"DESIGN OF AN EVOLVING SYSTEM FOR THE IMPLEMENTATION OF AN INTEGRATED QUALITY AND ENVIRONMENT MANAGEMENT SYSTEM IN MALAGASY COMPANIES"

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ABSTRACT

In an increasingly dynamic and complex environment, it is a challenge for organizations to constantly meet the requirements and take into account the future needs and expectations of customers. In a highly competitive market, the interest is not only to satisfy customers but also to build a good image. Promoting quality and the environment, which are both concepts oriented towards sustainable development, is an effective way to stand out. However, the problem is to know: How to implement practical and effective quality and environmental management systems? Implementing a management system is a project of change with varying degrees of importance in terms of cost and investment; furthermore, quality and environmental management must take into account technical regulatory constraints. However, there are several similarities between the management of these two areas. Thus, in order to optimize the management of these fields, the aim of this research is to look for a mechanism for implementing a system that integrates quality and the environment into a single management system. Indeed, managing these areas is a voluntary approach for companies, whose first principle of success is to meet the needs of the present without compromising the ability of future generations.

Keywords: *Device - Environment - Management – Quality - System*

INTRODUCTION

Companies create wealth and evolve in a dynamic social and environmental environment. Conveying a good image is a strategy to position themselves in a complex and demanding market. Thus, these companies are forced not only to offer products and services that meet the requirements of customers, but also to take care of the impact of their activities on the environment. This situation pushes them to improve their quality and environmental standards. The principle of management in these areas is based on the mastery of skills, on the optimization of resource consumption through greater involvement of staff and improvement of the entity's processes.

Since then, quality standards have continued to evolve by setting up sectoral reference systems to meet the specific needs of economic sectors. Indeed, the International Standards Organization's procedures dictate that all standards must be reviewed at least every five years to determine whether they should be reaffirmed, revised or withdrawn.

Quality has evolved to identify and satisfy latent customer needs. Quality in this case is about satisfying the needs of these consumers before they become aware of them. Quality management allows to improve the quality and thus to satisfy the expressed or not needs of the customers or users.

The system must consider the final customer in order to create a product or a service that precisely meets his explicit or implicit needs.

Environmental issues have become increasingly important in recent decades. It has been the origin of a generalized mobilization in the face of the accelerated degradation of planetary ecosystems. The environmental problem is no longer a technical and scientific issue, it is a real socio-political issue. Ecologists, governments and companies are all appealing to the idea of sustainable development by taking up the dual challenge of economic development and environmental protection.

Environmental management has several objectives: improving the company's image, improving relations with the neighborhood, or obtaining an ecolabel or other environmental certification.

The environmental management system is a management tool for the company and the community that enables it to organize itself in such a way as to reduce and control its impact on the environment. It inscribes the commitment to environmental improvement of the company or the community in the long term by allowing it to improve continuously.

In the field of business, implementing a management system means implementing a well-defined approach according to the activity and the objective of the company. Integrated management has become a key success factor because, not only is it a strategic axis at the organizational level, but it is also a means for companies to obtain a competitive advantage by standing out through standardization. The commitment to this type of approach is based on the awareness of companies to meet the requirements of customers and stakeholders. The integrated management system is useful for developing responsible actions that are increasingly oriented towards standardization.

Quality management and environmental management are two very different fields, but their conception at company level brings them together with the same objective, which is to stand out by considering the requirements of third parties and the environment. Thus, a fusion of these two fields in a single management system is possible despite their specificities. The major stake of the implementation of the integrated management system is to place the companies in a step of progress in terms of effectiveness and efficiency, allowing the satisfaction of all the interested parties. The management systems managing the two areas are part of the open perspective for sustainable development through the improvement of the results of the company's activities, including product quality and environmental impact. Thus, managing quality and the environment through a single management system is more practical and efficient. This vision requires companies to have a great capacity to adapt and above all an effective managerial approach.

These visions push to model an evolutionary device of implementation of an integrated Management System quality and environment.

The major stake with such an evolutionary device is to facilitate the task of the company in the effective implementation of the integrated management system quality and environment, and to take part effectively on the improvement of the global performance of the company.

The problem that arises is therefore to know: How to implement practical and effective quality and environmental management systems?

The integrated quality and environment management model is designed based on the requirements of the relevant standards, avoiding redundancies, and conducting a general policy to ensure a good image for the company. The steps of the model design follow the method MEVA[1] . The implementation of the model will then be tested at the company level, assuming that the implementation of this integrated management system will improve quality and environmental management.

The experimentation is done on a sample of fourteen companies working in the field of hydrocarbon transport in Madagascar. The choice of this sector of activity is dictated by a certain number of criteria favorable to the research. Indeed, companies operating in this sector are subject to quality constraints and CSR standards in a vision for sustainable development.

The verification of the hypothesis is carried out by analyzing the results of an opinion poll conducted among the employees of these companies concerning the effectiveness of the experimental system. The evaluation of the evolutionary system of implementation of the management systems relates to the steps of implementation of the system: Launching, planning, management of the resources, implementation and control and follow-up.

[1] Modélisation- Expérimentation- Validation- Application

An experimentation by a scientific method which consists in using statistical calculations: the correlation method to confirm the validity of the hypothesis and to obtain quantitative data allowing to refine it. The qualitative data obtained by experimentation will be analyzed by a software recognized by its effectiveness which is the "Sphinx" in order to validate the hypothesis. Indeed, the Sphinx software allows the design of a questionnaire, the capture and analysis of the responses and the exploration of the recorded data.
The software integrates more advanced multidimensional analysis techniques (factorial analysis, typology, etc.) and can analyze any file containing numbers and/or text, regardless of its origin. Also, the software allows to process open-ended questions, non-directive interviews or any other text regardless of its origin.

CONCEPTUAL BASE OF THE STUDY

The management system is an approach that brings together the provisions relating not only to actions to be taken in the face of risks and opportunities, but also to the determination of legal requirements, and especially to the setting of objectives and planning of actions to achieve them. This approach mobilizes, in a permanent way, all the members of the company in order to manage and improve the effectiveness of its operation in front of the evolution of its environment. Total efficiency is part of a continuous improvement approach, which is a concept inspired by the wheel of DEMING[2].
During the planning process, and particularly in setting objectives, the standard requires consideration of the overall issues and expectations of its workers and other stakeholders, and identifies the "risks and opportunities" that may arise from hazards, risks, and legal and other requirements. This approach allows the policy and objectives to be more closely aligned with the company's overall strategy.
Resource management concerns the evaluation and allocation of the resources necessary for the operation of the management system.
Implementation must consider operational control, preparation and response to emergency situations. The company must establish processes to manage changes that affect its operations, such as working conditions, changes in knowledge about hazards and risks.
For monitoring and follow-up, the organization must determine what needs to be monitored and measured, including the effectiveness and efficiency of operational and other prevention measures. And finally, for continuous improvement of the company's overall performance, it must formalize corrective actions to reduce the gaps between the set and achieved objectives.
The SMQ is composed of a set of management tools made available to the management, which, by nature, must coordinate activities to guide and control the organization it directs.
The system consists in putting under control a set of processes, wishing to obtain products or services corresponding to the required quality levels. The company must understand the implicit and explicit needs of their customers and satisfy their requirements.
Quality is relative, as it depends on the requirements of customers and also of the company's internal and external stakeholders, as well as on the consideration of risks of all kinds. Total quality management is a way of managing an organization, focused on quality, based on the participation of all its members and aiming at long-term success through customer satisfaction and benefits for the members of the organization and for society.
Quality management standards are based on a number of principles, including a strong customer orientation, management motivation and commitment, process approach and continuous improvement.
The 9001 standard is derived from the 9000 standard, which is a benchmark aimed at improving perceived quality and, consequently, customer satisfaction. In order to simplify and make it more accessible for companies, the ISO certifiable standards have been gathered into a single ISO 9001. The adoption of the basic principles of quality management and best practices, namely: customer orientation, leadership, employee involvement, process approach, management by system approach, PDCA (Plan-Do-Check-Act) continuous improvement, factual approach to decision making, mutually beneficial relationships with suppliers. This International Standard specifies the requirements for a quality management system where the organization not only needs to demonstrate its ability to consistently provide products and services that meet customer and applicable legal and regulatory requirements, but also aims to increase customer satisfaction through the effective application of the system, including processes for system improvement and assurance of conformity with customer and applicable legal and regulatory requirements.
The environment is the set of elements (biotic or abiotic) that surround an individual or a species and some of which contribute directly to its needs, or as the set of natural (physical, chemical, biological) and cultural (sociological)

[2] La roue de DEMING se décompose en quatre phases :
- Plan : Préparer, planifier. Cela correspond à la stratégie.
- Do : Développer, réaliser, mettre en œuvre. Cela correspond à l'exécution des tâches.
- Check : Contrôler. Cela correspond à la vérification.
- Act : Agir, ajuster. C'est que l'on met en place une action pour ajuster.

conditions likely to affect living organisms and human activities. In the 21st century, the protection of the environment has become a major issue, at the same time as the idea of its degradation, both global and local, due to polluting human activities, has been imposed.

An Environmental Management System is a tool, a mode of organization which should allow an organization to structure its environmental management and to improve its environmental performance. It will allow to identify priorities, to plan a program of actions, to implement technical, financial and human means, to check and follow the evolution of the fixed objectives. This system allows the organization to reduce and control its impact on the environment.

Environmental management, also called environmental management, or eco-management, refers to the management methods of an entity (company, service...) aiming to take into account the environmental impact of its activities, to evaluate this impact and to reduce it.

The following ISO standards describe the SME :

- ISO 14001 [ISO 96-1] and ISO 14004 [ISO 96-2], define the specifications and guidelines for the use and implementation of the EMS.

- ISO 14010 [ISO 96-3], ISO 14011 [ISO 96-4] and ISO 14012 [ISO 96-5] define the principles and procedures for environmental auditing, as well as the qualification criteria for environmental auditors.

The ISO 14001 environmental management system standard is not a substitute for regulation and does not impose environmental obligations in the strict sense. Its primary objective is to provide a universal environmental management tool to prevent environmental protection from becoming a non-tariff barrier to the movement of goods **(Gendron, 2004**). he 2004 version of the ISO 14000 series includes ISO 14001, which specifies the requirements for an EMS, and ISO 14004, which provides guidelines for their implementation.

The standard allows organizations to formulate an environmental policy and objectives and is applicable to any organization that wishes to: implement, maintain and improve an environmental management system, ensure its compliance with the established environmental policy, demonstrate to others its compliance, seek certification or registration of its SME with an external body, perform a self-assessment and self-declaration of conformity to the standard.

Environmental management is the desire to minimize the harmful effects of its activities on the environment and also to improve its environmental performance.

The integrated quality and environmental management system (SMQE) is inspired by the ISO 9001 standard, quality management system (SMQ), internationally recognized and the ISO 14001 standard: environmental management system (SME). The reading of the standards allows us to see that there is a real compatibility between these two standards. However, the purposes are different, the quality management system meets the needs of customers while the environmental management system meets the needs of interested parties.

The SMQE has as input the needs and requirements of the interested parties. The operational process begins with management leadership and commitment to quality by developing a quality policy that guides all activities.

Next, planning for non-conformance prevention followed by resource management to ensure the implementation of the system. The control and monitoring concern the audits for the conformity of the activities by the procedures set up, the management review for the improvement of the system.

And finally, the output elements are the satisfaction of the interested parties which testifies the result of the performance of the system.

The quality and environment approach aims to improve the quality of products, services or benefits to customers, while taking care of environmental impacts.

The implementation of a quality and environment management system (SMQE) allows organizations to meet the requirements of the different stakeholders of the organization.

The evaluation of the effectiveness of the quality and environmental management system will be done through an experiment with a few companies and the opinions of the employees of these companies regarding the practicality of the system and the improvements made by the system will be used as a benchmark.

RESULTS

Analysis of the practicality of the device

In any project, effectiveness is not only limited to the expected results but also and above all oriented towards the practicality of the system. The following results refer to the employees' opinions on the practicality of the managerial approaches designed to implement a quality and environmental management system.

In concrete terms, the practicality of a system must respond both to the fact that the steps of its implementation are complete and well understood but also judged easy by the users or employees on the one hand, but on the other hand, that this practice meets the initial expectations of companies so that the change made does not generate a

certain resistance that could be detrimental to the duration of its implementation in the organization. The results of our study establish the uniformity of the opinions collected from the employees of the companies which reveal in a general way their agreement on the practical side of the device.

Table 1: Mean scores of employee opinions on device practicality items.

items for evaluating the practicality of the system	Mean	Ecart type
In your opinion, are the steps of the system complete?	3,26	,789
In your opinion, are the steps of the system understood?	3,30	,802
In your opinion, are the steps of the system easy to implement?	3,28	,820
In your opinion, does the system meet the initial expectations of the companies?	3,30	,808
In your opinion, does the system not generate resistance to change?	3,35	,774
In your opinion, does the system allow the SMH3SQE to be implemented in record time?	3,29	,779

Source: Author, 2020

Concerning the contributions that could be generated by the system, the five items used to assess them evaluate the enrichment of maturity through feedback, the achievement of objectives, the improvement of personal development, but above all the contribution to the certification of the company in the areas and the profitability of the system.
It is clear from the averages and standard deviations of the opinions of the respondents presented in the table below that the employees more than agree on the capitalization of the values generated by the system, given that the average scores exceed the scale of 3, which marks the overall agreement of the respondents.

Table 2: Average scores of evaluation items for the device's contributions

Items for evaluating the contributions of the system	Mean	Ecart type
In your opinion, has the feedback during the implementation enriched the maturity of the company?	3,28	,797
In your opinion, does the system allow the company to reach its objectives?	3,29	,773
In your opinion, does the system improve the personal development of employees?	3,33	,764
According to you, the system allows the company to be certified to reinforce its H3SQE commitment ?	3,32	,741
According to you, the system is profitable for the company ?	2,86	,567

Source: Author, 2020

Evaluation of the improvements made by the EQMS

It should be remembered that before the experiment, these companies already had management systems that managed quality and the environment separately. The new system is supposed to bring improvements in both areas.
The following results explain the changes observed in quality and environmental management during the experimentation.

Quality management improvement

When the quality management system adopted is successful, it is mainly reflected in the success of all the company's initiatives. Quality refers to the ability of a company to meet the requirements of its customers. These requirements can be implicit or explicit.
This means that quality is not really what the company thinks it has put into a product or service.

On the contrary, it is what the customer can see in it. Quality also takes into account what the customer is willing to pay for a given service or product. Everything else is non-value and wasteful.
It is from this angle that we have focused the evaluation of the impact of the system on quality management. Also, the criteria selected address the control of procedures, the quality of products, the degree of customer satisfaction and the price ratio.
These four elements are considered reliable for the evaluation if we refer to the value of Cronbach's Alpha coefficient greater than 1, presented in the following table.

Table 3: Reliability statistics for items measuring the impact of the system on quality management

Cronbach's Alpha	Cronbach's Alpha based on standardized items	Number of elements
,869	,870	4

Source: Author, 2020

The results of the study of the employees' opinions on the above-mentioned criteria, shown in the table below, establish in a general way that the quality management has produced states of consolidation since the establishment of the system. The average scores, which are all higher than 3, and the standard deviation values, which are all below the average, guarantee the uniformity of the quality management progress report.

Table 4: Items for measuring the impact of the system on quality management

Impact measurement items	Mean	Ecart type
131Do you think that the control of procedures has been improved since the application of the new system?	3,27	,794
132Do you think the quality of products has improved since the implementation of the new system?	3,32	,767
133In your opinion, has the level of customer satisfaction been improved since the application of the new system?	3,32	,747
134Do you think the relationship with third parties has been improved since the application of the new system?	3,34	,712

Source: Author, 2020

Improvement of environmental management
Integrated environmental management develop the will to reduce the ecological footprint on the environment and the will of sustainable development. There has been an awareness of the irreversible nature of certain behaviors.
The environment and its management is the will to reduce to a minimum the harmful effects of its activities on the environment and also to improve its environmental performance. (ISO 14000 standard).
Our criteria for evaluating the impact of the environmental management system of the companies in the study use 4 items that are generally focused on corporate social responsibility, such as energy consumption, water treatment system, environmental training and environmental rehabilitation system.
Unfortunately, the reliability analysis of the respondents' opinions on the use of these 4 criteria seems to be lacking in our measurement scales according to the value of Cronbach's Alpha coefficient of 0.509 lower.

Table 5: Reliability statistics for environmental management measurement items

Cronbach's Alpha	Cronbach's Alpha based on standardized items	Number of elements
,509	,507	4

Source: Author, 2020
In order to be objective in the analysis of the results of the environmental management after the introduction of the system, we identified the relevant criteria for this study by observing the fluctuation of the values of Cronbach's Alpha coefficient by deleting one by one the items in the battery of measures.

The results obtained in the table below show that the removal of the water treatment system and energy consumption favorably increase the coefficient values to units greater than 0.7.
We deduce that in the current economic context, for companies the high costs of using renewable energy and wastewater treatment techniques respectively are still unaffordable and lead them not to consider them in their environmental management.

Table 6: Items for measuring the impact of the system on environmental management

Environmental management measurement items	**Cronbach's Alpha when the item is deleted**
135Do you think the energy consumption has been improved since the implementation of the new system?	,765
136Do you think the wastewater treatment system has been improved since the implementation of the new system?	,833
137Do you think the environmental training system has been improved since the implementation of the new system?	,368
138Do you think the environmental rehabilitation system has been improved since the application of the new system?	,517

Source: Author, 2020

Evaluating the real impacts of the environmental management system through the average scores on opinions, it is clear that there is no improvement in energy consumption and water treatment, as the scores are lower than 3. However, the states of improvement are very noticeable in the environmental training systems and environmental rehabilitation, as the average scores of 3.782 and 3.823 invoking the state of very improved, obtained, evaluating the opinions of employees are very close 4.

Table 7: Average scores of the two items selected for the environmental management evaluation

Items selected for the evaluation of environmental management	**Mean**	**Ecart type**
137In your opinion, has the environmental training system been improved since the application of the new system?	3,782	,783
138In your opinion, has the environmental rehabilitation system been improved since the implementation of the new system?	3,823	,593

Source: Author, 2020

EFFECT OF THE IMPLEMENTATION OF THE SMQE ON THE IMPROVEMENT OF QUALITY AND ENVIRONMENTAL MANAGEMENT AT THE ENTERPRISE LEVEL

Over the last few decades, many organizations have established a quality assurance system in order to satisfy their customers and to better manage their continuous improvement processes. Several national and international standards have appeared in different countries. However, the awareness of interested parties and the development of legislation have led to the implementation of additional environmental audits. Thus, the integrated quality and environment management system designed and presented in the previous section is supposed to lead to improvements in the quality and environment management of companies.
The verification of this last hypothesis also returns the same techniques as before.
Also, we can deduce from the values of the coefficient of determination R^2 of 0.816 and 0.752, associated respectively with the regression models of the states of improvement of the management of quality and the management of the environment based on the standards of implementation of the 4 phases device, the significance of these two models if we refer to the values of the significant p-values lower than 0.05.

Table 8: Summary of the quality management and environmental management models by the 4 implementation phases of the system.

Model	R		R-two	R-two adjusted	Standard error of the estimate	Modifier les statistiques				
						Variation of R-two	Variation of F	ddl1	ddl2	Sig. Variation of F
Quality management	0,903[a]		0,816	0,812	0,27787	0,816	215,629	4	195	0,000
Environmental management	0,743[a]		0,752	0,743	0,29537	0,552	60,110	4	195	0,000

a. Predictors: (Constant), control_monitoring_1, resource_management, implementation, score_launch_1
Source: Author, 2020

The results of the F-test on the ANOVA of the relevance of the two models confirm the predictive effects of the 4 phases on the improvement states of quality management and environmental management because the p-values equal to 0.00 are lower than the error risk of 5%.

Table 9: ANOVA of the quality management and environmental management models by the 4 implementation phases of the system.

Model		Sum of squares	ddl	Medium square	F	Sig.
1	Regression	66,598	4	16,650	215,629	0,000
	Residuals	15,057	195	0,077		
	Total	81,655	199			

a. Dependent variable: quality management improvement

Model		Sum of squares	ddl	Medium square	F	Sig.
1	Regression	20,977	4	5,244	60,110	0,000
	Residuals	17,012	195	0,087		
	Total	37,989	199			

a. Dependent variable: improvement of environmental management

b. Predictors: (Constant), control_monitoring_1, Resource management, implementation, launch score
Source: Author, 2020
However, the analysis of the p-values associated with the different coefficients of the 4 phases of implementation of the device by comparison with the risk of error of 5% allows us to identify :

Table 10: Coefficients of the model of quality management improvement through the 4 phases of implementation

Model		Non-standardized coefficients		Standardized coefficients	t	Sig.
		B	Norme Ecart	Bêta		
1	(Constant)	-0,321	0,188		-1,708	0,089
	score_launch_1	0,419	0,192	0,275	2,181	0,030
	Resource management	0,186	0,112	0,175	1,658	0,099
	Implementation	0,199	0,137	0,162	1,457	0,147
	control_monitoring_1	0,344	0,193	0,310	1,787	0,076

a. Variable dépendante : amélioration du management qualité
Source: Author, 2020
- On the one hand, the p-value of the implementation coefficient is critical because its value of 0.147 exceeds the 0.05 threshold. This implementation phase did not show significant contributions to the quality management improvement states.

Table 11: Model coefficients of the improvement of the environmental management by the 4 phases of implementation of the system

Model		Non-standardized coefficients		Standardized coefficients	Model	Sig.
		B	Norme Ecart			
1	(Constant)	0,889	0,200		4,444	0,000
	score_launch_1	0,032	0,204	0,031	0,158	0,875
	Resource management	-0,014	0,119	-0,019	-0,116	0,908
	Implementation	0,400	0,145	0,475	2,749	0,007
	control_monitoring_1	0,200	0,205	0,264	0,974	0,031

a. Dependent variable: improvement of environmental management
Source: Author, 2020

- On the other hand, the same table of coefficients but on the model of environmental management below informs us that the state of improvement of quality management is mainly due to the implementation and control and monitoring of the system. Indeed, only the values associated with these two components are lower than 0.05.
The validation of the hypothesis comes from the significance of the model of the effectiveness of joint management of quality and environment.
According to the results of our analysis of the predictive effect of the improvements of the respective management of quality and environment, based on the F-test of the coefficient of determination R^2 and the ANOVA of the model, we can deduce from the tables of results establishing the significant p-values (lower than 0.05) below that the model is significant.
The state of effectiveness of the joint management of quality and environment is then justified by the states of improvement observed in the management of quality and environment. The latter are themselves justified by the 4 phases of implementation of the system.

Table 12: Summary of the effectiveness model of joint quality and environmental management by the respective states of improvement of quality and environmental management

Model	R		R-two	R-two adjusted	Standard error of the estimate				
					Variation de R-deux	Variation of R-two			
1	0,710[a]	0,704	0,699	0,398	0,504	98,049	2	193	0,000

a. Predictors: (Constant), environmental management improvement, quality management improvement
Source: Author, 2020

Table 13: ANOVA model of effectiveness of joint quality and environmental management by the respective states of improvement of quality and environmental management

Model		Sum of squares	ddl	Medium square	F	Sig.
1	Regression	31,111	2	15,555	98,049	0,000
	Residuals	30,619	193	0,159		
	Total	61,730	195			

a. Dependent variable: 152 How effective do you think the quality and environmental management system is?
b. Predictors: (Constant), environmental management improvement, quality management improvement.
Source: Author, 2020
The table of coefficients of the model of effectiveness of the joint management of quality and environment, whose associated p-values are all lower than 0.05, expresses the significant contribution of the states of improvement of the management of the two components on the effectiveness of joint management. The hypothesis is validated.

Table 14: Management coefficients for the effectiveness of joint quality and environmental management

Model		Non-standardized coefficients		Standardized coefficients	Model	Sig.
		B	Norme Ecart	Beta		
1	(Constant)	0,651	0,194		3,363	0,001
	improvement of the quality management	0,341	0,055	0,391	6,151	0,000
	improvement of environmental management	0,513	0,081	0,402	6,321	0,000

a. Dependent variable: 152 In your opinion, is the quality and environmental management system effective?
Source: Author, 2020

CONCLUSION

The implementation of these management systems requires a complete process to be followed successively. The effectiveness of management systems depends largely on the success of these steps. Several standards and reference systems are already available to guide companies in the management of sensitive areas. However, the evolution and the contexts push to the need for approximation, standardization and coherence. Quality and the environment are two different fields, yet the similarities noted in the objectives and the required approaches encourage the integration of the two fields into a single management system. The EQMS is the logical extension of the quality and environmental standards. The implementation of this management system is based on a device requiring a complete approach to be respected successively, namely: the launch, the management of resources, the implementation, the control and follow-up. The repercussions of this system on the management of the domains are judged positive according to the analyses of the results of survey made with the companies in which the device is tested. This effectiveness is justified not only by the practicality of the system but also by the improvements that it has brought to the quality and environmental management initiated by the companies.

Doesn't the integration of the two fields in a single management system constitute an effort of rationalization in order to avoid the use of disparate tools and to optimize costs?

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- **ISO 21500 : 2012 /« Lignes directrices sur le management de projet »**

ANNEXES

Annexe 1

Trends in Respondents' Responses to the Launch Device

VARIABLE	ITEMS	Mean	Ecart type
Launch of the dispositif	Are staff invited to participate in device planning?	1,71	,780
	Is the meeting room set aside for all staff?	1,72	,829
	Is an attendance sheet available for each meeting?	2,10	,527
	Are minutes kept for each meeting?	2,45	,671
	Has a call for expressions of interest been made for committee members?	1,71	,762
	Is a profile required for the coordinator position?	3,31	,739
	Is the H3SQE policy written by the coordinator?	3,29	,753
	Is the H3SQE objective proposed by the coordinator?	2,84	,583
	Is the organizational chart developed by the coordinator?	3,27	,819
	Are the terms of reference set by the coordinator?	3,37	,697
	Is the information management system developed by the coordinator?	3,26	,834
	Is the H3SQE hazard list developed by the coordinator?	3,32	,754
	Are the risk assessment methods developed by the coordinator?	3,23	,876
	Are the prevention plans developed by the coordinator?	3,32	,754
	Is the calculation of the effectiveness and efficiency of the plan developed by the coordinator?	2,51	,665
	Is the selection of the coordinator approved by the committee?	3,26	,822
	Is the H3SQE policy approved by the committee?	3,34	,733
	Is the H3SQE objective approved by the committee?	3,33	,789
	Is the H3SQE organizational chart approved by the committee?	3,33	,758
	Are the terms of reference approved by the committee?	3,30	,777
	Is the information management system approved by the committee?	3,36	,750
	Is the H3SQE hazard list approved by the committee?	3,28	,820
	Are prevention plans approved by the committee?	3,31	,766
	Are the risk assessment methods approved by the committee?	3,28	,778
	Is the calculation of the plan's effectiveness and efficiency rate approved by the committee?	2,88	,572
	Are the committee members validated by management?	3,71	,727
	Is the selection of the coordinator validated by management?	3,28	,809
	Is the H3SQE policy validated by management?	3,35	,735
	Is the H3SQE objective validated by management?	3,80	,636
	Is the H3SQE organization chart validated by management?	3,28	,809
	Are the responsibilities validated by management?	2,86	,562
	Is the information management system validated by management?	3,23	,847
	Is the H3SQE hazard list validated by management?	3,27	,792
	Are the risk assessment methods validated by management?	3,31	,746
	Are the prevention plans validated by the management?	3,32	,781
	Is the calculation of the plan's effectiveness and efficiency rate validated by management?	3,68	,795
	Are the committee members introduced to the staff?	3,30	,749
	Is the coordinator introduced to the staff?	3,69	,780
	Is the H3SQE policy presented to staff?	2,93	1,042
	Is the H3SQE objective presented and understood by staff?	3,25	,831
	Is the H3SQE organizational chart presented to staff?	3,29	,804
	Are the terms of reference read and approved by staff?	2,89	,608
	Is the information management system presented and applied by staff?	2,92	,547
	Is the H3SQE hazard list presented and understood by staff?	3,69	,773

	Are risk assessment methods presented and understood by staff?	2,86	1,061
	Are the prevention plans presented and understood by the personnel?	3,30	,794
	Is the calculation of the effectiveness rate of the plan presented and understood by the personnel?	2,94	,541

Source: Author, 2020

Annexe 2

Overall trends in the views of employees in the study sample on resource management in the scheme

Study items for resource management	Mean	Ecart type
Is the competency profile and staff training plan developed by the coordinator?	2,99	1,025
Is the budget developed by the coordinator?	2,12	,560
Is the infrastructure and equipment determined by the coordinator?	2,87	1,083
Are the processes, procedures, work instructions, records and awareness developed by the coordinator?	3,30	,783
Is the information system determined by the coordinator?	2,93	,584
Are the competency profile and training plan for staff approved by the committee?	3,35	,700
Is the budget approved by the committee?	3,34	,704
Is the infrastructure and equipment approved by the committee?	3,27	,825
Are the processes, procedures, work instructions, records and awareness approved by the committee?	3,22	,896
Is the information system approved by the committee?	3,33	,783
Are the staff competency profile and training plan validated by management?	3,28	,802
Is the budget validated by management?	3,69	,829
Is the infrastructure and equipment validated by management?	3,25	,813
Are processes, procedures, work instructions, records and awareness validated by management?	3,73	,756
Is the information system validated by management?	3,31	,784
Are the competency profile and training plan presented and understood by staff?	2,10	1,025
Is the budget presented and understood by the staff?	2,52	1,421
Is the infrastructure and equipment presented and understood by the staff?	2,93	1,020
Are the processes, procedures, work instructions, records and awareness presented and understood by staff?	3,29	,811
Is the information system presented and understood by staff?	2,89	1,048

Source: Author, 2020

Annexe 3

Descriptive statistics of employees' views on the implementation of the scheme

ITEMS	Mean	Ecart type	Analyse N
Is the monitoring plan developed by the coordinator?	3,35	,727	400
Has the coordinator prepared a report on the actions carried out?	3,27	,836	400
Is the results dashboard developed by the coordinator?	3,30	,775	400
Is the compilation of contingency plans developed by the coordinator?	3,34	,733	400
Is the monitoring plan approved by the committee?	3,32	,768	400
Is the summary of completed actions approved by the committee?	3,33	,743	400
Are the results presented to the committee?	3,32	,761	400
Are contingency plans approved by the committee?	3,04	,550	400
Is the monitoring plan validated by management?	3,34	,765	400
Is the review of completed actions validated by management?	3,26	,846	400
Are the results reported to management?	3,67	,857	400
Are emergency response plans validated by management?	3,34	,753	400
Is the monitoring plan presented and understood by the staff?	3,16	,610	400

Is the results of the actions taken presented and understood by the staff?	3,02	,665	400
Are staff informed of the results?	3,25	,830	400
Are emergency response plans presented and understood by staff?	3,52	,782	400

Source: Author, 2020

Annexe 4

Statistics on the evaluation of the monitoring and control system

Items	Mean	Ecart type	Items	Mean	Ecart type
Is the internal audit program developed by the coordinator?	3,30	,819	Is the external audit program validated by management?	3,31	,823
Is the external audit program developed by the coordinator?	3,30	,794	Is the compilation of control device rules validated by management?	3,67	,804
Is the compilation of control device rules developed by the coordinator?	3,29	,766	Is the system for encouraging staff to report anomalies or opportunities for improvement validated by management?	3,29	,818
Is the system for encouraging staff to report discrepancies or the opportunity for improvement developed by the coordinator?	2,91	,578	Are corrective action lists validated by management?	3,28	,784
Is the compilation of corrective action lists developed by the coordinator?	3,26	,822	Is the evaluation of corrective actions validated by management?	3,24	,820
Is the evaluation of corrective actions developed by the coordinator?	3,33	,770	Is the corrective maintenance plan for risk control validated by management?	3,35	,727
Is the corrective maintenance plan for risk control developed by the coordinator?	3,31	,773	Is the internal audit program presented and understood by staff?	2,54	,672
Is the internal audit program approved by the committee?	3,31	,765	Is the external audit program presented and understood by the staff?	2,45	,678
Is the external audit program approved by the committee?	3,31	,753	Is the compilation of control rules for control devices presented and understood by staff?	3,32	,767
Is the compilation of control device rules approved by the committee?	3,27	,825	Is the system for encouraging staff to report discrepancies or opportunities for improvement presented and understood by staff?	3,24	,816
Is the system for encouraging staff to report discrepancies or opportunities for improvement approved by the committee?	3,33	,729	Are corrective action lists presented and understood by staff?	3,29	,785
Are corrective action lists approved by the committee?	3,31	,773	Is the evaluation of corrective actions presented and understood by personnel?	2,96	1,014
Is the evaluation of corrective actions approved by the committee?	3,34	,725	Is the corrective maintenance plan for risk control presented and understood by staff?	3,26	,858
Is the corrective maintenance plan for risk control approved by the committee?	3,31	,738	Is the external audit program validated by the management?	3,31	,823
Is the internal audit program approved by management?	3,35	,741	Is the compilation of control device rules validated by management?	3,67	,804

Source: Author, 2020

Annexe 5
Average scores for environmental management evaluation items

	Mean	Ecart type
135In your opinion, has the energy consumption been improved since the application of the new system?	2,46	,664
136Do you think the wastewater treatment system has been improved since the application of the new system?	2,92	,505
137Do you think the environmental training system has been improved since the implementation of the new system?	3,28	,783
138Do you think the environmental rehabilitation system has been improved since the application of the new system?	2,88	,593

Source: Author, 2020