfaction.

Doing: They have been based on the necessary procedures which are: training, and external and internal communication, which allow a) to identify the competencies required for each of the different roles they perform, affecting compliance with the policy, objective and goals, as well as environmental performance, compliance with legal and other requirements and control of significant energy uses related to the operation of the System , b) Determine for each of the roles involved in the performance of the GIS the training needs ,c) Develop a training plan focused on preparing the staff for the efficient execution of their responsibilities and functions related to the System , d) Evaluate the effectiveness of the actions taken and take action e) Keep documented information. And in the case of communication, the following must be defined according to the legal requirements and other requirements: a) Defining the internal and external parties involved in the organization in relation to knowing information relevant to the System , b) In both cases, both for internal and external communication, defining for each of the GIS elements: The parties involved who must know about a specific GIS element, the time at which they must be informate, the role within the organization in charge of

delivering the relevant information, the means under which the data will be described, c) Keeping documented information.

Checking: The performance evaluation process of the System must allow for the constant monitoring, measurement, analysis and evaluation of its performance, for which it is determined: a) the system components to be monitored, the criteria under which the management indicators will be evaluated, the periods of review and evaluation of the different management indicators, the methods of analysis and assessment, b) minimum criteria to be assessed, the minimum criteria to be evaluated in accordance with the ISO 9001:2015, ISO 14001:2015, and ISO 50001:2011 standards are the conformity of products and services, the significant uses of energy and other elements resulting from the energy review, the assessment of actual energy consumption with the expected level, the degree of customer satisfaction, the performance and efficiency of the GIS, if planned has been efficiently implemented, the effectiveness of actions taken to address risks and opportunities, the performance of external suppliers and finally the need for System improvements.

Acting: To carry out the external and internal audits to know the opportunities for improvement of the process, in the field of conformity of the service provided, the significant uses of energy and other elements resulting from the energy review. Additionally, the evaluation of the actual energy consumption with the expected, the degree of customer satisfaction, the performance and efficiency of the implemented, if the plan has been efficiently implemented, the effectiveness of actions taken to address risks and opportunities, the performance of external suppliers, and finally the need for integral system improvements.

In this way, all the systems required in Colombia to belong to the group of competitive companies in the service market can be fully certified.

4. Conclusions

This work was prepared for both, business and academic purposes, where the convergence, complementarity, and need to integrate each of the study standards were analyzed. These were ISO 9001: 2015, ISO 14001:2015, OHSAS 18001: 2007 (New 45001: 2018), and ISO 50001:2011.

Through the analysis of the Standards, it was possible to propose a comprehensive conceptualization focused on the items that will allow companies in the service sector to study, to achieve competitiveness in the market. The companies that manage to execute the rules alternately and satisfactorily comply with the audits will have as their primary basis the Colombian legislation in their favor.

The fact of turning this study into a romantic proposal for management makes it a subtle tool to employ, facilitating management's decision in the face of business actions related to their primary political structure.

In key aspects, it is concluded that the organization must ensure that there is clarity regarding the objectives, methodology and basic concepts related to the implementation of the integrated management system and that all personnel is aware of it.

The implementation and development of the Integrated Management System must be controlled by monitoring each of the processes, as a commitment, not only to customers, but also to employees and society in general, and finally, in order to integrate the system, all the areas that contribute to the development of each organization must be linked together in order to control, monitor and evaluate the evolution of each one with regard to the implementation of the integrated management system.

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