

ISO 9001 European Scoreboard: an instrument to measure macroquality

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Purpose: ISO 9001 certification is nowadays considered to be one of the most effective tools that can be adopted for guiding the management of Quality Systems. The stunning growth observed by these standards all over the world confirms a strong polarisation of enterprises' interest in this practice. Owing to the wide incidence of this phenomenon, a deep investigation of ISO 9001 diffusion over time is mandatory and of importance. In line with our previous publications, this paper derives from a research project that we are conducting in Portugal in order to develop the 'ISO 9001 European Scoreboard', aimed at studying and ranking European Union (EU) countries based on the diffusion of quality management systems. *Methodology/approach:* In order to achieve such a goal, the authors have performed a set of statistical analyses over public data sets. *Findings:* Based on the model developed and the analyses performed, we were able to identify clusters of countries with different ISO 9001 evolution stages, derived from the ISO 9001 per 1000 inhabitants' scores and countries' growth indexes. *Originality:* With this scoreboard, we are able to categorise and rank countries based on the quality management systems evolution (growth rates) over the past few years. Ultimately, such an 'ISO 9001 European Scoreboard' will be an instrument to provide a comparative assessment of quality management practices over the EU states, leading to the dynamic evaluation of their 'macroquality' levels achieved, according to such a standard. We believe that such results provide an additional important contribution to the study of management systems diffusion/evolution, aimed at providing more fact-based insights and understandings.

Keywords: ISO 9001; scoreboard; diffusion; evolution; efficiency

Introduction

International standards provide requirements or give guidance on good management practices. Of the many standards published, a few have achieved truly global status and are now integrated with the world economy and in the organisations that use them (Juran & De Feo, 2010). Thus, a management system can be defined as a set of interrelated organisational processes which use different resources to achieve the objectives specified by the organisation. Management systems therefore relate to planning, carrying out, controlling and improving various activities in an organisation, by itself, and with regard to its stakeholders, on how the company is performing in both the short and the long term. According to Karapetrovic, Casadesús, and Heras (2006), management systems are thus based on the basic principles of systematisation and formalisation duties.

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Management systems today cover a broad spectrum of areas within an organisation and are aimed at providing confidence to different internal and external stakeholders. Karapetrovic and Willborn (1998a, 1998b), Karapetrovic et al. (2006) and Sampaio, Saraiva, and Guimarães Rodrigues (2009a, 2010), among other researchers, address a number of factors that influence the decisions on the implementation of a specific standard, ranging from the availability of internationally accepted models to stakeholders' pressures. The three most popular standards are ISO 9001 (quality management systems), ISO 14001 (environmental management systems) and OHSAS 18001 (occupational health and safety management systems). Additionally to these standards, there is an emergent set of other standards that, although having a more reduced number of certified companies, reflect significant added value for those companies that implement them. In this group of standards, one can find ISO 22000 (food safety management systems), ISO/TS 16949 (quality management systems – particular requirements for the automotive sector), and ISO 26000 (social responsibility).

The number of ISO 9001-certified companies is significantly high when compared with the remaining management systems, thus reflecting the huge importance that ISO 9000 certification has assumed for companies across the planet. According to the last ISO Survey (ISO, 2011), in December 2010, 1,109,905 ISO 9001 certificates were issued in the world. China leads the ISO 9000 top 10 countries, with 297,037 certificates, followed by Italy with 138,892 certified organisations. Regardless of the number of ISO 9000 worldwide certified organisations, it is important to point out that recent analyses show an apparent stabilisation over the number of certified companies, thus reflecting a possible market saturation (Sampaio, Saraiva, & Guimarães Rodrigues, 2011).

In line with our previous publications, this paper derives from a research project that we are conducting in Portugal in order to develop the 'ISO 9001 European Scoreboard', aimed at studying and ranking European Union (EU) countries based on the quality management systems diffusion. With this scoreboard, we will be able to categorise and rank countries based on the quality management systems evolution (growth rates) over the past few years. In the end, such an 'ISO 9001 European Scoreboard' will be an instrument to provide a comparative assessment of quality management practices over the EU states, leading to the dynamic evaluation of their 'macroquality' levels achieved, according to such a standard.

We believe that such results provide an additional important contribution to the study of management systems diffusion/evolution, aimed at providing more fact-based insights and understandings.

This paper is structured as follows. In the next section, we present a short literature review related to the worldwide diffusion of management systems, followed by a research methodology section. Then, we present the work developed and an analysis of the results obtained. Finally, we close with a conclusions section.

Literature review

Mansfield (1961, cited in Albuquerque, Bronnenberg, & Corbett, 2006) was perhaps the first to explicitly model the process of technology diffusion, using the well-known logistic function and corresponding S-shaped growth curve. Surprisingly, the existing literature on ISO 9000 or ISO 14000 rarely refers the international diffusion literature, despite the fact that the spread of management standards is probably subject to installed-base effects (Albuquerque et al., 2006).

At present, there are a large number of international and national standards whose aim is to order and systematise, among other things, the implementation of business management systems in relation to a wide variety of functions and operations. All the ISO management standards have a very similar methodology, which includes the creation, structure and implementation process, possibly followed by a verification conducted by a third independent part.

For the specific case of the diffusion of management standards, the literature is scarce. Concerning quality management systems diffusion, one should point out three research teams that have obtained some important results related to this issue. The first results regarding a quantitative approach to explain the ISO 9001 certification diffusion were published by Saraiva and Duarte (2003), who aimed to predict how ISO 9000 certification would develop worldwide in the future. These authors have also identified significant variables that influence the quality management systems certification diffusion. Saraiva and Duarte (2003) have developed a regression model that allows one to compute estimates for ISO 9001 certificates at a given country from its population, gross national income and number of certificates in the last two years. The authors have also derived a model which forecasts the evolution of the total number of certificates issued in the world for the period ranging from 2002 to 2006.

Similarly, a second contribution, carried out by Franceschini, Galetto, and Cecconi (2004, 2006), analyses in detail some areas looked at by Saraiva and Duarte (2003). The authors have studied the ISO 9000 standard quality certification growth in some European countries and have suggested the use of a logistic model, from a close analogy between certification diffusion and bio-population growth, in order to describe the certification diffusion process related to each specific economic-entrepreneurial macro-structure. The model suggested provides a forecast of new certifications growth, together with the time required to reach a certain saturation level. If we look at the evolution curve for the number of certificates over time, in each country, we can indeed observe a kind of 'saturation effect' (Franceschini et al., 2006). According to the authors, after a certain period of fast growth, a physiologic break takes place, suggesting that when the number of certified organisations reaches a certain limit, certification loses its connotation and becomes less attractive for the remaining non-certified companies. At this stage, there is a reduction of the competitive gap between certified and non-certified companies, and the number of new enterprises potentially interested in achieving certification decreases significantly (Franceschini et al., 2004).

Sampaio, Saraiva, and Guimarães Rodrigues (2009b, 2009c) have concluded that there is a linear relationship between the number of ISO 9001 issued certificates per 1000 inhabitants and the percentage of ISO 9001-certified companies for each EU country.

More recently, Marimon, Casadesús, and Heras (2004) and Casadesús, Marimon, and Heras (2005) have tried to see if the model proposed by Franceschini et al. (2004) is only adaptable to a country's ISO 9000 certification, or whether similar models can also be used for their levels of ISO 14000 certifications. Casadesús et al. (2005) have investigated whether these models can be used solely in terms of the data gathered at a worldwide level or could be also adaptable to each individual country involved. The authors have also tried to determine whether the diffusion process has proceeded in a relatively homogeneous way between the different activity sectors involved, or if certification has clearly taken place more quickly in certain sectors. The authors have concluded that, according to the model proposed, ISO 9000 and ISO 14000 standards have reached an important moment in their maturity. From the economic sectors' perspective, both standards are developing towards smaller indices of concentration, and there are fewer fluctuations in

the sector's positions in the rankings of certifications. The authors have stated that those sectors that were leaders or pioneers in the introduction of the ISO 9000 standards have played similar galvanising roles in the case of the ISO 14000 standards. Corbett and Kirsch (2001) have stated that the unprecedented surge in the progress of the ISO 9000 standards has been an important factor in explaining the surge observed for the ISO 14001 standard.

The studies that have been carried out by Corbett are very important and of greater interest to an understanding of the diffusion of ISO 9000 and ISO 14000 certifications. Nevertheless, those studies refer to the mechanisms of diffusion, rather than to the actual diffusion observed over time (Corbett & Kirsch, 2000, 2001; Corbett, 2005).

According to van der Wiele, van Iwaarden, Brown, Steimle, and Zink (2009) the differences among the different ISO 9000 countries lead to the conclusions that the diffusion of the ISO 9000 standard follows its own routes in different countries influenced by those countries' specificities. For example, in a research study carried out in Egyptian companies, the perceived relative advantage of ISO standards, the perceived complexity of ISO standards, the perceived compatibility of ISO standards with the existing quality system and procedures, the competitive environment where the company operates, the external pressure to implement a quality management system, the company's organisational structure and a highly formalised organisational structure positively influence the adoption of ISO standards (Hashem & Tann, 2007). From a global perspective, the success in disseminating the management standards would seem to be closely linked to the dynamics themselves of the globalisation process of Western economies and the main players in them – the multinationals (Marimon, Heras, & Casadesús, 2009).

According to Marimon et al. (2009), worldwide decertification is evident, being more in those countries that have reached 95% of the degree of saturation shown by the logistic model. However the authors have found evidence of three group of countries based on the standards expansion – the 'expansionists', the 'mature' and the 'retrocessive' countries.

Given the above previous works, in the next section we propose a new ISO 9000 diffusion indicator that will allow one to categorise and rank countries based on the quality management systems evolution (growth rates) over the past few years. In the end, such an 'ISO 9001 European Scoreboard' will be an instrument to provide a comparative assessment of quality management practices over the EU states, leading to the dynamic evaluation of their 'macroquality' levels achieved, according to such a standard. We believe that such results provide an additional important contribution to the study of management systems diffusion/evolution, aimed at providing more fact-based insights and understandings.

Research methodology

Given the goal already mentioned, the work that we conducted consisted mostly of a quantitative exploratory data analysis over data collected from reliable sources, both regarding ISO 9000 certification as well as population. By crossing both sets of data, we were able to come up with a number of insightful observations, based upon the values collected from the sources mentioned next.

Data sources

For the purposes of this study, we have compiled and used data obtained from the following two main sources:

- ISO, regarding data related to the numbers of ISO 9001-certified entities
- World Bank, regarding data related to the population of each country.

ISO 9001 European Scoreboard (E9S)

According to the last available ISO Survey (ISO, 2011), the number of ISO 9001 issued certificates in Europe represents 48% of the worldwide number of issued certificates. Looking in more detail at the EU reality (Figure 1), the gap between the number of ISO 9001 issued certificates per 1000 inhabitants – ISO 9001pc, for EU15 and for EU27 is decreasing and has been almost inexistent in the past few years. It is important to point out that the first enlargement of the EU took place in 2004, and this fact may have catalyzed the diffusion and increase of the number of certified quality management systems in those countries. Furthermore, the number EU 15 ISO 9001pc score is decreasing/stabilising since 2008 and the EU 27 score presents a growth trend, thus reflecting that the increase in the number of issued certificates in Europe is mainly due to the enlargement in the East of the EU.

The ISO 9001 European Scoreboard proposed in this paper derives from the following model:

$$E9S_{x,z} = (0.2 \times \Delta_{i-3})_{x,z} + (0.3 \times \Delta_{i-2})_{x,z} + (0.5 \times \Delta_{i-1})_{x,z},$$

where Δ_{i-3} , Δ_{i-2} and Δ_{i-1}

correspond to the variation of the number of issued certificates in the years $i-3$, $i-2$ and $i-1$, to the x standard in the z country or region.

In the model developed, we considered different weights for the number of ISO 9001 certificates variations, thus reflecting that each year assumes a different importance in the E9S estimation – the most recent years have more weight in the E9S score estimation.

Table 1 shows the E9S scores computed based on the evolution of the number of ISO 9001 issued certificates in the last three years (2007–2008; 2008–2009; 2009–2010). As one can see, we were able to identify three groups of countries:

- (1) Countries with a negative E9S score, thus reflecting that there is a decrease in the number of ISO 9001 issued certificates in those countries for the last few years.

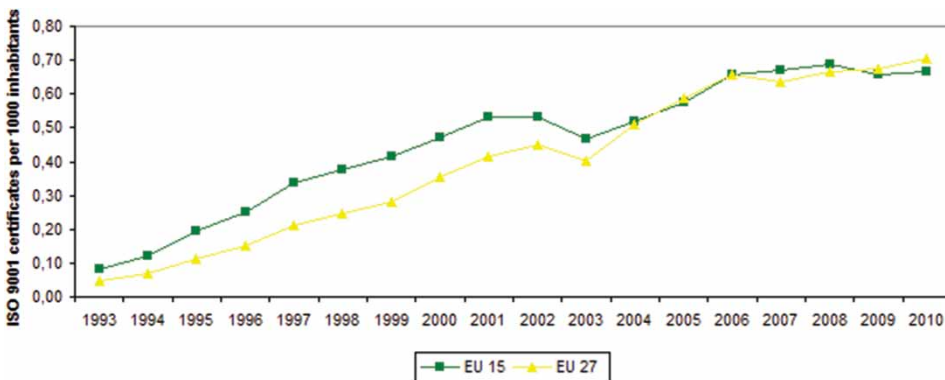


Figure 1. ISO 9001 evolution in the EU.

Table 1. ISO 9001 European Scoreboard.

Country	E9S (%)
Luxembourg	-23.2
The Netherlands	-12.8
Belgium	-8.4
Greece	-8.4
Slovenia	-3.0
Hungary	-2.8
Spain	-2.7
Sweden	3.6
Finland	3.8
Portugal	4.3
Germany	4.3
Denmark	4.8
Ireland	6.2
Estonia	6.3
Poland	6.6
Italy	6.9
UK	7.6
Cyprus	9.5
Slovakia	10.5
Austria	10.7
Bulgaria	11.5
Malta	12.5
France	14.2
Lithuania	15.4
Romania	17.7
Czech Republic	18.9
Latvia	28.9

- (2) Countries with a positive E9S score but below 10%. This group of countries is mainly composed of many of the EU15 countries. For the majority of these countries, a stabilisation of the number of companies with certified quality management systems or a very soft increase is taking place.
- (3) Finally, the third group of countries is composed of those countries with a very significant growth dynamic – countries with E9S scores higher than 10%, where the number of ISO 9001 issued certificates increased substantially in the last few years. In general, this group mainly consists of Eastern Europe countries.

It is also important to point out that 26% of the EU countries do have a negative E9S score, 40% do present a positive score but below 10% and 33% of the countries do present a clear growth dynamic concerning ISO 9001 registration.

Figure 2 reflects the relationship between the ISO 9001pc score (Saraiva & Duarte, 2003; Sampaio et al., 2009b, 2009c) and the E9S score for each EU country. As one can verify, the majority of the EU countries do present ISO 9001pc scores below 1.00 and E9S scores below 20%.

Based on Figure 2, we would like to point out also the following:

- Italy presents the highest ISO 9001pc score (2.30) but a growth index (E9S) below 10%.

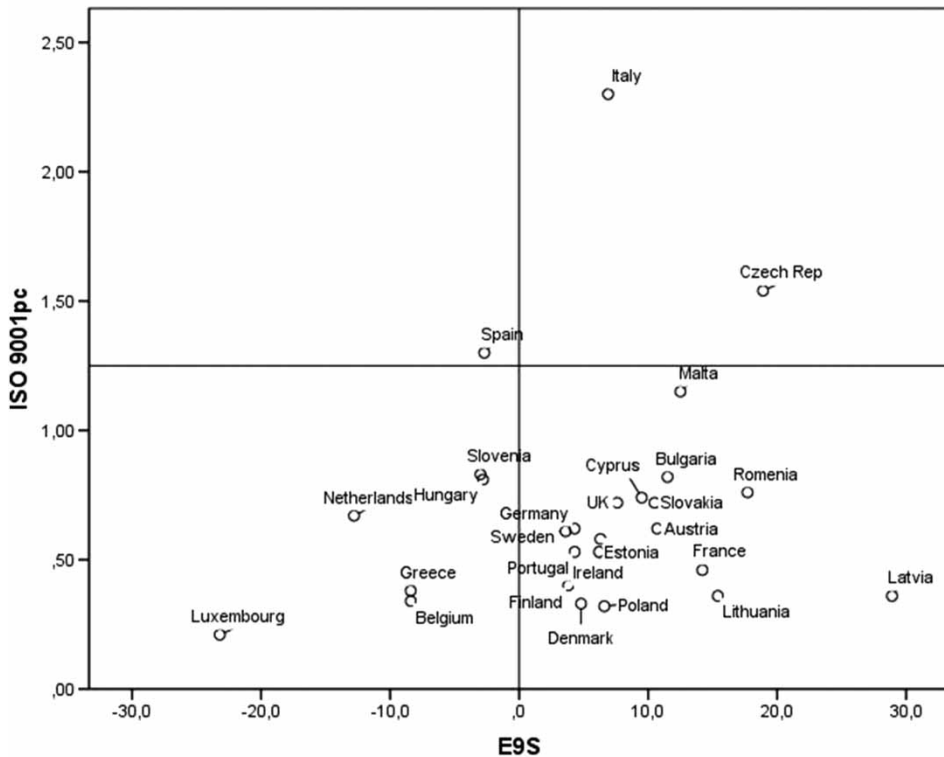


Figure 2. ISO 9001pc versus E9S.

- The Czech Republic presents a high ISO 9001pc score (1.54) together with a high E9S score of 19%. On the opposite side, Latvia presents the highest E9S score (29%) but a reduced number of issued certificates per 1000 inhabitants (0.36).
- Spain presents a high ISO 9001pc score (1.30) together with a negative growth index of 2.7%.

Quality management has a positive relationship with business performance (Dick, 2000). However, it is not mandatory to have ISO 9001 implemented in order to perform quality management. Nevertheless, ISO 9001 is a strong tool that helps to achieve this aim, despite ISO 9001 certification usually being a result of customers and market pressures, leading to fewer improvements and benefits as if it was an initiative promoted by the company itself – the so-called internal motivations. According to Häversjö (2000), the ISO 9001 standard promotes the formalisation of processes and an efficient operational control over documents and suppliers. Furthermore, it is an opportunity to improve the company image and enlarge its markets.

According to Hamrol (2011), the implementation of quality management systems had a positive impact on quality assurance, contributing to a higher level of competitiveness. However, in many cases, organisations only issue certification due to pressure from the market, such as pressures from clients, without giving real importance to implementation – which contributes to an ineffective and inefficient system. Also, the lack of management involvement makes it impossible to reach down to the bases of the organisation, which are the mission, vision and the strategic management of goals.

According to Ruzevicius, Adomaitiene, and Sirvidaite (2004) and Adomaitiene and Ruzevicius (1999), total quality management and quality management systems implementation are the approaches with highest impact on products and operations quality improvement – operational efficiency improvement.

An efficient quality management system allows companies to decrease the number of non-conforming products and the number of customer complaints, helps the employees to perform their jobs better, improves communication and makes the choice of suppliers more effective (Ruzevicius et al., 2004).

A number of studies have been carried out that tried to relate the impact of quality management practices on organisational performance. The majority of them conclude that there is a positive relationship between the implementation of quality management practices and organisational performance improvement (Sampaio et al., 2009a).

Results obtained by Gupta (2000) show that ISO 9001-certified companies differ positively from non-certified ones on ‘technological management’, ‘quality management control’, ‘causes of poor quality’ and ‘quality control techniques used’. Romano (2000) reports statistically significant improvements after ISO 9001 certification, concerning ‘quality performance in production and on the reliability of the production system’ and ‘external quality performances’. He also observed that ‘non-quality costs’ diminished significantly after ISO 9001 certification. Ozgur, Meek, and Toker (2002) point out that the level of usage of the majority of quality tools is higher in ISO 9001-certified firms. Concerning the services sector, Dick, Gallimore, and Brown (2002) concluded that ISO 9001 certification makes a strong difference in the ways quality is perceived and measured.

Although the majority of the studies carried out state that there is a positive relationship between ISO 9001 certification and performance, as just mentioned, there is also a group of authors who did not find enough evidence to support such a relationship (Terziovski, Samson, & Dow, 1997; Quazi, Hong, & Meng, 2002; Conca, Llopis, & Tarí, 2004). Results obtained by Terziovski et al. (1997) showed that the presence or absence of ISO 9001 certification is a poor predictor of organisational performance and quality. Quazi et al. (2002) concluded that there was no statistically significant relationship between ISO 9001 certification status, quality management practices and quality results.

There seems to be, however, a strong relationship between the companies’ certification motivations and the corresponding results obtained. When firms simply react to external pressures for getting certified, they may face ISO 9001 registration as a prime objective *de per se*, adopt a minimalist approach to achieve it, and thus achieve limited internal performance improvements.

The number of ISO 9001 certificates per country does not express directly the companies’ efficiency. It is not possible to classify a country as more efficient than another, just because it has a higher number of issued certificates. However, usually, certified companies are more organised and more client-focused due to the implementation of the standard. The ISO 9001 standard is a tool that helps companies to achieve business excellence, promoting quality excellence with a strong customer focus (Klefsjö, Bergquist, & Garvare, 2008).

Conclusions

In this paper, we present the first approach to a new ISO 9001 diffusion indicator that allows one to categorise and rank countries based on the quality management systems evolution (growth rates) over the past few years. As stated, we have identified different profiles of countries based on their E9S scores – countries where ISO 9001 certification

is decreasing, countries where ISO 9001 certification is stabilising, and countries where ISO 9001 certification is significantly increasing.

A quality management system should not be seen as a tool or approach that organisations use to solve the several daily problems with which they are faced. An organisation's competitive advantage depends on the individual performance of each worker and on the organisational infrastructure that supports the company. Thus, that competitive advantage can gain a lot through the use of a quality management system.

This was our first approach in order to develop a 'European Quality Scoreboard', that would be an instrument to provide a comparative assessment of quality management practices over the EU states, leading to the dynamic evaluation of their 'macroquality' levels achieved. Currently, we are working in order to improve the model presented in this paper with the introduction of new variables that reflect the quality state-of-the-art in each EU country. However, we believe that these first results provide an additional important contribution to the study of management systems diffusion/evolution, aimed at providing more fact-based insights and understandings.

References

- Adomaitiene, R., & Ruzevicius, J. (1999). TQM implementation in Lithuanian education institutions. In *TQM for University II* (pp. 498–509). Verona. International Conference. Retrieved from <http://www.esoe.org/tqm2.html>
- Albuquerque, P., Bronnenberg, B., & Corbett, C. (2006, June 20). *A spatio-temporal analysis of the global diffusion of ISO 9000 and ISO 14000 certification* (Working Paper). Los Angeles, CA: UCLA Anderson School of Management, UCLA.
- Casadesús, M., Marimon, F., & Heras, I. (2005). *ISO 9000 and ISO 14000 standards: An international diffusion model*. Proceedings of the TQM & 6-sigma for Competitiveness Conference, Shanghai [CD].
- Conca, F., Llopis, F., & Tari, J. (2004). Development of a measure to assess quality management in certified firms. *European Journal of Operational Research*, 156, 683–697.
- Corbett, C.J. (2005, August 23). *Global diffusion of ISO 9000 certification through supply chain* (Working paper). Los Angeles, CA: UCLA Anderson School of Management, UCLA.
- Corbett, C.J., & Kirsch, D.A. (2000). ISO 14000: An agnostic's report from the front line. *ISO 9000 + ISO 14000 News*, 2, 4–17.
- Corbett, C.J., & Kirsch, D.A. (2001). International diffusion of ISO 14000 certification. *Production and Operations Management*, 10(3), 327–342.
- Dick, G., Gallimore, K., & Brown, J. (2002). Does ISO 9000 accreditation make a profound difference to the way service quality is perceived and measured? *Managing Service Quality*, 12(1), 30–42.
- Dick, G.P.M. (2000). ISO 9000 certification benefits, reality or myth? *The TQM Magazine*, 12(6), 365–371.
- Franceschini, F., Galetto, M., & Cecconi, P. (2006). A worldwide analysis of ISO 9000 standard diffusion. *Benchmarking: An International Journal*, 13(4), 523–541.
- Franceschini, F., Galetto, M., & Gianni, G. (2004). A new forecasting model for the diffusion of ISO 9000 standard certifications in European countries. *International Journal of Quality and Reliability Management*, 21(1), 32–50.
- Gupta, A. (2000). Quality management practices of ISO vs. non-ISO companies: A case of Indian industry. *Industrial Management & Data Systems*, 100(9), 451–455.
- Hamrol, A. (2011). How political and economic circumstances can influence pursuits of excellence in quality management. *Total Quality Management & Business Excellence*, 22(5–6), 619–640.
- Hashem, G., & Tann, J. (2007). The adoption of ISO 9000 standards within the Egyptian context: A diffusion of innovation approach. *Total Quality Management and Business Excellence*, 18(6), 631–652.
- Häversjö, T. (2000). The financial effects of ISO 9000 registration for Danish companies. *Managerial Auditing Journal*, 15(1/2), 47–52.

- ISO. (2011). *The ISO survey of certifications 2010*. Geneva: Author.
- Juran, J., & De Feo, J. (2010). *Juran's quality handbook* (6th ed.). New York: McGraw-Hill.
- Karapetrovic, S., Casadesús, M., & Heras, I. (2006). *Dynamics and integration of standardized management systems – an empirical study*. Girona: Universitat de Girona.
- Karapetrovic, S., & Willborn, W. (1998a). The systems view for clarification of quality vocabulary. *International Journal of Quality and Reliability Management*, 15(1), 99–120.
- Karapetrovic, S., & Willborn, W. (1998b). Integration of quality and environmental management systems. *The TQM Magazine*, 10(3), 204–213.
- Klefsjö, B., Bergquist, B., & Garvare, R. (2008). Quality management and business excellence, customers and stakeholders: Do we agree on what we are talking about, and does it matter? *The TQM Journal*, 20(2), 120–129.
- Marimon, F., Casadesús, M., & Heras, I. (2004). *A dynamic model for the diffusion of ISO 9000 and ISO 14000 standards*. Proceedings of the International Conference on Modelling & Simulation, Valladolid [CD].
- Marimon, F., Heras, I., & Casadesús, M. (2009). ISO 9000 and ISO 14000 standards: A projection model for the decline phase. *Total Quality Management and Business Excellence*, 20(1), 1–21.
- Ozgur, C., Meek, G., & Toker, A. (2002). The impact of ISO certification on the levels of awareness and usage of quality tools and concepts: A survey of Turkish manufacturing companies. *Quality Management Journal*, 9(2), 57–69.
- Quazi, H., Hong, C., & Meng, C. (2002). Impact of ISO 9000 certification on quality management practices: A comparative study. *Total Quality Management*, 13(1), 53–67.
- Romano, P. (2000). ISO 9000: What is its impact on performance? *Quality Management Journal*, 7(3), 38–56.
- Ruzevicius, J., Adomaitiene, R., & Sirvidaite, J. (2004). Motivation and efficiency of quality management systems implementation: A study of Lithuanian organizations. *Total Quality Management and Business Excellence*, 15(2), 173–189.
- Sampaio, P., Saraiva, P., & Guimarães Rodrigues, A. (2009a). ISO 9001 certification research: Questions, answers and approaches. *International Journal of Quality and Reliability Management*, 26(1), 38–58.
- Sampaio, P., Saraiva, P., & Guimarães Rodrigues, A. (2009b). A statistical analysis of ISO 9000 related data for ultra-peripheral and Portuguese regions. *Quality Management Journal*, 16(2), 44–58.
- Sampaio, P., Saraiva, P., & Guimarães Rodrigues, A. (2009c). An analysis of ISO 9000 data in the world and the European Union. *Total Quality Management and Business Excellence*, 20(12), 1303–1320.
- Sampaio, P., Saraiva, P., & Guimarães Rodrigues, A. (2010). A classification model for prediction of certification motivations from the contents of ISO 9001 audit reports. *Total Quality Management and Business Excellence*, 21(12), 1279–1298.
- Sampaio, P., Saraiva, P., & Guimarães Rodrigues, A. (2011). ISO 9001 certification forecasting models. *International Journal of Quality and Reliability Management*, 28(1), 5–26.
- Saraiva, P., & Duarte, B. (2003). ISO 9000: Some statistical results for a worldwide phenomenon. *Total Quality Management and Business Excellence*, 14(10), 1169–1178.
- Terziovski, M., Samson, D., & Dow, D. (1997). The business value of quality management systems certification: Evidence from Australia and New Zealand. *Journal of Operations Management*, 15, 1–18.
- van der Wiele, T., van Iwaarden, J., Brown, A., Steimle, U., & Zink, K. (2009). An international comparison of the perceptions about the revised ISO 9000 quality system standards. *Total Quality Management and Business Excellence*, 20(4), 393–408.