

# Design, application, and interpretation of a test to top managers of a food industry organization based on the leadership clause of ISO 14001

## Diseño, aplicación, e interpretación de un cuestionario aplicado a integrantes de la alta dirección de una organización de la industria alimenticia, basado en la cláusula de liderazgo de la ISO 14001

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### Abstract

*This article presents the relationship between five phrases-qualities (problem solving, commitment, communication, competence, and accountability) related with leadership practiced by top management leaders of an organization of the food industry, to qualify their leadership and to detect weaknesses in the exercise of this leadership with the purpose of implementation of corrective actions to achieve a correct leadership as recommended by ISO 1400 therefore proceed to a certification under the mentioned standard.*

**Keywords:** leadership, ISO 14001, statistical analysis.

### Resumen

*Este artículo presenta la relación entre cinco sintagmas-cualidades (resolución de problemas, compromiso, comunicación, competencia, y responsabilidad) inmersos en el liderazgo que practican los líderes pertenecientes a la alta dirección de una organización de la industria alimenticia. Para calificar el liderazgo que practican, así como para detectar las debilidades en el ejercicio de este liderazgo y con el propósito de buscar acciones correctivas para garantizar que los mencionados líderes ejerzan un liderazgo conforme lo recomienda la ISO 14001 para posteriormente proceder a una certificación bajo la citada norma.*

**Palabras claves:** liderazgo, ISO 14001, análisis estadístico.

## 1 Introduction

Nowadays the success of ISO 14001 Environmental Management Systems (EMS) is directly related to good leadership that workers from top management perform, ISO 14001 itself recognize leadership as an impact factor for its application. In an organization certified

by ISO 14001 the role of a leader will be determinant and fundamental for the success or failure in their tasks.

There exist important qualities that a leader must have in order to be able to guide his or her teamwork to achieve expected and set goals related with ISO 14001. The most important leader's qualities are the next five: commitment, communication, competence, problem solving and accountability.

Given the information collected from Iso 14001, leadership is a based factor that will enhance and assure that an EMS is going to be executed accordingly to the standard itself. However, such standards establish that in order to fulfill this clause, top management are meant to be constantly monitored since they have the top mentioned priority to accomplish.

Based on the needs of an organization to carry out a perfect EMS, the initial, constant and final monitoring of the top management's qualities are a must.

This present work exposes and proposes the design, application, development, results and recommendations of a fast, easy-to-apply yet positive in internal consistency questionnaire that materializes a tool to verify the compliance of the five qualities in top management leaders in one organization immerse in food industry in Mexico to ensure success in a future ISO 14001 certification, this was achieve through a factorial link between five selected phrases (commitment, communication, competence, problem solving and accountability) to discover weaknesses and heterogeneous thinking and acting leadership, with the main objective of implement corrective actions to guarantee the perform of good homogeneous leadership in top management, ten top management participants from the same food industry organization were considered to apply the cited questionnaire.

Likert scale was appropriate for this research because it permitted to evaluate "objective measures" where participants completed measurement scales, it allowed to see large sample sizes and increased the validity of the findings also allowing a parametric analyses of the results (Hartley 2013).

To develop the questionnaire we adapted a likert scale developed by previous researchers based on five scale points from high to low levels (strongly agree, agree, undecided, disagree and strongly disagree). The questionnaire survey allowed us to collect data which was standardized and easy to understand and granted easy comparison which gave us more control over the research process.

Data for the questionnaire was developed by analysis of articles, books and theoretical sources in relation to ISO 14001 and other ISO publications.

## 2 Theoretical background

### 2.1 Leadership

Leadership is recognized as an impact factor in ISO 14001 to success in EMS implementation (2015). Tabassi and Bakar describes leadership as a process whereby a leader, a person in a formal position of authority, with his or her intelligence and willpower has a bearing on a group of subordinates to be able them to develop their potentials so as the attain the organization objectives within granted time, funding and quality (2010). Top managers are expected to actively develop their leadership skills and to know how to adapt them to best accomplish the task at hand. Leadership means defining, steering and guiding the team members down the path that a leader believe will best serve the interests of the organization. (Free management 2013).

Top management which usually includes managers, supervisors and team leaders are the main drivers of an EMS implementation, having a critical role in making sure that EMS is successfully implemented. (Abdullah et.al. 2010).

There exist five indispensable qualities to guarantee that top management practice good leadership in EMS implementation: commitment, communication, competence, problem solving and accountability.

### 2.2 Commitment

Commitment is directly related with action (Maxwell, 1999), Sebhatu and Enquist have shown that leaders should be aware that the implementation of the ISO standards need to be integrated with internal and external perspectives and determined that they need to know about environmental indicators and measurements (2007). ISO 14001 aims to an important relationship between leadership and commitment in clause 5 which enunciate that top management shall demonstrate leadership and commitment with respect to the EMS mentioning important topics as accountability, integration, communication, etc. ISO 14001 stand out that there exist specific responsibilities related to EMS in which top management should be personally involved or which top management should direct (2015).

### 2.3 Communication

Communication is the key to good leadership. According to John Maxwell communication is the key to leadership because it makes easier connection between coworkers (1999). Mumford et al. define communication as one of the most important qualities of a leader to effectively convey information, for them It's one of the most fundamental qualities of the leadership skills (2007). On the other hand Zeng and Tam contributes in the idea that communication is a very important quality pointing out information exchanges as in the 17 scale of important critical factors of a leader. (2003).

For Sebhatu and Enquist, communication is important because managers have to be conscious of the importance of communicating with their customers in order to understand their value, while simultaneously managing a quality improvement process that will lead to sustainable services and products (2007). Elele and Fields established that the commitment level is directly related with communication and the way that employees are involved in decision making process. (2010).

ISO 14001 mention that organizations shall establish, implement and maintain the processes needed for internal and external communication relevant to EMS and makes emphasize in the fact that communication allows organizations to provide and obtain important information related to its EMG (2015).

#### 2.4 Competence

Competence is described as devoting to continuous improvement and to perform at a consistently high level of excellence (Maxwell 1999). ISO 14001 describes this quality as the ability to apply knowledge and skills to achieve intended results (2015). Zeng and Tam consider the most important critical factor affecting implementation of ISO 14001 standards as environmental consciousness of top leaders, putting out the importance of environmental culture of top leaders in environmental management. Legal system and legal enforcement were pointed as fourth and fifth critical factors, expertise professional as ninth, training on EMS was stated on the 11<sup>th</sup> place (2003).

Core competencies give organizations the opportunity to develop competitive advantages, allowing organizations to diversify and increase their profits (Tampoe 1994).

At the same time, core competences are an organization's fundamental capabilities; an integration of skills that are competitively unique. This means that these capabilities are difficult to imitate (Gareis et.al, 2000).

It is important to understand that actual organization's complexity demands leaders to have value-based perspective, stakeholders ask for an orientation towards more fundamental, shared values and holistic thinking in organizations, for respect, social responsibility and community (Pruzan, 1998).

#### 2.5 Problem solving

Problem solving is conceived as the interplay among different factors: anticipate problems, accept the truth, seeing the big picture, handle one thing at the time, develop method and go out looking for problems to solve (Maxwell 1999). It is important for top management to identify the critical areas where they should focus on before they can take action to resolve it (Abdulla et.al, 2010). Effective problem solving is one of the key attributes that separate great leaders from average ones (Checkland 1998). It is a quality that organizations and especially leaders must know how to handle, in this

way, the permanence of the organization over time is ensured.

Nowadays the problems must be visualized as a method of strengthening for the organization, where leaders actively participate and commit themselves to the resolution and prevention of problems, being the most useful way to improve the performance of the organization (Liang et.al. 2010).

#### 2.6 Accountability

Accountability was shown as a fundamental quality of a leader (Tomsic et al, 2016). It's conceived as the interplay among three factors: system clarity, social support and personalized responsibility, where clarity is the whole of standards and expectations on the basis of which an employee's behaviour is evaluated, social support is the encouragement to use the system immerse in Quality Management System resulting from the observation and evaluation, and personalized responsibility spells out the responsibility in relation to the responsibilities of others (Turusbekova et al, 2007).

ISO 14001 recognize that people involved in organization's EMS should have a clear understanding of their role, responsibility and authority for conforming to the ISO requirements and achieving intended outcomes (2015).

### 3 Design of the leadership-oriented questionnaire

#### 3.1 Statistical sample

The sample was taken as a whole, all the participants that the organization specified as the top management team. This team is composed by 10 environmental engineers, each of which are in charge of different parts of the product process. The mean of time that these engineers have been working for the same organization is 1.5 years.

#### 3.2 Leadership-oriented questionnaire

According to the theoretical investigation, the following items were created by highlighting the qualities that the participants of the top management team must have: problem solving, commitment, communication, competence, accountability.

##### Item 1 – Quality 1: Problem solving.

A leader must define, steer, and guide their team members down an aligned path that serve the bests interests of the organization, in regard to the management system that is under their current charge.

- 1.- Strongly disagree.
- 2.- Disagree.
- 3.- Undecided.
- 4.- Agree.
- 5.- Strongly agree.

Item 2 – Quality 2: Commitment.

The implementation of the ISO standards is executed with the integration of internal and external perspectives, by making use of the leader’s knowledge about the management system indicators or measurements.

- 1.- Strongly disagree.
- 2.- Disagree.
- 3.- Undecided.
- 4.- Agree.
- 5.- Strongly agree.

Item 3 – Quality 3: Communication.

The leaders need to have constant communication with their customers in order to understand their value, while simultaneously managing a quality improvement system process.

- 1.- Strongly disagree.
- 2.- Disagree.
- 3.- Undecided.
- 4.- Agree.
- 5.- Strongly agree.

Item 4 – Quality 4: Competence.

The perspective of the leaders has to be oriented towards fundamental, shared-values, and holistic thinking in their organizations.

- 1.- Strongly disagree.
- 2.- Disagree.
- 3.- Undecided.
- 4.- Agree.
- 5.- Strongly agree.

Item 5 – Quality 5: Accountability.

Leaders are distinguished for three main factors: system clarity (standards and expectations of their behavior is evaluated), social support (encouragement to use the system), and personalized responsibility (responsibility assigned to them in relation to the responsibilities of others).

- 1.- Strongly disagree.
- 2.- Disagree.
- 3.- Undecided.
- 4.- Agree.
- 5.- Strongly agree.

3.3 Internal consistency – making use of Cronbach’s Alpha

The internal consistency demonstrates how closely related a set of items are as a group. For this particular case, this questionnaire has to be consistent to the main construct, which is Leadership (Tavakol et.al., 2011).

After the questionnaire was applied, the answers of all the 10 environmental engineers were analyzed utilizing the software Microsoft Office Excel.

The following formulae was used to measure the internal consistency of the items:

$$\alpha = \frac{K}{K - 1} \left[ 1 - \frac{\sum S_i^2}{S_T^2} \right] \tag{1}$$

Where:

$\alpha$  = Cronbach’s Alpha Coefficient.

K = total of items.

$\sum S_i$  = sum of all variances.

$S_T$  = variance of the sum of all items.

By applying the Cronbach’s Alpha coefficient to the sample’s answers, it was obtained  $\alpha = 0.92$ ,  $\alpha = 92\%$ . Given that  $\alpha > 0.9$ , this supports an excellent internal consistency, describing the extent of which all items of the questionnaire measure the focused construct: leadership.

3.4 Interrelationship among the engineer’s qualities – making use of Person’s Correlation Coefficient (r)

Once the items were verified to present an excellent internal consistency, a further analysis was needed to provide the correlation among the engineers.

This Microsoft Office Excel analysis expresses the thinking-correlation between all the participants.

4 Results and discussion

4.1 Results of the execution of calculations by making use of the software Microsoft Office Excel

The answers for every item for each engineer, were ordered in Table 1

Table 1. Results obtained after the questionnaire was applied to the top management participants.

Leader/Item	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	Total
Q1	4	5	4	5	5	5	5	5	5	5	48
Q2	4	5	4	4	5	5	5	4	5	5	46
Q3	5	5	5	5	5	5	5	5	5	4	49
Q4	5	5	5	4	4	4	5	5	4	5	46
Q5	4	4	4	3	4	3	3	4	5	5	39

The statistical data used to calculate Cronbach’s Alpha Coefficient is presented in Table 2.

Table 2. Statistical data obtained from the 5-point Likert scale results.

Measurement/Leader	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10
Mode	4	5	4	5	5	5	5	5	5	5
Mean	4.37	4.78	4.37	4.13	4.57	4.32	4.51	4.57	4.78	4.78
Median	4	5	4	4	5	5	5	5	5	5
Variance	0.24	0.16	0.24	0.56	0.24	0.64	0.64	0.24	0.16	0.16

The value of Cronbach's Alpha was generated with the data in Table 1 and Table 2. This data was compiled in Table 3 as well as the result of such coefficient.

**Table 3.** Calculation of Cronbach's Alpha Coefficient.

<b>Cronbach's Alpha</b>	0.92
<b>Items</b>	5
<b>Σ Variance</b>	3.28
<b>Tot. Variance</b>	12.24

The data from which the recommendations were based are presented in the Table 4.

**Table 4.** Pearson's Correlation Coefficient matrix among the engineer's answers.

Engineer/Engineer	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10
L1	1.0									
L2	0.4	1.0								
L3	0.1	0.4	1.0							
L4	0.3	0.8	0.3	1.0						
L5	0.1	0.6	0.1	0.7	1.0					
L6	0.1	0.8	0.1	0.8	0.9	1.0				
L7	0.4	1.0	0.4	0.8	0.6	0.8	1.0			
L8	0.6	0.6	0.6	0.7	0.1	0.4	0.6	1.0		
L9	0.6	0.2	0.6	0.1	0.6	0.2	-	-	1.0	
L10	0.6	0.2	0.6	0.5	0.4	0.3	0.2	0.4	0.2	1.0

**4.2 Discussion of the data obtained after the generation of calculations by making use of the software Microsoft Office Excel**

In this section, the interpretation of data is presented as a way of not only mere numeric, but as recommendations to the organization.

**4.2.1 About the questionnaire**

By applying the Cronbach's Alpha Coefficient to the sample's answers, it was obtained  $\alpha = 0.92$ ,  $\alpha = 92\%$ . Given that  $\alpha \geq 0.9$ , this supports an excellent internal consistency, describing the extent of which all items of the questionnaire measure the focused construct: leadership.

Having a coefficient of a percentage bigger than 90%, assures the organization that the questionnaire being developed and applied, not only function on the sample but that it could be scaled to a bigger sample in case it is required. The data/answers returned would provide a high reliability.

In spite of that, it is recommended to always run a statistical Cronbach's Alpha Coefficient analysis every time they utilize this instrument to know their top management's participants level of Leadership qualities.

**4.2.2 About the engineers**

The association between the way engineers think about one from the other by creating a correlation matrix (Table 4), provides the organization a wider view of their top management's leaders-thinking, in regard to the five qualities previously described. Since the data does not present extreme values, Pearson's Correlation Coefficient is not affected.

In Table 5, the recommendations are expanded by the need of action related to the ranges of Pearson's values that are most significant for this study. This table has been adapted to this study's needs but based on the ranges of Schorber et al., 2018.

**Table 5.** Rule of thumb for the organization's need of action in regard to the correlation's coefficient value.

Need of action	Strength of relationship Pearson's Correlation Coefficient value	Action
Null	$r \geq 0.9$	The engineer's thinking is directly related. This interprets as they have clearance and make equally use of the five top manager's qualities.
High	$0 < r < 0.9$	The organization needs to prepare the engineers to understand and align themselves to the five qualities to ensure the correct application of the EMS and to avoid at all cost failure due to poor leadership.
Very High	$0 \leq r \leq -1$	As the thinking of one engineer goes directly to the aims of this paper (the five qualities to ensure the application of the EMS), the thinking of the other goes to exactly a different direction (to the failure of the EMS).

The Table 6 shows a correlation of  $r \geq 0.9$ , which correlates to the number of engineers that do think and behave alike (without taking into account the values of 1 of the diagonal). Here we observe that only L1-L3, L2-L7, and L5-L6. As seen, this requires a null need of action among them only.

The Table 7 shows a correlation of  $0.9 < r < 1$ , which means that the organization needs to focus on what is going with their leaders and between them.

They all must think and behave alike in order to fulfill the ISO 14000 needs of the clause 5 Leadership. And as appreciated, chosen leaders are far from the objective, which requires the organization to take action to either train their current choices of leaders or to change them.

**Table 6.** Correlation of  $r \geq 0.9$ .

	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10
L1	1.00									
L2	0.41	1.00								
L3	1.00	0.41	1.00							
L4	0.33	0.80	0.33	1.00						
L5	-	0.61	-	0.76	1.00					
L6	0.10	0.88	0.10	0.87	0.92	1.00				
L7	0.41	1.00	0.41	0.80	0.61	0.88	1.00			
L8	0.67	0.61	0.67	0.76	0.17	0.41	0.61	1.00		
L9	-	-	-	0.13	0.61	0.25	-	-	1.00	
L10	0.61	0.25	0.61	0.53	0.41	0.38	0.25	0.41	0.25	1.00

**Table 7.** Correlation of  $0 < r < 0.9$

	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10
L1	1.00									
L2	0.41	1.00								
L3	1.00	0.41	1.00							
L4	0.33	0.80	0.33	1.00						
L5	-	0.61	-	0.76	1.00					
L6	0.10	0.88	0.10	0.87	0.92	1.00				
L7	0.41	1.00	0.41	0.80	0.61	0.88	1.00			
L8	0.67	0.61	0.67	0.76	0.17	0.41	0.61	1.00		
L9	-	-	-	0.13	0.61	0.25	-	-	1.00	
L10	0.61	0.25	0.61	0.53	0.41	0.38	0.25	0.41	0.25	1.00

Table 8 is the representation of the engineers who not only do not think-behave alike, but who will step on each other's way once they start to apply the leadership. Organization is highly recommended to study the behavior of these participants, to train or to change them.

**Table 8.** Correlation of  $0 \leq r \leq -1$

	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10
L1	1.00									
L2	0.41	1.00								
L3	1.00	0.41	1.00							
L4	0.33	0.80	0.33	1.00						
L5	-	0.61	-	0.76	1.00					
L6	0.10	0.88	0.10	0.87	0.92	1.00				
L7	0.41	1.00	0.41	0.80	0.61	0.88	1.00			
L8	0.67	0.61	0.67	0.76	0.17	0.41	0.61	1.00		
L9	-	-	-	0.13	0.61	0.25	-	-	1.00	
L10	0.61	0.25	0.61	0.53	0.41	0.38	0.25	0.41	0.25	1.00

### 5 Conclusions

In this work, a methodology was designed and presented to measure and calculate the five selected qualities to ensure the implementation of an EMS: commitment, communication, competence, problem solving, and accountability.

The design of an evaluation instrument was performed, measuring its confirmation according to Cronbach's alpha coefficient. Verifying that, given the result obtained, the confirmation was excellent.

In the case of the interrelation between the thinking of the subjects, thanks to the answers obtained after the application of the instrument, the study was carried out by applying the correlation matrix between each of the top management engineers surveyed. The deep analysis of the connection between the current situation of the leaders, verify and correct problems that are intrinsic, behind each one of them; giving a true option to the leaders of the participants to take the necessary action measures that will allow them to properly implement the ISO 14001.

The case study presented shows the effectivity of the methodology of the proposed method, to identify the current situation in which each member of senior management is in relation to the five qualities.

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