

**HUMAN RESOURCE MANAGEMENT AND
ENVIRONMENT MANAGEMENT SYSTEMS:
AN EMPIRICAL STUDY**

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De conformidad con la base quinta de la convocatoria del Programa de Estímulo a la Investigación, este trabajo ha sido sometido a evaluación externa anónima de especialistas cualificados a fin de contrastar su nivel técnico.

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HUMAN RESOURCE MANAGEMENT AND ENVIRONMENT

MANAGEMENT SYSTEMS: AN EMPIRICAL STUDY

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Abstract

The present study focuses on understanding and measuring the effect that the implementation of an ISO 14001 environmental management system (EMS) has on human resource (HR) management in a company. The paper proposes and applies a measurement instrument to test the hypotheses derived from the theoretical framework established by Daily & Huang (2001) as well as from the ISO 14001 standards. Data collection was carried out by mailing a survey to the person responsible for environmental affairs of businesses with an ISO 14001 EMS implemented, or in the advanced stages of being implemented, in one autonomous region of Spain. Both reliability analysis and factor analysis, if necessary, were performed for the scales used. The results obtained indicate that the HR factors act as predicted by the hypotheses, except in the case of rewards. Finally, the present study provides empirical evidence in order to test and extend the model proposed by Daily & Huang.

Keywords: Human resource management, Environmental Management System, ISO 14001, certification

1. Introduction

The present study focuses on understanding and measuring the effect that the implementation of an ISO 14001 environmental management system has on human resource management in a company. The relevance of environmental aspects in various areas of company management has been increasing at the same time that environmental consciousness has been increasing on the social and individual level. On the other hand, companies have been evolving from a reactive attitude involving simply pollution control and legislative compliance to a more proactive one. They are now putting more emphasis on damage prevention instead of repair, and in minimizing natural resource consumption and environmental contamination (Russo & Fouts, 1997; Aragón-Correa, 1998; Brockhoff et al., 1999; Sharma, 2000). In the final analysis, this has converted the environment into another issue to be taken into account when it comes to making strategic and operational decisions, both at the corporate and the functional level (Dechant & Altman, 1994; Hart, 1995; Aragón-Correa, 1998; Sharma & Vredenburg, 1998; Berry & Rondinelli, 1998, Henriques & Sadorsky, 1999; Hoffman, 2001).

The role of human resource management in company environmental management receives partial attention in many of the above cited papers, however only in a few does it constitute the main focus. Morgenstern et al. (2002) study the potential job losses due to the application of environmental standards. Several papers treat various aspects of the role of managers (Sharma & Nguan, 1999; Bansal & Roth, 2000; Cordano & Frieze, 2000; Ramus & Steger, 2000; Aragón-Correa et al., 2002). And yet others highlight the relevance that certain human resource practices have on appropriate company environmental management (Egri & Herman, 2000; Hanna et al., 2000; Daily & Huang, 2001; Egri & Hornal, 2002).

It is this last group that is closest to our area of study and merits closer review. Egri & Herman (2000) focus on the role of leadership, specifically on values and leadership styles of environmental managers drawn from a sample of U.S. and Canadian companies. The Hanna et al. (2000) study focuses on the role of work groups and the relation of these groups to production process type, operating results, employee involvement and environmental results. As for Egri & Hornal (2002), they introduce the concept of strategic environmental management of human resources, and suggest that adequate HR management provides essential support to the environmental management of a company. Specifically they study the relation between various human resource practices and the organizational results of a sample of Canadian industrial companies.

The scope of the studies cited above is limited to the current situation in the U.S.A. and Canada, where the ISO 14001 presence is in the minority. However, in Europe, and increasingly in Asia as well, implementing an EMS that meets the ISO 14001 guidelines is the path chosen by a wide variety of companies to deal with their environmental management [1] For this reason it is worthwhile to clarify the relation between the implementation of an environmental management system of this type, and some of the most relevant questions concerning human resource management. This is the perspective adopted in the work of Daily & Huang (2001) who, based on the similarities that exist between environmental management systems and quality management systems, propose a theoretical framework in order to analyze the human resource factors that affect the implementation of an environmental management system that conforms to the ISO 14001 standard. From the literature about quality (Flynn et al., 1994; Saraph et al., 1989) it can be deduced that there is a strong relation between the appropriate implementation of quality management systems and some human resource

factors such as top management support, training, rewards, employee empowerment and teamwork. Based on the expectation that the situation is similar for an EMS, Daily & Huang elaborate a model, which up until the present has lacked an empirical test. In this model, they identify five human resource factors as being the most relevant to environmental management: top management support, training, teams, rewards and empowerment.

The main contribution of the present study is to provide empirical evidence in order to test the model proposed. At the same time, we propose to add to the hypotheses deduced from the original model with others elaborated from the ISO 14001 standard itself. In short, the objective of this paper is to propose and apply a measurement instrument to permit testing the hypotheses derived from the theoretical framework established by Daily & Huang (2001) as well as from the ISO 14001. In order to do this, we will begin by carrying out a review of the role that people play in the ISO 14001 standard. In the next section, the hypotheses of the paper will be elaborated based on the reference model, the ISO standard and a review of the literature. Following that, we will explain the empirical study carried out as well as the process employed in measuring the variables. Finally, the results will be analyzed and conclusions presented.

2. People in the ISO 14001 guidelines

The objective of the ISO 14001:2004 international standard is to support the protection of the environment and the prevention of pollution in balance with socioeconomic needs (ISO, 2004). The standard also contains requirements such that an environmental management system enables an organization to establish and evaluate the effectiveness of the procedures to implement an environmental policy and

objectives, to achieve compliance with these parameters and to demonstrate this compliance to third parties (ISO, 2004). Moreover, this system must be based on certain basic principles, and put forward some requirements. Specifically, the principles of the standard include an emphasis on prevention, continuous improvement and the commitment of management and employees. As for the requirements, they refer to, among others, training and professional competence, job planning, and communication with all relevant interested parties.

An analysis of the ISO 14001 standard also makes it clear that the implementation of an EMS according to the specified requirements has a clear impact on numerous aspects that relate to human resource management in an organization, namely:

- The standard states in the utilization guidelines that the success of an EMS implementation requires the commitment of all the employees of an organization, and, as a result, environmental responsibilities should not be considered restricted to the environmental function, but rather could be included in other areas of the organization.
- In the section of the ISO 14001 that relates to environmental management, there is a requirement that responsibilities to achieve the objectives and goals in each relevant function and level of the organization be assigned. As a result, it appears reasonable to expect that this translates into increased empowerment of people in the organization.
- The section relating to operational control requires that an organization identify the operations and activities associated with significant environmental aspects[2] according to its policy, objectives and goals, and establish and maintain up-to-date procedures related to these aspects.

- Additionally, in making reference to training, the standard requires that employees or members of the company be aware of their functions and responsibilities in achieving compliance with the environmental policy and procedures, and of the requirements of the system. Both elements point to the view that the environment be considered as a transverse responsibility.
- The higher degree of both employee empowerment, and the performance of tasks related to the prevention and reduction of environmental impacts[3] from company activity requires, on the other hand, providing each person with the knowledge and tools necessary to achieve these ends. The standard requires, in the section relating to training, awareness and professional competence, that all personnel whose work could generate a significant environmental impact receive adequate training and have professional competence based on appropriate education, training or experience.
- Along with this increased concern for preparation, the organization is also required to make its employees or members aware of the importance of complying with the environmental policy and procedures of the EMS. Employees are also to be made aware of their functions and responsibilities relating to this compliance, of the environmental impacts of their activities and of the consequences of non-compliance with the specified procedures. In this area, the influence of the corporate culture will depend on the level of real management involvement, which needs to reinforce to the employees the veracity of the company's environmental commitment.

3. Hypotheses

As discussed in the introduction, Daily & Huang (2001) identify five human resource factors that prove relevant to the appropriate implementation of an EMS according to ISO 14001. In this section, each of these factors will be analyzed in order to establish hypotheses concerning the role played by each one in the implementation and certification process of an ISO 14001 EMS.

3. a. Top Management Support

The support and involvement of top management appear essential to the satisfactory implementation of an EMS as well as for the successful execution of any type of entrepreneurial initiative (Wilms et al., 1994; Argyris, 1998), including the introduction of environmental considerations in company strategy (Banerjee, 1998). Specifically, top management's role centres equally on achieving a more flexible culture as well as on providing information. The former results in a culture that is favourable to change, thus facilitating adaptation to the system requirements, and the latter permits participative management as well as superior functioning and control of the system (Kitazawa & Sarkis, 2000; Gupta & Sharma, 1996). In the literature, emphasis is placed on top management's role, however the standard insists on the need for involvement and participation of all management levels. For this reason, the role of the overall management team is as important here as it is understood to be in the sphere of quality management (Powell, 1995). And consequently, we propose to test the following two hypotheses:

Hypothesis a.1: In companies that adopt an EMS according to ISO 14001, involvement and participation of top management is promoted.

Hypothesis a.2: In companies that adopt an EMS according to ISO 14001, involvement and participation of middle management is promoted.

3.b Training

The ISO standard, as has been previously stated, makes express mention of the need to train employees so that they can adequately fulfil their functions. The literature has amply stressed the fundamental nature of training in terms of the appropriate implementation of environmental actions (Dechant & Altman, 1994; Starik & Rands, 1995; Wehrmeyer, 1996). This emphasis on training is also cited as one of the principal benefits associated with the implementation process (Groenewegen & Vergrart, 1991; Kitazawa & Sarkis, 2000). Training, along with the availability of information, is a potent instrument in terms of bringing about change leading to more proactive environmental attitudes (Bansal & Roth, 2000; Sharma, 2000). On the other hand, training programs should include not only issues directly related to the environment, but also other management techniques such as teamwork, interpersonal skills and others that aid in promoting the cultural change required (Saraph et al., 1989; Bhushan & McKenzie, 1994). At the same time, and though Daily & Huang do not make express mention of it, it is also true that the training of the management team is as important as that of the employees. This is indicated in the corresponding section of the standard and can be deduced from studies centred on the sphere of quality (Powell, 1995). The hypotheses in this case are:

Hypothesis b.1: In companies that adopt an EMS according to ISO 14001, employee training in environmental issues, as well as specific management techniques, is promoted.

Hypothesis b.2: In companies that adopt an EMS according to ISO 14001, manager training in environmental issues, as well as specific management techniques, is promoted.

3.c Empowerment

Empowerment can be defined as the construction, development and increase in employee power brought about by sharing and teamwork (Ghoshal & Bartlett, 1995). For some, empowerment signifies allowing employees to decide how to satisfy the client, while for others it is providing employees with almost unlimited power to deal with whatever problem that may arise (Bowen & Lawler, 1992). Employee empowerment is as essential in the environmental area as it is in others (Powell, 1995, Ahire et al., 1996). As has been shown through an analysis of the ISO 14001 standard, a large part of the efforts relating to environmental processes, in terms of both prevention and control, fall on the employees. In this sense, a relation is suggested between satisfactory environmental results and the degree to which empowered employees are involved (Hanna et al. 2000). In short, according to Daily & Huang (2001), motivated and empowered employees are necessary, at least, in the communication, control and preparation, and emergency response phases. The hypothesis relating to this issue is:

Hypothesis c.1: In companies that adopt an EMS according to ISO 14001, an increase in employee empowerment tends to be produced.

3.d Teamwork

Teamwork appears to be an essential instrument in quality management systems in that it permits information sharing and fosters cooperation in order to improve results

(Coyle-Shapiro, 1995). For these same reasons, it can be assumed that a similar situation prevails in terms of environmental management systems. On the other hand, teams which group together various functions and departments could be especially useful in achieving environmental results as problems in this area usually surpass formal departmental limits (Kitazawa & Sarkis, 2000). These groups find themselves subject to specific conditions (Denison & Hart, 1996) deriving from members' diverse backgrounds, preferences and expectations, as well as from the time demands and other pressures they often face. In summary, according to Daily & Huang (2001), the implementation of an EMS that conforms to ISO 14001, will require communication and coordination between different departments throughout the entire organization, and thus the hypothesis we formulate in this area is:

Hypothesis d.1: In companies that adopt an EMS according to ISO 14001, the flow of information and coordination between departments tends to increase.

3.e Rewards

The existence of a well-designed rewards system can help to motivate employees to achieve satisfactory performance levels, including in the environmental area. The existence of a rewards system that takes environmental aspects into account is an indirect reflection of the level of management commitment to the environmental issue. The rewards could be monetary or non-monetary (Milliman & Clair, 1996; Ramus & Steger, 2000), and could be tied to individual, group or organizational actions (Egri & Hornal, 2002). In any case, rewards must be tied to the attainment of environmental objectives (Starik & Rands, 1995), and be consistent with other facets of the rewards system of the organization (Dechant & Altman, 1994; Flannery et al.,

1996). Following the separation employed in previous sections between managers and employees, the hypotheses relating to rewards are:

Hypothesis e.1: In companies that adopt an EMS according to ISO 14001, a greater link between the rewards received by management and the attainment of environmental objectives tends to be established.

Hypothesis e.2: In companies that adopt an EMS according to ISO 14001, a greater link between the rewards received by employees and the attainment of environmental objectives tends to be established.

4. Data collection and measurement of variables

4.1 Data collection

The information necessary to test the hypotheses put forward was obtained in an empirical study. The specifications of this study are shown in Table I. It was decided to conduct the research in one specific geographic area (the autonomous region of Cantabria) as this facilitated achieving a higher response rate as well as obtaining information and access to the majority of the companies.

Table I: Specifications of the empirical study

Population	56 companies, in all sectors, with an ISO 14001 EMS implemented or in the process of being implemented, and located in the region of Cantabria
Data collection techniques	Questionnaire mailing with telephone follow-up
Sample size	40 companies (71.4% response rate ⁴)
Margin of statistical error	± 8.1% (95.5% confidence interval)
Date of fieldwork	November / December 2002

To obtain an up-to-date census of the population under study we made use of information from the “Sociedad Española de la Calidad”, as well as the Cantabria Chamber of Commerce which, through its initiative, “Programa Cantabria XXI”, actively promotes the implementation of environmental management systems in the region’s businesses. Through the use of these two sources, and after the rectification of the initial data received, it was determined that the total number of businesses with an ISO 14001 EMS implemented, or in the advanced stages of being implemented, was 59. The principal characteristics of our sample are shown in Table II. In our sample, no restrictions were established regarding business sector or company size, although these variables were controlled.

Data collection was carried out by mailing a survey to the person responsible for environmental affairs, if there was such a person and he or she could be identified, or, to the managing director. An explanatory letter was enclosed with the survey describing the motive and objectives of our research, guaranteeing the privacy of the data provided, and offering, as an incentive, to provide the study results. Prior to the survey mailing,

the companies were advised of the study and encouraged to participate by officials of the Chamber of Commerce's "Programa Cantabria XXI".

Table II: Sample population characteristics

Number of employees	%	Business sector	%	Geographical sphere	%
Less than 50	27.5	Industrial	72.5	International	66.0
Between 50 and 200	42.5	Services	15.0	National	13.0
More than 200	30.0	Construction	12.5	Regional	21.0

Data collection took place during the months of November and December of 2002, during which time the companies were called to remind them of the survey. As a consequence of these calls we found that three of the firms initially included in the sample population had abandoned their intention of implementing an EMS, thus reducing our study group to 56 companies.

In the creation of the questionnaire we referred to the literature on the implementation of environmental management systems as well as to that dealing with the impacts of the implementation of quality management systems (Saraph, et al., 1989; Benson, et al., 1991; Powell, 1995; Ahire, et al., 1996; Black & Porter, 1996, Grandzol & Gershon, 1998). The inclusion of literature on quality management is justified not only due to the greater degree of empirical research in this area but also to the fact that quality management and environmental management share the same philosophy and many similar practices. This fact is reflected in the works of diverse authors (Brown, 1996; Corbett & Cutler, 2000; O'Dea & Pratt, 1995). It was decided not to elaborate separate questionnaires adapted to industrial or service companies, and special attention was given to the drafting of questions in order to avoid misunderstandings. These

factors enabled us to design an initial version which included all the variables required in order to test our hypotheses, and which was administered to some of the directors and environmental managers of both industrial and service companies. In this version, all participants responded to the same questionnaire. Based on the results of this pre-test, along with the suggestions of the participants, we drew up the definitive version of our questionnaire. Different versions of the questionnaire were drawn up in which the order of the items within each question was altered so as to avoid any bias in the responses. The unit of analysis chosen was the factory or service facility.

4.2 Measurement of variables

The hypotheses were tested according to the following procedures.

Hypotheses a.1 and a.2 were measured using dichotomous variables. To determine the type of “top management involvement”, six questions were formulated to check whether top management had been directly involved in the following issues: the development and implementation of the environmental management system, its certification, informative meetings with those responsible for implementation and certification, and lastly, the process of problem resolution. The type of “middle management involvement” was determined using the same six questions.

The hypotheses b.1, b.2, e.1 and e.2 were measured using Likert 5 point scales (1 “nothing” to 5 “a lot”). In the case of “employee training”, six questions were used dealing with the level of training received relating to the following issues: environmental aspects of the job, environmental awareness, the methodology and implications of environmental certification, the consequences of non-compliance with the procedures, technical skills (data interpretation, problem solving, ...) and team formation and group dynamics. The same questions were employed to measure

“manager training”. The role of “manager rewards” was measured with two questions dealing with the type of link that existed between manager rewards and the attainment of environmental objectives. One question explored this link as it related to environmental managers, and the second did so in terms of the rest of the management team. As for “employee rewards”, one question was employed to explore this same link.

Hypotheses c.1 and d.1 were measured with Likert 7 point scales (1 “decreased a lot” to 7 “increased a lot”). “Employee empowerment” was measured with four questions which make reference to the level to which employee responsibility was modified in the following areas: the elaboration of job-related environmental objectives, the method of carrying out the job, data collection and checking of results, and job process modification depending on the results obtained. These aspects make up the phases of the continuous improvement cycle, or the PDCA cycle. “Interdepartmental information flow and coordination” was measured with three questions about how the need to analyze information flow between departments of the work centre or factory had varied, and about the information flow and coordination between the environmental management department and the other company departments.

To verify that, in those cases in which more than one item was used to measure the variation of a particular parameter, the scales used correctly reflect that variation, the reliability was analysed by the use of the Cronbach alpha coefficient. The results of these analyses are shown in tables III.a.I to III.d.I.

<i>Table III.a.I</i>			<i>Table III.a.II</i>		
Reliability of the scale Top management involvement			Reliability of the scale Middle management involvement		
	Corrected item	Alpha if item		Corrected item	Alpha if item
	total correlation	deleted		total correlation	deleted
Item a.1	0.735	0.917	Item b.1	0.577	0.867
Item a.2	0.855	0.901	Item b.2	0.615	0.861
Item a.3	0.761	0.914	Item b.3	0.594	0.865
Item a.4	0.836	0.904	Item b.4	0.777	0.834
Item a.5	0.793	0.909	Item b.5	0.736	0.841
Item a.6	0.719	0.919	Item b.6	0.777	0.834
Alpha =	0.925		Alpha =	0.874	

<i>Table III.b.I</i>			<i>Table III.b.II</i>		
Reliability of the scale Employee training			Reliability of the scale Manager training		
	Corrected item	Alpha if item		Corrected item	Alpha if item
	total correlation	deleted		total correlation	deleted
Item c.1	0.671	0.874	Item c.1	0.823	0.893
Item c.2	0.745	0.862	Item c.2	0.803	0.895
Item c.3	0.664	0.875	Item c.3	0.747	0.903
Item c.4	0.724	0.865	Item c.4	0.726	0.908
Item c.5	0.702	0.869	Item c.5	0.701	0.908
Item c.6	0.718	0.866	Item c.6	0.807	0.894
Alpha =	0.888		Alpha =	0.919	

<i>Table III.c.I</i>			<i>Table III.d.I</i>		
Reliability of the scale Employee empowerment			Reliability of the scale Interdepartmental information flow and coordination		
	Corrected item	Alpha if item		Corrected item	Alpha if item
	total correlation	deleted		total correlation	deleted
Item d.1	0.615	0.862	Item e.1	0.787	0.902
Item d.2	0.734	0.812	Item e.2	0.865	0.838
Item d.3	0.756	0.799	Item e.3	0.818	0.878
Item d.4	0.735	0.810			
Alpha =	0.864		Alpha =	0.912	

In the tables it can be seen that all the items in each of the scales show a correlation superior to 0.5. The lower alpha limit in terms of accepting the validity of a scale is generally accepted to be 0.7 (Nunnally y Bernstein, 1994; Peterson, 1994), a value that is amply surpassed in all the scales contained in the abovementioned tables. In the scale for manager rewards (comprised of two items), the alpha is 0.982, also above the values considered as being valid.

In addition to this analysis of reliability, a factor analysis was performed for each of the scales comprising more than two items. In every case a single factor was obtained with an eigenvalue greater than one.[5] This allowed us to use the mean value of the items that make up the scale as a global indicator of the corresponding parameter. This criterion was also used for the scales made up of two items. And it is this indicator which is used in the analyses that appear in the following section where we present the principal results of the empirical study.

5. Results

In the first place the means, standard deviations and correlations of the indicators associated with the hypotheses proposed were calculated. The results can be seen in Table IV. The variables which measure top management and middle management involvement, which were binary, show values superior to 0.5. Thus, it appears that this necessary management involvement in the process is taking place, though it is clear that middle management involvement is much higher (0.82) than that of top management. To check that the involvement in both management levels is significantly different in statistical terms, the corresponding Wilcoxon T test for two paired samples was carried out, which, as with the rest of the tests carried out in this study, are of a non-parametric character[6]. The results obtained confirm the existence of significant differences between top and middle management involvement ($z=-2.3$, $p=0.019$), which allows us to affirm that middle management involvement is perceived as significantly higher. This result may reflect the fact that the survey was directed to company environmental managers who are, in many cases, middle managers and might be overvaluing their real participation. It is also possible, however, that there is lesser involvement of top management which, in turn, could be impacting on the EMS implementation process. Along these lines, top management involvement appears positive and significantly correlated with most of the other variables (middle management involvement, labour and manager training and rewards) which supports the idea that it is necessary or essential.

Table IV. Means, Standard Deviations and Correlations

	Mean	S.D.	a.1	a.2	b.1	b.2	c.1	d.1	e.1
a.1 Top management involvement	0.68	0.38							
a.2 Middle management involvement	0.82	0.31	0.46**						
b.1 Employee training	2.80	1.09	0.46**	0.54**					
b.2 Manager training	3.09	1.11	0.44**	0.39*	0.76**				
c.1 Employee empowerment	4.94	0.78	-0.01	0.07	0.33	0.19			
d.1 Interdepartmental information flow and coordination	5.36	1.08	0.08	0.08	0.16	-0.04	0.26		
e.1 Manager rewards	1.74	1.13	0.52**	0.31	0.34	0.04	0.13	0.27	
e.2 Employee rewards	1.57	0.90	0.37*	0.31	0.35**	0.06	0.06	0.33*	0.81**

*p< 0.05

**p< 0.01

The indicators related to employee and manager training, measured with a Likert 5 point scale, show values very close to 3 (small increase). It is notable that the value for employee training appears to be smaller than that for management. In order to check whether the difference in these values is significant, the Wilcoxon T test was again employed. The results confirm that there are significant differences between the training received by employees and managers ($z=-2.1$, $p=0.036$). Thus, while the literature consulted highlights the fundamental nature of employee training, the empirical study carried out indicates that it increased only moderately and to a lesser degree than that of management. This result could be a consequence of the fact that the EMS was recently implemented in the majority of the surveyed companies (87.5% of the sample companies have had ISO 14001 certification for less than two years). Thus, the training of managers might have received greater emphasis in order to equip them with the preparation and awareness that would allow for more active involvement in the subsequent processes.

Employee empowerment was measured with a Likert 7 as was interdepartmental information flow and coordination. While increases were seen as predicted by the theory, they were not very great, especially in the case of empowerment, which didn't even reach 5 (small increase). The fact that the increase in the need for information and interdepartmental coordination was insubstantial could be related to the fact that 52.5% of the companies indicated that they already made use of work groups or teams before the implementation of the ISO 14001 EMS.

Lastly, turning our focus to the indicators associated with rewards, also measured using a Likert 5 scale, we observe that the values obtained hardly exceed 1 (the link between rewards and the attainment of environmental objectives had no effect). The Wilcoxon T test was employed to check whether the lower value shown relating to employees was significantly different from that relating to managers. In this case, the results ($z=-1.5$, $p=0.136$) do not permit us to affirm that there is a significant difference between employees and managers in terms of this link. This result is in contradiction with that predicted by current theory about the relevance of rewards (Egri & Hornal, 2002), and is indicative of an inappropriate practice in terms of human resources. Moreover, this aspect is seen to be especially relevant given that the link between employee rewards and a large number of other variables appears positive and significantly interrelated. Furthermore, of these variables, the most influential is that relating to manager rewards.

In order to test the hypotheses proposed in this paper, the response frequency observed for each of our six indicators was compared, in order to determine whether the percentages of responses that support the hypotheses are significantly greater, in statistical terms, than those that refute them. In order to carry out this analysis, and to facilitate the interpretation of the results the categories were regrouped. For those

hypotheses that employed a 7-point Likert scale, three categories were created to indicate a decrease, lack of change, or an increase in the indicator in question. And for those hypotheses where the variation was measured with a 5-point Likert scale, two categories were created to indicate that the analysed indicator either was promoted or showed no variance. The tests carried out are of a non-parametric character, employing the binominal test for those in two categories, and the Chi-squared for the rest. The results are shown in Table V.

Table V. Test of Hypotheses

HYPOTHESIS	CATEGORY	PROPORTIÓN OBSERVED	LEVEL OF SIGNIFICANCE
Top management involvement	Promoted	0.87	0.000
	Not promoted	0.13	
Middle management involvement	Promoted	0.92	0.000
	Not promoted	0.08	
Employee training	Promoted	0.97	0.000
	Not promoted	0.03	
Manager training	Promoted	0.97	0.000
	Not promoted	0.03	
Employee empowerment	Increased	0.92	0.000
	Unchanged	0.05	
	Decreased	0.03	
Interdepartmental information flow and coordination	Increased	0.9	0.000
	Unchanged	0.05	
	Decreased	0.05	
Manager rewards	Promoted	0.35	0.099
	Not promoted	0.65	
Employee rewards	Promoted	0.32	0.047
	Not promoted	0.68	

The hypotheses related to management involvement (top and middle) were both supported in that it can be seen that they both increased significantly (in 87 to 92% of the cases, respectively).

The hypotheses related to employee and manager training were also supported. In this case, based on an analysis of the results it can be deduced that a significant intensification of training for both groups was produced, with 97% of the sample population affirming this situation.

The hypothesis relating to empowerment was supported in a statistically significant way in that 92% of the cases indicated that employee empowerment increased.

Regarding the role played by teams, the need for more information and coordination between departments was supported in a statistically significant way in that both increased (in 90% of the cases).

Lastly, the hypotheses related to rewards are the only ones that were not supported given that, although not statistically significant, the results obtained are in contradiction to those expected. It was reported that a link exists between manager rewards and the attainment of environmental objectives in only 35% of the cases studied, and this dropped to 32% in the case of employees. In addition, this result would be explain due to the particular firms' culture.

By way of synthesis, the results obtained confirm that the percentages of responses that confirm the hypotheses are significantly different in statistical terms, as well as being superior, to those obtained that refute the hypotheses. There is one exception, and that relates to the hypotheses relating to rewards.

6. Conclusions

Based on the model in Daily & Huang (2001) dealing with the human resource factors that influence the implementation and certification process of an environmental management system, as well as the ISO 14001 standard and the current literature, a series of hypotheses were proposed. The focus of these hypotheses is the effect that the implementation of an environmental management system that conforms to the above-mentioned standard has on these human resource factors. These hypotheses extend the view proposed by Daily & Huang (2001) to the degree that the involvement of the entire corporate hierarchical structure is considered essential, as opposed to only top management. Additionally, the need for training and the linking of rewards is applied to managers as well as to employees.

The results obtained in the empirical study indicate that the human resource factors act as predicted by the hypotheses, except in the case of rewards. The absence of a linkage between rewards and the attainment of environmental objectives is worth highlighting as the rewards system is a relevant factor in terms of achieving all the positive effects possible from an EMS. This factor does not appear to be receiving sufficient attention which could translate into lesser awareness and participation of all employees.

In terms of the rest of the hypotheses, we find that while they were all supported in a statistically significant manner, the intensity of the effects is, in general, quite moderate. The possible factors or causes to explain this situation are various:

- Very recent EMS implementation in most of the companies analyzed, with 87.5% of them having achieved certification during the last two years.

- The form in which the implementation was carried out in that there was a low level of top management involvement, an absence of linkage between the attainment of environmental objectives and rewards and insufficient training of employees. In this section, it is important to note that given the recent implementation of the standard, the fact that managers received more intense training than employees is a good sign. It suggests that the training process is being focused on management at the outset with the view to promote their involvement and to facilitate subsequent training for the balance of the workforce.
- Existence of a previously implemented quality management system (84.62% of the companies have a quality management system that conforms to the ISO 9001 standard), such that a large part of the effects expected had already taken place. The implementation of an EMS in these cases only resulted in changes of an incremental nature.

Finally, it is felt that the information obtained through this study provides the additional benefit of contributing to a better understanding of the challenges and difficulties involved in implementing an EMS. The most relevant of these appear to be top management involvement, and the need to establish a clearer link between rewards and the attainment of environmental objectives, both of which are very much related to the other analyzed variables.

However, in evaluating these results, it is important to recognise the constraint presented by working with a limited sample of businesses, from the perspective of physical location. They were all based in a very concentrated geographical area, the Spanish autonomous region of Cantabria. On the other hand, we have no reason to

believe that company behaviour varies as a function of its geographical sphere of activity.

With respect to future research, apart from more deeply analyzing the causes of the effects encountered, the scope of the survey should be broadened to include opinions which complement those of managers and experts, as well as to extend the population under study so as to represent a larger geographical area. At the same time, it is necessary to analyze the relationship between the implementation process and overall company results.

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¹ Of the total existing certifications worldwide, Europe accounts for 48.43% and East Asian nations 35.94%, while the USA barely represents 5.37% of the total (ISO, 2003)

² In accordance with the definitions included in section 3 of the ISO 14001, an environmental aspect is understood to be the part of the activities, products or services of an organisation that could interact with the environment.

³ In accordance with the definitions included in section 3 of the ISO 14001 guidelines, environmental impact is understood to be any change in the environment, be it adverse or beneficial, that results either entirely or in part from the activities, products or services of an organization.

⁴ Pertinent analyses were done in order to evaluate how representative the sample was. Therefore, the firms of the sample were compared with the firms that did not respond to the questionnaire to respect to the size and sector variables and no significant differences were found.

⁵ The Kaiser-Meyer-Olkin indexes for the analyses carried out were: 0.75 (top management involvement), 0.71 (middle management involvement), 0.81 (employee training), 0.88 (manager training), 0.70

(employee empowerment) and 0.74 (interdepartmental information flow and coordination). As to the percentages of variance explained by the single value obtained in each of these analyses, they are 72.78, 61.84, 64.21, 71.33, 71.13 and 85.07% respectively.

⁶ In this case, the use of non-parametric tests is justified by the relatively small size of our sample, as well as the absence of normality in a large number of the variables employed in the study. Along these lines, the use of the Kolmogorov-Smirnov test for each of the indicators allowed us to confirm the absence of normality (to a level of significance of 0.05) for all of the indicators, except “top management involvement”, “middle management involvement”, “manager rewards” and “employee rewards”.

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