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## Information capability under different quality management approaches

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33

*Gestión y uso eficiente de la información en función del enfoque de calidad adoptado por la organización*  
*Gestão e uso eficiente da informação em função do enfoque de qualidade adotado pela organização*

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*Explore the development of the information capability in companies committed to quality management and explore whether the development of information capability depends on the quality management system adopted by the company. The efficient use and management of information can be considered a capability for a company. From a review of the literature we first define information capability related practices. Then, through a questionnaire, we captured the perception of managers in two types of companies regarding the existence of information practices. We contacted companies that used ISO 9000 as their quality management system and companies that were committed to the EFQM excellence model. The paper contributes to a deeper understanding of the information capability construct. According to the results, companies committed to quality management have developed the information capability. Also, this study shows the differences in its development in terms of the quality system adopted by the company. The data has been obtained from small samples of companies from different regions in the world. Also other quality management systems could be considered.*

*El objetivo de este estudio es analizar si la gestión y el uso de la información es eficiente en empresas comprometidas con la gestión de la calidad y si depende del sistema de gestión de calidad adoptado por la organización. A partir de una revisión bibliográfica hemos establecido un conjunto de buenas prácticas que conducen a la gestión y el uso eficiente de la información en la organización. A continuación, usando un cuestionario, hemos recogido la percepción de los directivos sobre el nivel de adopción de las prácticas establecidas. Los directivos pertenecían a dos tipos de organizaciones: empresas que han adoptado la ISO9000 como sistema de gestión de calidad y empresas que han adoptado el modelo EFQM de calidad total. El estudio contribuye a lograr un conocimiento más profundo de la gestión y uso eficiente de la información como fuente de ventaja competitiva para la organización. El nivel de adopción de las prácticas que conducen a la gestión y uso eficiente de la información es elevado en las organizaciones comprometidas con la gestión de la calidad. Además se han detectado diferencias que dependen del sistema de calidad adoptado por la misma. Los datos se han obtenido de muestras pequeñas de empresas de diferentes regiones del mundo. Por otro lado, sólo se han tenido en cuenta dos sistemas de calidad.*

*O objetivo deste estudo é analisar se a gestão e o uso da informação é eficiente em empresas comprometidas com a gestão da qualidade e se depende do sistema de gestão de qualidade adotado pela organização. A partir de uma revisão bibliográfica, estabelecemos um conjunto de boas práticas que conduzem à gestão e ao uso eficiente da informação na organização. A seguir, usando um questionário, recolhemos a percepção dos diretores sobre o nível de adoção das práticas estabelecidas. Os diretores pertenciam a dois tipos de organizações: empresas que adotaram a ISO 9000, como sistema de gestão de qualidade e empresas que adotaram o modelo EFQM de qualidade total. O estudo contribui para conseguir um conhecimento mais profundo da gestão e uso eficiente da informação, como fonte de vantagem competitiva para a organização. O nível de adoção das práticas que conduzem à gestão e uso eficiente da informação é elevado nas organizações comprometidas com a gestão da qualidade. Para além disso, detetaram-se diferenças que dependem do sistema de qualidade adotado pela mesma. Os dados obtiveram-se de amostras pequenas de empresas de várias regiões do mundo. Por outro lado, só se tiveram em conta dois sistemas de qualidade.*

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## 1. Introduction

This research explores information capability development in companies committed to quality management. Information capability is evidenced through a set of observable practices commonly adopted in a company and consists of efficiently managing and using information. Information capability depends on a company's ability to manage information effectively over the life cycle of information use, a company's ability to effectively manage appropriate IT applications by integrating them in day-to-day business, and a company's ability to instil and promote behaviours and values in employees for effective information use.

We explore information capability development in companies committed to quality management because quality management systems are considered to be information intensive management systems. Therefore, it seems reasonable to expect that these companies have also promoted information capability development and that information practices are actually common practices in these companies. However, the approach to quality management adopted by the company may affect information capability development. This paper explores the impact that the approach to quality management may have on the development of information capability.

## 2. Framework and objectives of the study

### 2.1. Information Capability

According to Resource Based View (RBV) organizational theory the key to the strategic success of a company lies in its capabilities. This theory considers a capability to be a source of competitive advantage for the company which allows the generation of value and differentiation through the combined use of a series of resources (Peppard & Ward, 2004; Ashurst et al., 2008). A company's capabilities are evidenced through several practices commonly adopted in a company. According to Ashurst et al. (2008), practices, which are described as a set of socially defined ways of doing things in order to achieve an outcome, are more concrete and observable than capabilities.

We consider a company to have information capability when the use and management of information is so efficient that it is a source of competitive advantage for the company. This capability can be decomposed into a number of concrete and observables practices, and from a review of the literature we defined an initial list of information capability related practices.

Marchand et al. (2000) proposed the "information orientation model" to explain how different information related practices are needed to improve business performance, and they found empirical evidence to support the model, which has been used in later studies (Choo et al, 2006; Hwang, 2011; Mithas et al. 2011). In their model, Marchand et al. (2000) pooled information practices into three major groups: 1) information management, or practices related with the management of the information life cycle, 2) information technologies, or practices related to the integration of information technology into day-to-day business, and 3) information culture, or practices where behaviours and values assumed by employees in relation to the use and management of information are shown.

#### KEY WORDS

**Information capability, information practices, RBV, Quality management systems, ISO 9000, EFQM**

#### PALABRAS CLAVE

**Gestión de información, Buenas prácticas, RBV, Gestión de calidad, ISO 9000, EFQM**

#### PALAVRAS-CHAVE

**Gestão de informação, Boas práticas, RBV, Gestão de qualidade, ISO 9000, EFQM**

#### JEL CODES:

**D800; L150; M100**

Taking into account inputs from many authors (Zárraga-Rodríguez & Alvarez, 2013; Chou et al., 2007; Choo et al., 2006; Sabherwal & Chan, 2001; Carmichael et al., 2011; Coltman et al., 2010; Hwang, 2011; among others) we present a set of practices to be used when assessing information capability development in a company. Table 1 shows practices in the information management group, Table 2 shows practices in the information technology group, and Table 3 shows practices in the information culture group.

Table 1. Information management practices

| Practices  | Code* |
|--|-------|
| The organization defines processes that address competitive and technology surveillance.   | IM_S1 |
| The organization defines processes that facilitate the detection and identification of information to anticipate problems with suppliers and partners.                 | IM_S2 |
| The organization cares about knowing the information needed by employees, customers, suppliers and other stakeholders and systematically collects it.                  | IM_C1 |
| The organization systematically gathers information from the environment (competitors, legislation, markets) and the inner workings, filtering it to prevent overload. | IM_C2 |
| The organization defines processes to ensure that the information is available to stakeholders as needed (people can easily find it).                                  | IM_O  |
| The organization defines processes to transform data into useful information that can be used for decision-making.   | IM_P  |
| The organization defines processes to have updated databases so as to ensure that people are using the best information available.                                     | IM_M  |
| The organization defines processes that ensure the distribution and exchange of information and the scope covered.   | IM_D  |

Table 2. Information technology practices

| Practices   | Code*   |
|---|---------|
| The organization uses information technology to support daily operations in order to improve individual productivity.   | IT_OS   |
| The organization uses information technology to automate and integrate the management of business processes.  | IT_BPS1 |
| The organization uses information technology to facilitate the management of people (training, knowledge management, development plans, etc.).                          | IT_BPS2 |
| The organization uses information technology to interact and strengthen relationships with stakeholders (suppliers, customers, partners, employees, etc.).              | IT_BPS3 |
| The organization uses information technology to facilitate the development and exchange of new ideas. This also includes new products and services.                     | IT_IS   |
| The organization uses information technology to facilitate the monitoring and analysis of internal or external business aspects (indicators) to assist decision-making. | IT_MS   |
| The organization uses information technology to anticipate possible outcomes of decisions before they are made, to predict values of indicators, etc.                   | IT_SS1  |
| The organization uses information technology in competitive and technology surveillance.  | IT_SS2  |
| The organization uses information technology to facilitate the sharing and exchange of information.   | IT_ISS1 |
| The organization uses information technology to automate document location.   | IT_ISS2 |

Table 3. Information culture practices

| Practices  | Code* |
|--|-------|
| The organization values people who share sensitive information rather than manipulate or hide it for their own benefit.  | IC_I  |
| In the organization there are formal and reliable sources of information and the organization's members use them.  | IC_F  |
| The organization reveals information about the performance of the company to all employees to influence and direct individual performance and consequently the company's performance.  | IC_C  |
| In the organization the free exchange of sensitive and non-sensitive information in a collaborative way is a common practice among team members and between areas.   | IC_S1 |
| In the organization the free exchange of sensitive and non-sensitive information in a collaborative way with external stakeholders (customers, partners, suppliers, society, etc.) is a common practice.                     | IC_S2 |
| Members of the organization trust each other enough to talk about failures and mistakes in an open and constructive manner and without fear of unfair repercussions.   | IC_T  |
| Members of the organization show concern and preoccupation with obtaining and applying new information that enables them to respond quickly to changes and that enables them to promote innovation in products and services. | IC_P  |

## 2.2. Quality management approaches.

Organizations are committed with quality management mainly within two frameworks (Martínez Costa et al. 2008; Bayo-Moriones et al., 2011; Heras-Saizarbitoria et al., 2011): a quality management system based on the ISO 9000 international quality standards series or a total quality management (TQM) model. The European Framework for Quality Management, i.e. the EFQM excellence model, is the model designed by the European Foundation for quality management and is the model mainly adopted in Europe.

Both frameworks are information intensive management systems. Therefore, it is reasonable to expect that the use and management of information is efficient in companies that have adopted one of these quality management systems. To the extent that we have considered the efficient use and management of information as a capability, we can expect that these companies have also promoted information capability development and that information practices are actually common practices in these companies.

A company's performance may differ depending on whether its quality management is based on the ISO 9000 international standards or the EFQM excellence model (Heras et al., 2011). A company's approach to quality management may also lead to differences in how information capability is developed and how information is used and managed.

Russell (2000) analysed the link between the ISO 9000 subcriteria and the EFQM excellence model's criteria and concluded that the level of contribution is low-to-medium regarding information which is considered as resource. Heras et al. (2011) point out that the use of the EFQM excellence model has more influence on internal communication than the ISO 9000.

The purpose of this paper is to explore the impact that these two approaches to quality management have on the development of the information capability in a company. With this aim, we study the differences regarding the adoption of information related practices depending on the quality management reference framework adopted.

We defined the following research question

Q1. - Are there differences between the extended use of information capability related practices among companies depending on the quality management approach adopted?

In order to answer this question we followed the methodology described in the next section.

### 3. Research methodology

#### 3.1. Data Collection

The instrument designed to collect the data was a questionnaire which contained three sections: practices related to the management of the information life cycle (that is, the IM section), practices related to the integration of information technology in day-to-day business (the IT section), and practices related to behaviours and values assumed by employees and displayed when using information (the IC section). There were a total of 25 statements organized as follows: 8 items in the IM section, 10 items in the IT section, and 7 items in the IC section. The results were categorized using a Likert scale from 1 to 10 (from 1-strongly disagree to 10-strongly agree).

The instrument was pre-tested in order to avoid misunderstanding effects, i.e. to make sure the items' meanings were clear and that the questionnaire was easy to answer.

Our target populations were companies committed to EFQM excellence model and companies with a quality management system based on the ISO 9000. Participants committed to EFQM were companies in the Basque Country that had received a quality award according to the points obtained during external evaluation that employs the scoring system used by the European Model for Excellence. The sample consisted of 44 managers who reported their agreement with each statement. Participants committed to ISO 9000 were companies in Mexico with an ISO certification, and 47 managers reported their agreement with each statement.

#### 3.2. Analysis of data

Because a random sample was selected, the data analysis process involved the use of statistical techniques. The research question (Q1 from above) was evaluated using statistical hypothesis tests, and the Minitab 16® software package was used to analyse the results. In order to compare information capability development among ISO 9000 companies and EFQM companies and because the sample is small and the responses are not normally distributed, a nonparametric test was applied. We used the Mann Whitney U test, which is also known

as the Mann-Whitney Wilcoxon test or the Wilcoxon Rank Sum test. This technique allows us to test whether two samples are likely to derive from the same population. An assumption for the Mann-Whitney test is that the data are independent random samples from two populations that form a continuous or ordinal scale.

In the statistical tests applied in this study, the criteria established in order to reject the null hypothesis was  $p < 0.05$  or  $p < 0.1$ .

## 4. Results and Discussion

Table 4 presents a summary of the scores given to each statement by the respondents from EFQM companies.

Table 4 Quantitative results: mean ( $\bar{x}$ ) and deviation ( $\sigma$ ) of the questionnaire scores (EFQM)

|           | IM_C1 | IM_C2   | IM_S1   | IM_S2   | IM_O  | IM_P  | IM_M   | IM_D   |         |         |
|-----------|-------|---------|---------|---------|-------|-------|--------|--------|---------|---------|
| $\bar{x}$ | 7.93  | 7.32    | 6.34    | 6.89    | 7.43  | 7.34  | 7.36   | 7.43   |         |         |
| $\sigma$  | 1.59  | 1.84    | 2.11    | 2.05    | 1.72  | 1.71  | 1.83   | 1.61   |         |         |
|           | IT_OS | IT_BPS1 | IT_BPS2 | IT_BPS3 | IT_IS | IT_MS | IT_SS1 | IT_SS2 | IT_ISS1 | IT_ISS2 |
| $\bar{x}$ | 8.00  | 7.77    | 7.64    | 7.20    | 7.14  | 8.02  | 7.32   | 6.36   | 7.66    | 7.55    |
| $\sigma$  | 1.49  | 1.60    | 1.70    | 1.89    | 1.69  | 1.45  | 1.75   | 1.94   | 1.57    | 1.66    |
|           | IC_I  | IC_F    | IC_C    | IC_S1   | IC_S2 | IC_T  | IC_P   |        |         |         |
| $\bar{x}$ | 8.23  | 8.09    | 8.30    | 7.43    | 6.45  | 6.91  | 7.48   |        |         |         |
| $\sigma$  | 1.83  | 1.57    | 1.76    | 1.73    | 2.01  | 1.94  | 1.70   |        |         |         |

Table 5 presents a summary of the scores given to each statement by the respondents from the ISO 9000 companies.

Table 5 Quantitative results: mean ( $\bar{x}$ ) and deviation ( $\sigma$ ) of the questionnaire scores (ISO 9000)

|           | IM_C1 | IM_C2   | IM_S1   | IM_S2   | IM_O  | IM_P  | IM_M   | IM_D   |         |         |
|-----------|-------|---------|---------|---------|-------|-------|--------|--------|---------|---------|
| $\bar{x}$ | 6.96  | 7.19    | 7.36    | 6.98    | 7.13  | 7.22  | 7.51   | 7.28   |         |         |
| $\sigma$  | 2.72  | 2.34    | 1.99    | 2.18    | 1.84  | 1.84  | 1.89   | 1.87   |         |         |
|           | IT_OS | IT_BPS1 | IT_BPS2 | IT_BPS3 | IT_IS | IT_MS | IT_SS1 | IT_SS2 | IT_ISS1 | IT_ISS2 |
| $\bar{x}$ | 7.94  | 7.62    | 7.52    | 7.34    | 7.13  | 7.34  | 7.28   | 7.06   | 7.47    | 7.21    |
| $\sigma$  | 1.93  | 1.85    | 1.83    | 2.13    | 1.79  | 2.01  | 2.21   | 2.17   | 1.72    | 1.78    |
|           | IC_I  | IC_F    | IC_C    | IC_S1   | IC_S2 | IC_T  | IC_P   |        |         |         |
| $\bar{x}$ | 7.09  | 7.53    | 7.66    | 7.04    | 6.43  | 6.81  | 7.15   |        |         |         |
| $\sigma$  | 2.48  | 1.98    | 1.95    | 2.35    | 2.47  | 2.29  | 1.9    |        |         |         |



Figure 1, Figure 2 and Figure 3 show the mean values for each practice from the two samples. Graphically, these three figures point out that the level of adoption of the information capability related practices differ in the case of seven practices: IM\_C1 (The organization cares about knowing the information needed by employees, customers, suppliers and other stakeholders and systematically collects it), IM\_S1 (The organization defines processes that address competitive and technology surveillance), IT\_MS (The organization uses information technology to facilitate the monitoring and analysis of internal or external business aspects (indicators) to assist decision-making), IT\_ISS2 (The organization uses information technology to automate document location), IC\_I (The organization values people who share sensitive information rather than manipulate or hide it for their own benefit), IC\_F (In the organization there are formal and reliable sources of information and the organization's members use them) and IC\_C (The organization reveals information about the performance of the company to all employees to influence and direct individual performance and consequently the company's performance).

Figure 1. Mean scores for the level of adoption of information management practices. EFQM vs. ISO 9000

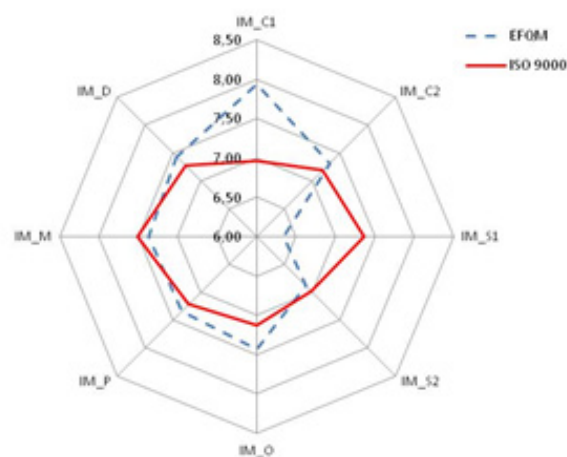


Figure 2. Mean scores for the level of adoption of information technology practices. EFQM vs. ISO 9000

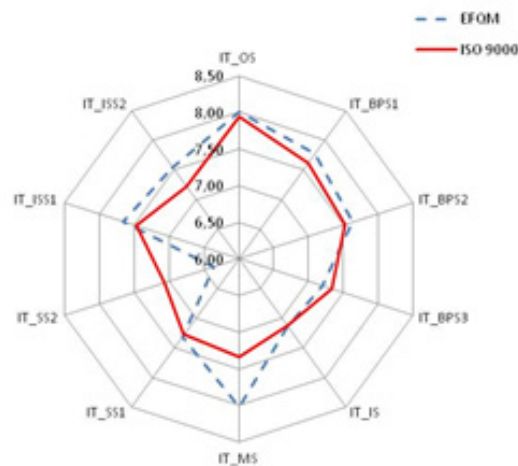
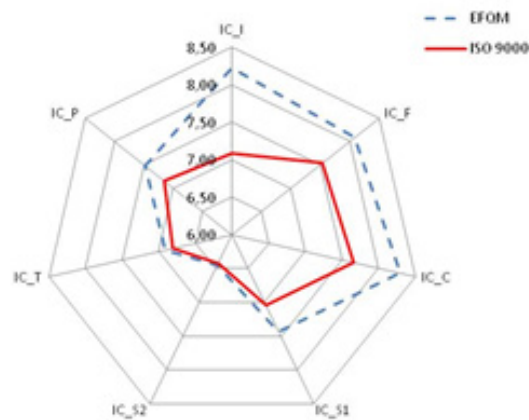




Figure 3. Mean scores for the level of adoption of information culture practices. EFQM vs. ISO 9000



In order to see whether the differences in scores were significant, Mann Whitney U tests were run on the data from the two samples. This analysis was conducted in order to answer our research question—are there differences between the level of adoption of information capability related practices?—and the statistical hypothesis analyzed was:

$H_0$ : The median values are equal in both groups

$H_1$ : The medians are unequal

Results for the tests are shown in Table 6 (significance is indicated by asterisks next to each value; \* $p < 0.05$ ; \*\* $p < 0.1$ ).

Table 6. Results of the Mann Whitney U Test to compare medians

| Practices | MEAN DIFFERENCES (EFQM, ISO 9000) | MEDIAN DIFFERENCES | P-VALUE (Mann Whitney Test) |
|-----------|-----------------------------------|--------------------|-----------------------------|
| IM_S1     | 0.97                              | 0.00               | 0.2116                      |
| IM_S2     | 0.13                              | 0.50               | 0.9548                      |
| IM_C1     | -1.02                             | -1.00              | 0.0206*                     |
| IM_C2     | -0.09                             | 0.00               | 0.8336                      |
| IM_O      | 0.30                              | 1.00               | 0.2185                      |
| IM_P      | 0.12                              | 1.00               | 0.477                       |
| IM_M      | -0.15                             | 1.00               | 0.7958                      |
| IM_D      | 0.16                              | 1.00               | 0.5075                      |
| IT_OS     | 0.06                              | 0.00               | 0.9449                      |
| IT_BPS1   | 0.16                              | 0.00               | 0.5731                      |
| IT_BPS2   | 0.11                              | 0.00               | 0.65                        |
| IT_BPS3   | -0.14                             | -1.00              | 0.5436                      |

|                |       |      |          |
|----------------|-------|------|----------|
| <i>IT_IS</i>   | 0.01  | 0.00 | 0.8774   |
| <i>IT_MS</i>   | 0.68  | 1.00 | 0.0402*  |
| <i>IT_SS1</i>  | 0.04  | 0.00 | 0.7393   |
| <i>IT_SS2</i>  | -0.70 | 0.00 | 0.062**  |
| <i>IT_ISS1</i> | 0.19  | 1.00 | 0.3113   |
| <i>IT_ISS2</i> | 0.33  | 1.00 | 0.2009   |
| <i>IC_I</i>    | 1.14  | 1.00 | 0.009*   |
| <i>IC_F</i>    | 0.56  | 0.00 | 0.0746** |
| <i>IC_C</i>    | 0.64  | 0.00 | 0.0577** |
| <i>IC_S1</i>   | 0.39  | 0.00 | 0.6277   |
| <i>IC_S2</i>   | 0.03  | 0.00 | 0.5874   |
| <i>IC_T</i>    | 0.10  | 0.00 | 0.923    |
| <i>IC_P</i>    | 0.33  | 0.00 | 0.3362   |

The data seem to point out that there are statistically significant differences in terms of the level of implementation of certain information capability related practices when companies are committed with the EFQM excellence model and when companies have adopted a quality management system based on the ISO 9000. In particular there is evidence regarding the unequal median values between the two groups for these six practices: IM\_C1, IT\_MS, IT\_ISS2, IC\_I, IC\_F and IC\_C.

The significant differences that appeared regarding certain practices may be interpreted as follows.

One of the practices in which statistically significant differences have arisen belongs to information management related practices, specifically with the process of information collection. When we study whether an organization cares about knowing the information needed by employees, customers, suppliers and other stakeholders and systematically collects it (IM\_C1), we find that there are differences with the level of implementation. Although both frameworks involve gathering data, according to Martínez-Llorente & Martínez-Costa (2004) ISO 9000 does not require analysis of the data and TQM only requires data be gathered if it is with the aim of analysing them and using the results to improve quality. Therefore, differences related to the collection of data may arise.

Two of the practices in which there are statistically significant differences belong to information technology related practices. Differences arise in relation to the use of information technology to facilitate the monitoring and analysis of internal or external business aspects (indicators) in order to assist decision-making (IT\_MS) and with the use of information technology to automate document location (IT\_ISS2). Under a TQM model, quality information has to be readily available and the information should be part of the visible management system (Martínez-Llorente & Martínez-Costa, 2004). However, it seems as if companies under the ISO 9000 quality approach are more aware of the need to automate document location, and as a consequence these companies use information technologies as support to a greater extent with this aim in mind. One of the main results of implementing ISO 9000 is improvement in the decision-making process; however, according to the results, the use of information technologies as support for this process seems to be adopted to a greater extent in companies under the EFQM excellence model.

Three of the practices in which statistically significant differences have arisen belong to information culture related practices: the organization values people who share sensitive information rather than manipulate or hide it for their own benefit (IC\_I), in the organization there are formal and reliable sources of information and the organization's members use them (IC\_F) and the organization reveals information about the performance of the company to all employees to influence and direct individual performance and consequently the company's performance (IC\_C). These three practices seem to be adopted to a greater extent in companies committed to the EFQM excellence model. This is consistent with the results presented by Heras-Saizarbitoria et al. (2011). These authors highlight the influence of the EFQM excellence model's principles of action in the culture of the organization and state that the use of the EFQM model has a notable influence on internal communication by improving it.

## 5. Conclusions

Companies that are aware of the importance of handling quality information when making the decisions that are necessary for competing in today's turbulent global environment will find in this study a set of practices to implement in order to develop their information capability.

We have found statistically significant differences in terms of the level of implementation of certain information capability related practices between companies that are committed to the EFQM excellence model and companies that have adopted a quality management system based on the ISO 9000.

According to the results it seems that the companies analyzed are more aware of the need to know what information is needed by employees, customers, suppliers and other stakeholders when they are committed to the EFQM excellence model. Also, their intention to systematically collect that information is stronger in them.

In the set of practices related to information technologies, companies committed to the EFQM excellence model are more aware of the need to use information technology to facilitate the monitoring and analysis of internal or external business aspects in order to assist decision-making and the use of information technology while companies that have adopted a quality management system based on the ISO 9000 are more aware of the need to automate document location.

In the set of practices related to information culture is where more differences arise. Companies under the EFQM excellence model have adopted three practices to a greater extent than companies under the ISO 9000 quality approach. Specifically, companies under the EFQM excellence model value people sharing sensitive information rather than manipulating or hiding it for their own benefit, in these companies there exist formal and reliable sources of information used by the organization's members and also, these organizations reveal information about the performance of the company to all employees in order to influence and direct individual performance and consequently the company's performance.

Regardless of the system adopted, correctly applying a quality management system involves establishing processes that must be under control by using the right indicators. The monitoring of

the whole performance of the quality system would be allowed by using the appropriate indicators, which have to be produced and updated. An information system that is designed by taking information capability into account would be the most suitable because it would be efficient when using and managing information.

In terms of research limitations, the first one is that the data has been obtained from small samples of companies that used either the ISO 9000 or the EFQM excellence model as a quality management system. Companies with other quality management systems should be considered in order to gain more in-depth knowledge. The second limitation is that the companies that took part in the study are from different regions in the world, which could have introduced a bias.

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