



# ISO 9001 certification research: questions, answers and approaches

Received April 2008  
Revised August 2008  
Accepted August 2008

Paulo Sampaio

*Systems and Production Department, School of Engineering,  
University of Minho, Braga, Portugal*

Pedro Saraiva

*Chemical Engineering Department, University of Coimbra,  
Coimbra, Portugal, and*

António Guimarães Rodrigues

*Systems and Production Department, School of Engineering,  
University of Minho, Braga, Portugal*

## Abstract

**Purpose** – The majority of ISO 9001 certification research studies conducted so far are supported by survey methodologies and descriptive statistics. As such, they express conclusions that are mainly derived from opinions and perceptions about the subject. Thus, it is common to find in the open literature references that point out the highly subjective results derived from such studies (often of somewhat contradictory nature). This paper tries to compile the main conclusions that ISO 9001 research studies have tried to address, with the aim of describing the quality management systems literature state-of-the-art.

**Design/methodology/approach** – In order to achieve this objective, an exhaustive literature review of ISO 9000 studies was carried out. For that purpose approximately 100 articles were analysed, which were sorted in the following categories, according to the used methodology: surveys; analysis of financial indicators; case studies; interviews; literature review; and statistical data analysis.

**Findings** – This paper reflects an exhaustive literature review, which allowed the identification of a group of issues that ISO 9001 research studies have tried to address, as well as the most commonly used methodologies employed and main conclusions reached so far by the different authors. Then using such a state-of-the-art as a starting point, it pointed out a number of questions that seem to be relevant but have not been so far addressed in the open literature in terms of providing clear and precise answers, as well as others that are at the core of the authors' future work in this area.

**Originality/value** – The value of the paper is to point out and to compile the main conclusions reached by the different authors and researchers in the most important ISO 9001 issues addressed in the open literature.

**Keywords** ISO 9000 series, Assessment, Research

**Paper type** General review

## Introduction

The ISO 9000 standards have resulted since 1987 in a significant worldwide phenomenon, given the quite impressive growth and diffusion of registrations according to the ISO 9001 standard in so many countries and different kinds of organisations.

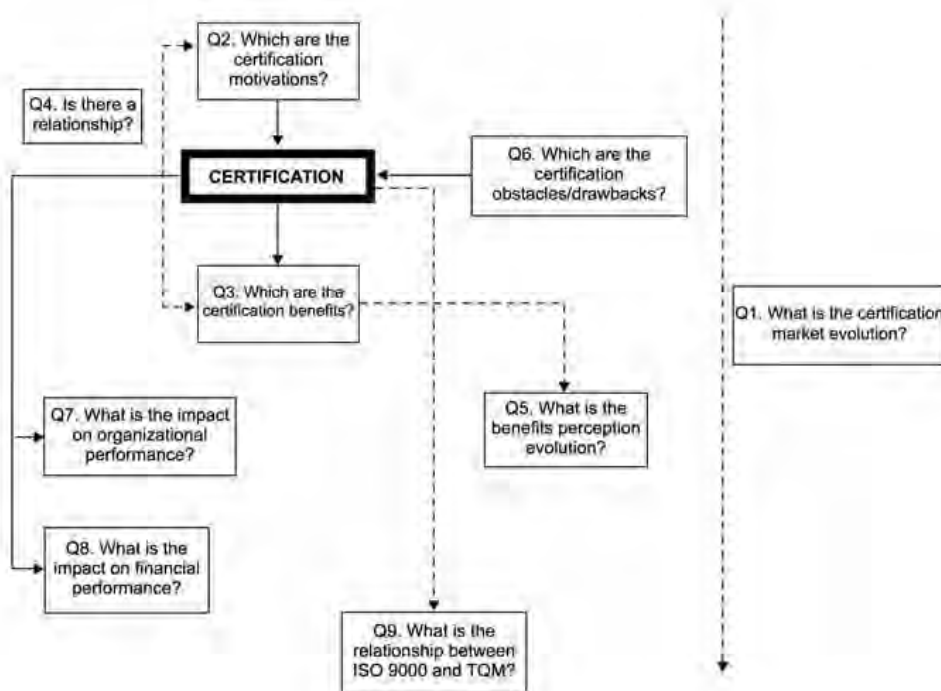
The authors acknowledge financial support provided by Fundação para a Ciência e a Tecnologia (FCT) through PhD research grant (BD/16032/2004).



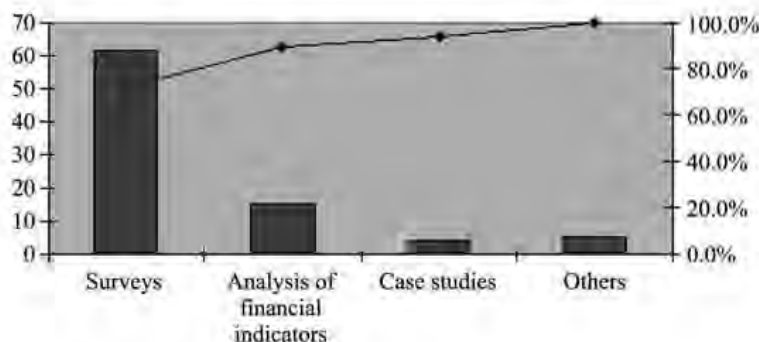
Therefore, it is not surprising that a reasonable number of researchers have tried to address topics related with such standards. From an exhaustive search in the open literature, we identified and carefully studied a total of 92 articles related with this topic, from which we derived a conceptual map (Figure 1) that illustrates the major questions addressed.

The most common research methodology adopted by the different authors corresponds to the use of survey techniques (Figure 2).

Only for two, out of the above nine main questions addressed (Q1 and Q8), were we able to find out that other research techniques tended to be adopted, so that in both cases hard data evidence is predominantly used to support the authors' conclusions (Table I).



**Figure 1.**  
Major ISO 9000 issues that previously published studies have tried to address



**Figure 2.**  
Pareto analysis of research techniques employed by researchers

**Table I.**  
Major ISO 9000  
publications and  
predominant associated  
research techniques  
employed

Surveys	Analysis of financial indicators	Case studies	Interviews	Literature review	Statistical data analysis
Mann and Kehoe (1994)	Wisner and Eakins (1994)	Mo and Chan (1997)	Mann and Kehoe (1994)	Stevenson and Barnes (2001)	Saraiva and Duarte (2003)
Maani <i>et al.</i> (1994)	Lima <i>et al.</i> (2000)	Staines (2000)	Curkovic and Pagell (1999)	Magd and Curry (2003b)	
Idris <i>et al.</i> (1996)	Heras <i>et al.</i> (2001, 2002a, b)	Withers and Ebrahimpour (2000, 2001)			
LRQA (1996)	Aarts and Vos (2001)	Gustafsson <i>et al.</i> (2001)			
Adam <i>et al.</i> (1997)	Beirão and Sarsfield Cabral (2002)	Dwyer (2002)			
Buttle (1997)	Corbett <i>et al.</i> (2002, 2003)				
Chapman <i>et al.</i> (1997)	Nicolau and Sellers (2002)				
Jones <i>et al.</i> (1997)	Tsekouras <i>et al.</i> (2002)				
Mo and Chan (1997)	Wayhan <i>et al.</i> (2002)				
Terziowski <i>et al.</i> (1997, 2003)					
Brown <i>et al.</i> (1998)					
Bryde and Slocock (1998)					
Kannan <i>et al.</i> (1999)					
Lee and Palmer (1999)					
Leung <i>et al.</i> (1999)	Chow-Chua <i>et al.</i> (2003)				
Lipovatz <i>et al.</i> (1999)	Martinez-Costa and Martinez-Lorente (2003)				
Ragothaman and Korte (1999)	Dimara <i>et al.</i> (2004)				
Terziowski and Samson (1999)	Naser <i>et al.</i> (2004)				
Al-khalifa and Aspinwall (2000)					
Gupta (2000)					
Haversjo (2000)					
Romano (2000)					
Sun (2000)					
Casadesús <i>et al.</i> (2001, 2004)					
Escanciano <i>et al.</i> (2001a, b, 2002)					
Gotzamani and Tsiotras (2001, 2002)					

(continued)

Surveys	Analysis of financial indicators	Case studies	Interviews	Literature review	Statistical data analysis
Gustafsson <i>et al.</i> (2001)					
Janas and Luczak (2002)					
Lee <i>et al.</i> (2001)					
Rahman (2001)					
Singels <i>et al.</i> (2001)					
Torre <i>et al.</i> (2001)					
Boulter and Bendell (2002)					
Dick <i>et al.</i> (2002)					
Halis and Oztas (2002)					
ISO/TC 176 (2002)					
Liebesman (2002)					
Ozgur <i>et al.</i> (2002)					
Pokinska <i>et al.</i> (2002)					
Quazi <i>et al.</i> (2002)					
Tari and Molina (2002)					
Chow-Chua <i>et al.</i> (2003)					
Coleman and Douglas (2003)					
Conca <i>et al.</i> (2004)					
Corbett <i>et al.</i> (2003)					
Douglas <i>et al.</i> (2003)					
Llopis and Tari (2003)					
Magd and Curry (2003a)					
Tari and Sabater (2004)					
Bhuiyan and Alam (2004)					
Martinez-Costa and Martinez-Lorente (2004)					
Martinez-Lorente and Martinez-Costa (2004)					
Quazi and Jacobs (2004)					
Williams (2004)					
Casadestus and Karapetrovic (2005a, b)					
van der Wiele <i>et al.</i> (2005)					

Table I.



**Main issues and answers**

Given the above overview of issues and research tools adopted, we will now summarise some of the main results reported in the open literature, regarding ISO 9001 certification.

*ISO 9001 certification market evolution*

The implementation of a quality management system, and its subsequent certification, is a voluntary process, supported by the organisation's own motivations, goals and policies.

The diffusion of ISO 9001 certifications started mostly in Europe. Then, European companies pressured their suppliers around the world to become also ISO 9001 certified, and such suppliers sought certification as a protection mechanism against the perceived threat of having ISO 9001 certification to become an international trade barrier. Next, domestic diffusion started to grow in those countries as well, namely due to competitive reasons (if our competitor is ISO 9001 certified, we should be also), and pressure exerted by downstream customers through global supply chains. Companies exporting goods or services into a region may also simultaneously import management practices from that region back to their home country (Corbett *et al.*, 2003).

According to the last ISO survey (ISO, 2007), quality management systems certification is still rising, so that by the end of December 2006 there were at least 897.866 ISO 9001 valid certificates issued in at least 170 different countries (see Tables II and III).

By looking at the top ten countries regarding ISO 9001 certificates, one can see that China has become the leader (143.823), followed by Italy (98.028), and Japan (53.771).

**Table II.**  
ISO 9001 certificates  
across continents (2005)

Continent	ISO 9001:2000	%
Europe	379.937	48.9
Far East	247.091	31.8
North America	59.663	7.7
Africa/West Asia	48.327	6.2
Central and South America	22.498	2.9
Australia/New Zealand	19.092	2.5
Total	776.608	100.0

**Table III.**  
ISO 9001 certificates  
growth for the top ten  
countries (2005)

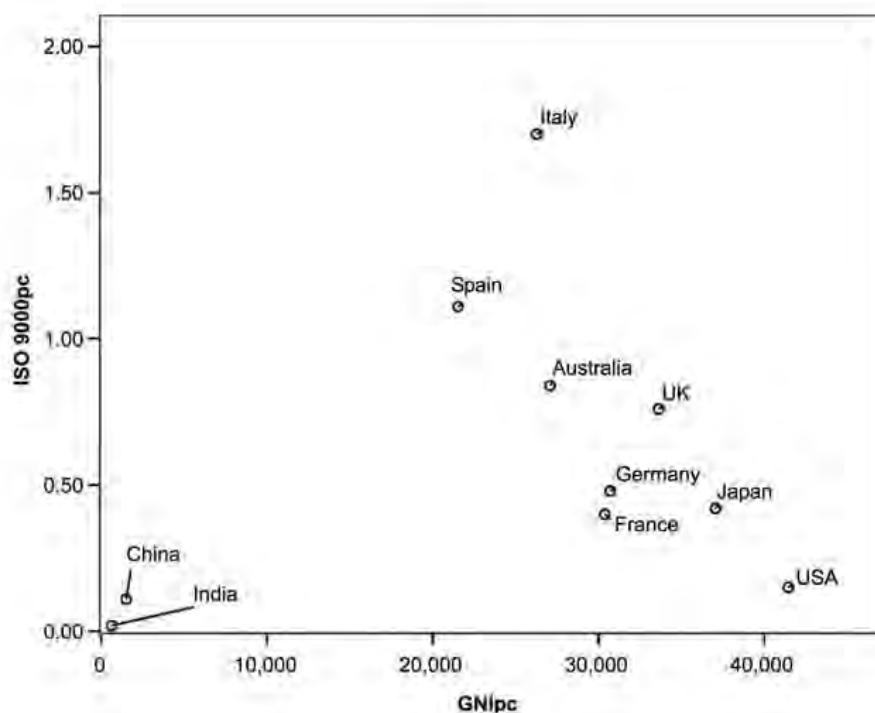
Country	2001	2002	2003	2004	2005	Country growth
China	7.413	40.997	96.715	132.926	143.823	136.410
Italy	1.974	14.733	64.120	84.485	98.028	96.054
Japan	3.650	16.813	38.751	48.989	53.771	50.121
Spain	808	8.872	31.836	40.972	47.445	46.637
UK	8.501	9.301	45.465	50.884	45.612	37.111
USA	1.104	4.587	30.294	37.285	44.270	43.166
Germany	2.338	10.811	23.598	26.654	39.816	37.478
India	544	2.247	8.367	12.558	24.660	24.116
France	2.194	6.529	15.073	21.769	24.441	22.247
Australia	3.442	7.024	19.975	17.365	16.922	13.480

These results reflect the huge importance that the Chinese economy is assuming on global trade and worldwide quality. In the top ten countries with ISO 9001 certificates we do find five European countries (Italy, the UK, Spain, Germany, France), two Far East countries (China, Japan), India, the USA and Australia.

With the aim of finding a possible relationship between a country's economic development and its ISO 9001 certification status, for the top ten countries already mentioned, we have compared their per capita gross national income ( $GNI_{pc}$ ), expressed in US\$, versus the number of ISO 9000 certificates per 1,000 people ( $ISO\ 9000_{pc}$ ), as reported in Table IV and Figure 3. When such a scaling takes place, one can see that China and India appear in the last positions of  $ISO\ 9000_{pc}$  while Italy takes the lead, with an  $ISO\ 9000_{pc}$  score of 1.70, followed by Spain, with 1.11.

Country	ISO 9000 pc	GNI pc
Italy	1.70	26.280
Spain	1.11	21.530
Australia	0.84	27.070
UK	0.76	33.630
Germany	0.48	30.690
Japan	0.42	37.050
France	0.40	30.370
USA	0.15	41.440
China	0.11	1.500
India	0.02	630

**Table IV.**  
ISO 9000 certificates per  
1,000 people and gross  
national income per  
capita



**Figure 3.**  
Top ten countries  
ISO 9000<sub>pc</sub> versus GNI<sub>pc</sub>

Saraiva and Duarte (2003) used the number of ISO 9001 certificates per capita to build statistical models and perform an exploratory data analysis of registrations on a country by country basis, finding out that there seems to be a maximum number of ISO 9001 certificates per 1,000 inhabitants that can be reached, ranging between 1.2 and 1.6. Later on, Franceschini *et al.* (2004) stated, under quantitative models, that in some countries ISO 9001 certification seems to be attenuating, because of a reduction in the competitive gap between certified and non certified companies, and the limited number of enterprises potentially interested in achieving ISO 9001 certification.

The same authors concluded that the shape of certification evolution, in different countries, seems to be a common one (Figure 4), and that the saturation level corresponds to a small fraction of the total number of companies in each country.

According to both Saraiva and Duarte (2003) and Franceschini *et al.* (2004) one may conclude that the number of certified firms seems to become stable around a certain "market saturation level".

According to results obtained also for the top ten countries (Table IV and Figure 3), there seems to be an apparent positive relationship between the number of ISO 9001 certificates per 1000 inhabitants and the levels of economic development reached in different countries. China and India have per capita incomes below US\$10,000 and ISO 9000<sub>pc</sub> values below 0.2; Germany, Japan, France and USA are countries with a high economic level but a relatively small ISO 9000<sub>pc</sub> score; Italy, Spain, Australia and UK are countries with high ISO 9000<sub>pc</sub> values and considerable economic development levels.

Based on the results just shown, we can state that there are some countries which are in a growth stage, regarding the number of certified entities. However, other countries, mainly those where quality management systems certification begun earlier

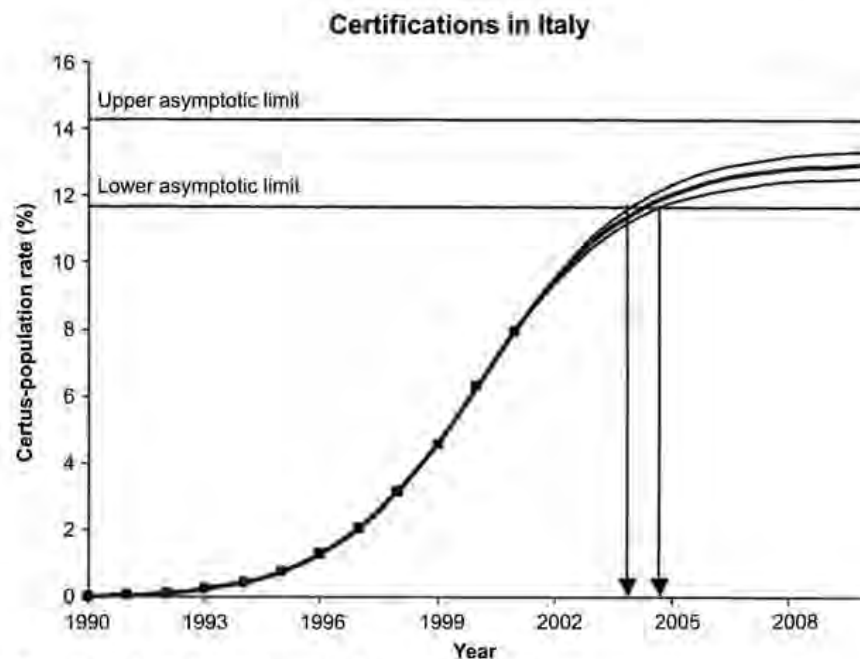


Figure 4.  
ISO 9001 certification  
evolution in Italy:  
percentage of companies  
that are ISO 9001 certified

Source: Adapted from Franceschini *et al.* (2004)

---

on, have already reached market saturation levels, and thus their number of certified companies tends to reach a certain constant value.

During the last five years, one can see also that the number of ISO 9001 certified companies has significantly increased. The same happened with the number of countries that do have ISO 9001 certified organisations.

It would be important for ISO 9000 researchers, certification bodies and companies, across the world, to pay a close attention to the ISO 9001 certification market evolution, and forecast its future.

#### *ISO 9001 certification motivations and benefits, barriers and drawbacks*

*ISO 9001 certification motivations.* ISO 9001 certification motivations can be classified according to one out of two main categories: internal and external motivations. Internal motivations are related with the goal of achieving organisational improvement, while external motivations are mainly related with promotional and marketing issues, customer pressures, improvement of market share, etc. (Buttle, 1997; Jones *et al.*, 1997; Mo and Chan, 1997; Brown *et al.*, 1998; Bryde and Slocock, 1998; Lee and Palmer, 1999; Lipovatz *et al.*, 1999; Escanciano *et al.*, 2001a; Gustafsson *et al.*, 2001; Torre *et al.*, 2001; Gotzamani and Tsiotras, 2002; Poksinska *et al.*, 2002; Corbett *et al.*, 2003; Douglas *et al.*, 2003; Llopis and Tari, 2003; Magd and Curry, 2003a).

ISO 9001 certification is frequently used mostly as a marketing tool (Poksinska *et al.*, 2002). Jones *et al.* (1997) defined two organisation types, according to their main purpose for achieving certification: the “non-development companies”, which are those whose primary reason for seeking quality certification is driven by the mentality of “achieving a certificate”; and the “developmental companies”, which are the firms that adopt quality certification because of their belief in the internal benefits that can derive from it.

In more detail, Magd and Curry (2003a) concluded that the most important reasons for certification, among Egyptian companies, were the following: “improve the efficiency of the quality system”; “pressures from competitors/foreign partners”; “to maintain/increase market share”; “to meet government demands” and “to comply with customers’ requirements”. Some companies also stated that without ISO 9001 certification they could not achieve a significant number of contracts (Douglas *et al.*, 2003). Corbett *et al.* (2003), based on an international survey, concluded that the main motivations for ISO 9001 certification are as follows: “quality improvements”; “improvements in corporate image”; “marketing advantage”; and “customer pressure”. Concerning US companies, one of the most important underlying reasons for becoming certified is the existence of commercial relationships with European markets (Bhuiyan and Alam, 2004).

*ISO 9001 certification benefits.* ISO 9001 certification benefits can be also classified into external and internal categories. The first ones are related to improvements in terms of marketing and promotional aspects, while internal benefits are related with organisational improvements (Buttle, 1997; Mo and Chan, 1997; Brown *et al.*, 1998; Leung *et al.*, 1999; Lipovatz *et al.*, 1999; Ragothaman and Korte, 1999; Staines, 2000; Casadesús *et al.*, 2001, 2004; Escanciano *et al.*, 2001a, 2002; Gustafsson *et al.*, 2001; Stevenson and Barnes, 2001; Torre *et al.*, 2001; Gotzamani and Tsiotras, 2002; Halis and Oztas, 2002; Liebesman, 2002; Poksinska *et al.*, 2002; Coleman and Douglas, 2003; Corbett *et al.*, 2003; Douglas *et al.*, 2003; Magd and Curry, 2003a; Bhuiyan and Alam, 2004; van der Wiele *et al.*, 2005).



Casadesús *et al.* (2001) proposed a classification for ISO 9001 benefits based on the perceived benefits obtained, suggesting four organisation types: “companies with high internal benefits (HIB)”; “companies with moderate internal benefits (MIB)”; “companies with high external benefits (HEB)” and “companies with moderate external benefits (MEB)” (see Table V).

Although “product quality improvements” are often quoted as an important ISO 9001 benefit, such an improvement may not be a direct result of a quality management system implementation (Withers and Ebrahimpour, 2001).

*Relationships between ISO 9001 motivations and benefits.* There is a consensual opinion that ISO 9001 benefits are related with company certification motivations, i.e. when companies become certified based on internal motivations the derived benefits are fulfilled on a more global dimension. On the other hand, when companies implement ISO 9001 based mostly on external motivations, improvements obtained are then mainly of an external nature (Jones *et al.*, 1997; Brown *et al.*, 1998; Gotzamani and Tsiotras, 2002; Poksinska *et al.*, 2002; Corbett *et al.*, 2003; Llopis and Tari, 2003; Williams, 2004).

Companies that sought quality certification for “developmental reasons” have experienced more internal benefits from certification (Jones *et al.*, 1997). Brown *et al.* (1998) argued that companies driven by internal reasons to seek certification have a more positive perception about improvements achieved. The manager that sees certification as an opportunity to improve internal processes and systems, rather than simply wanting to get a certificate on the wall, will get broader positive results from ISO 9001 certification. Gotzamani and Tsiotras (2002) stated that companies seeking ISO 9001 certification mainly based on external motivations will also achieve mostly external benefits, while those that seek certification based on true quality improvement will get benefits mainly in terms of internal operations improvement (Poksinska *et al.*, 2002; Williams, 2004).

Llopis and Tari (2003) suggest that companies more concerned about internal reasons are those that:

- obtain higher profits deriving from the implementation of a quality system;
- reach a greater practical implementation of quality management principles; and
- are most likely to progress towards total quality management.

External benefits	Internal benefits
Access to new markets	Productivity improvements
Corporate image improvement	Product defect rate decreases
Market share improvement	Quality awareness improvements
ISO 9000 certification as a marketing tool	Definition of the personnel responsibilities and obligations
Customer relationship improvements	Delivery times improvements
Customer satisfaction	Internal organisation improvements
Customer communication improvements	Nonconformities decreases
	Customers' complaints decreases
	Internal communication improvements
	Product quality improvement
	Competitive advantage improvement
	Personnel motivation

**Table V.**  
Most commonly stated  
ISO 9001 certification  
benefits reported in the  
literature

---

*ISO 9001 benefits time evolution.* There is evidence in the literature that ISO 9001 perceived benefits do decrease over time (Jones *et al.*, 1997; Terziovski *et al.*, 2003; Casadesús *et al.*, 2004; Casadesús and Karapetrovic, 2005a, b).

Jones *et al.* (1997) stated that there was no evidence to state that certified companies progressively experience more beneficial outcomes from ISO 9001 certification. In fact, results have indicated that, on the opposite side, companies appear to experience declining benefits over time. As organisations move along the quality journey and their quality systems mature, the manager's ISO 9001 certification perceived benefits do indeed diminish (Terziovski *et al.*, 2003). Juran (1999, cited in Terziovski *et al.*, 2003) stated that:

it appears that companies that are at the beginning stages of their quality journeys find that the ISO 9000 series of standards provides them with a guide for implementing a basic quality system. But for companies with good quality systems, the standard often just adds costs, delays and burdensome documentation, rather than providing any competitive advantage.

Therefore, according to Juran, it could well be the case that ISO 9001 certification relevance decreases for companies that reach mature quality systems and aim for best practices in continuous improvement.

Casadesús *et al.* (2004) verified that surveyed companies experienced an 11 per cent decrease (1998-2002) concerning ISO 9001 perceived benefits. On a subsequent study, Casadesús and Karapetrovic (2005a, b) concluded that, on average, ISO 9001:2000 certified companies perceived fewer benefits than their ISO 9001/2/3:1994 registered counterparts. The same authors suggest that this situation can be due to the fact that ISO 9001:2000 benefits will only be reached in a longer term perspective.

*ISO 9001 barriers and drawbacks.* The obstacle most frequently cited on the literature, regarding ISO 9001 certification, is the lack of top management involvement during the implementation process, which is known to be crucial for its success (Brown *et al.*, 1998; Stevenson and Barnes, 2001; Torre *et al.*, 2001; Douglas *et al.*, 2003).

Other barriers identified by companies are the following ones: high implementation and maintenance costs, despite of its decrease over time (Leung *et al.*, 1999; Stevenson and Barnes, 2001; Casadesús *et al.* 2004); lack of auditors' knowledge concerning specific industries; excessive auditors support over paperwork; different standard interpretations among auditors; ethical issues related with certification bodies (Brown *et al.*, 1998). Brown *et al.* (1998) also concluded that SME face restrictions concerning financial, human and material resources.

The major disappointment pointed out by ISO 9001 certified companies is that organisations requiring their suppliers to become ISO 9001 certified in order to do business are still using suppliers without ISO 9001 certification (Brown *et al.*, 1998; Douglas *et al.*, 2003). It is important to mention that "customer pressure" is one of the main motivations mentioned by companies to achieve ISO 9001 certification. For many organisations, ISO 9001 certification is a "necessary evil", forced upon by purchasers, particularly large organisations, which sometimes are not themselves ISO 9001 certified.

Given the set of issues explored in the ISO 9001 open literature, some interesting questions that seem to be yet somewhat unexplored but worthwhile studying are the following:

- How do certification motivations influence and relate with ISO 9001 audit non-conformities?
- What are the typical profiles for companies driven by external motivations, as opposed to internal ones for achieving ISO 9001 certifications?

*Impacts on organisational performance*

A number of studies have been carried out that try to relate the impact of quality management practices over organisational performance. The majority of them conclude that there is a positive relationship between the implementation of quality management practices and organisational performance improvement (Mann and Kehoe, 1994; Maani *et al.*, 1994; Wisner and Eakins, 1994; Adam *et al.*, 1997; Curkovic and Pagell, 1999; Terziovski and Samson, 1999; Gupta, 2000; Romano, 2000; Withers and Ebrahimpour, 2000, 2001; Lee *et al.*, 2001; Singels *et al.*, 2001; Boulter and Bendell, 2002; Dick *et al.*, 2002; Ozgur *et al.*, 2002; Tari and Molina, 2002; Tari and Sabater, 2004; Quazi and Jacobs, 2004).

Results obtained by Gupta (2000) show that ISO 9001 certified companies do 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 *et al.* (2002) point out that the level of usage for the majority of quality tools is higher in ISO 9001 certified firms. Concerning the services sector, Dick *et al.* (2002) concluded that ISO 9001 certification makes a strong difference in the ways quality is perceived and measured.

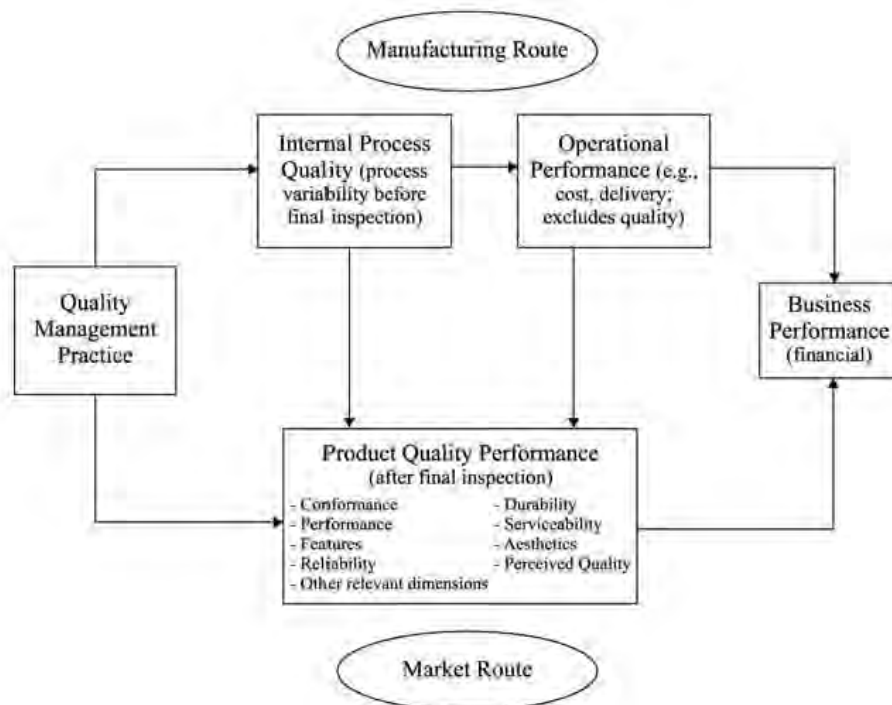
Although the majority of the studies carried out state that there is a positive relationship between ISO 9001 certification and performance, as was just mentioned, there is also a group of authors that did not find enough evidence to support such a relationship (Terziovski *et al.*, 1997; Quazi *et al.*, 2002; Conca *et al.*, 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 of itself, adopt a minimalist approach to achieve it, and thus achieve limited internal performance improvements.

*Impacts on companies’ financial performance*

According to Garvin (1984, cited in Sousa and Voss, 2002), the effect of quality over business performance, now looked strictly from a financial perspective, can be based upon two main routes: manufacturing and market (see Figure 5).

In the manufacturing route, improving internal process quality results in better operational performance, which leads to business financial performance. In the market



Source: Garvin (1984, cited in Sousa and Voss, 2002)

Figure 5.  
The quality performance  
model

route, improvement of product quality will influence marketing business performance, and from there result in financial performance improvement as well.

According to Sousa and Voss (2002), quality management practices have a significant and strong impact on quality and operational performance. However, their impact over business financial performance is weaker and not always significant. Brust and Gryna (2002) stated the following five economic areas where quality assumes a paramount importance:

- (1) exports competitive advantage;
- (2) national trade deficits;
- (3) economic growth;
- (4) productivity and customer satisfaction; and
- (5) standardisation.

A systematic approach to quality improvement results in two key factors that drive financial performance:

- (1) it generates greater value for customers, building market share and revenues; and
- (2) it lowers costs, increasing margins and asset usage (George, 2002).

Despite all the studies carried out in this area, conclusions reached so far have yet a contradictory nature. Some authors conclude that there is a positive relationship between ISO 9001 certification and companies' financial improvement (Maani *et al.*, 1994; Wisner and Eakins, 1994; LRQA, 1996; Chapman *et al.*, 1997; Janas and Luczak, 2002; Lee *et al.*, 2001; Beirão and Sarsfield Cabral, 2002; Nicolau and Sellers, 2002; Wayhan *et al.*, 2002; Chow-Chua *et al.*, 2003; Dimara *et al.*, 2004; Naser *et al.*, 2004), while others do not find evidence to support such a relationship (Adam *et al.*, 1997; Kannan *et al.*, 1999; Haversjo, 2000; Lima *et al.*, 2000; Heras *et al.*, 2001, 2002a, b; Aarts and Vos, 2001; Corbett *et al.*, 2002, 2003; Tsekouras *et al.*, 2002; Martínez-Costa and Martínez-Lorente, 2003).

Heras *et al.* (2001, 2002a, b), regarding better financial performance presented by ISO 9001 certified companies, argued that:

- one must consider the multitude of variables that influence or can influence a company's business financial performance;
- it is important that the characteristics of the samples used are analysed in greater detail, because it is possible that higher profitability of the certified companies may have to do with the fact that certified firms belong to activity sectors that enjoy greater profitability levels; and
- higher profitability rates verified among ISO 9001 companies may be related with the most profitable companies, being those that have a greater propensity to become ISO 9001 certified.

Overall, no consistent evidence could therefore be found in the literature concerning the real ISO 9001 impact over companies' business financial performance.

Therefore, there seems to be room for conducting additional work in order to analyse:

- what is the real ISO 9001 certification impact over business financial performance, if any;
- if "quality organisations" are indeed more profitable and competitive than the others; and
- if companies that become certified base on internal motivations have different results, also from a financial perspective, as compared to the ones that become certified based mostly on external motivations.

As Heras *et al.* (2001, 2002a, b) have already stated, one must consider that there is a multitude of variables that could influence a company's business financial performance, and thus it is very important to define a group of variables which must reflect the impact of quality management system implementation over company financial performance. It is also important, in order to properly analyse this issue, to reduce the influence of company activity sectors, sizes or other masking factors, because these may also mislead some of the conclusions that one may reach regarding the real impact of ISO 9001 certification over financial results.

*ISO 9001 and TQM – are they complementary or independent from each other?*

Although there is a large number of scientific publications related to TQM, the number of companies that have implemented total quality models after ISO 9001 registration is



---

not all that large. Escanciano *et al.* (2001b) concluded that companies that have already implemented or have planned to implement TQM were those that achieved ISO 9001 certification based mostly on internal reasons or that have been ISO 9001 certified for a long period of time already. Al-khalifa and Aspinwall (2000) concluded that the use and knowledge of TQM-related activities were very limited among surveyed companies, and mainly consisted in focusing on customer needs, expanding market share and cost reduction initiatives.

Concerning relationships between ISO 9001 implementation and the subsequent evolution to the adoption of excellence models (e.g. Malcolm Baldrige, EFQM), there are three different perspectives:

- (1) The most common perspective argues that ISO 9001 certification should be the first step and support a posterior total quality philosophy implementation (Idris *et al.*, 1996; Al-khalifa and Aspinwall, 2000; Escanciano *et al.*, 2001b; Gotzamani and Tsiotras, 2001; Magd and Curry, 2003b). Idris *et al.* (1996) stated that surveyed companies faced ISO 9001 certification like a first step towards TQM implementation. According to Magd and Curry (2003b), ISO 9001 can be implemented first to create stability and consistency in the organisation's work, so that TQM implementation later on enhances employee motivation and operational efficiency, to achieve overall organisational success and performance. Companies that have experienced high benefits from the certification process are those that use more frequently quality practices and that are more favourable to advance towards TQM (Escanciano *et al.*, 2001b).
- (2) Sun (2000) and Dwyer (2002) state that ISO 9001 cannot be faced as an independent approach from TQM, but that both methodologies should be integrated and implemented together. ISO 9001 is not a substitute for TQM, but both approaches must be completely and systematically implemented and integrated (Sun, 2000). Dwyer's (2002) main conclusion is that business excellence models and the ISO 9001 standard can and should be integrated, rather than compete with each other. As an integrated management system, they can help to implement quality systems more effectively, within the scope of a "bifocal" performance improvement strategy, aiming simultaneously for short- and long-term improvements and results.
- (3) Other authors do not establish any relationship whatsoever between ISO 9001 registration and TQM adoption. The results found by Rahman (2001) have indicated that there was no significant difference between the impacts of TQM practices on organisational performance for firms with and without ISO 9001 certification. Martínez-Lorente and Martínez-Costa (2004) and Martínez-Costa and Martínez-Lorente (2004) concluded that the best strategy may consist of implementing TQM without ISO 9001.

## Conclusions

The literature review carried out has shown that there are several important studies and previous research efforts carried out concerning the ISO 9000 standards, both for academicians and quality practitioners. We were able to identify which are some of the main ISO 9000 issues analysed in the open literature and the methodologies and techniques employed. Although some of the issues are exhaustively analysed by

different researchers, leading to consistent results, there are others with contradictory conclusions, namely regarding the ISO 9001 impacts over companies' financial performance and the relationships between the ISO 9001 certification and TQM adoption.

The ISO 9001 certification represents a worldwide phenomenon, and, if this standard is correctly implemented and understood, as opposed to being used just as a marketing and promotional tool, there seem to be significant benefits derived for the organisations that do so – both internal and external ones.

Furthermore, the literature review carried out allowed us to identify the following main conclusions:

- In spite of the international significant growth in the number of ISO 9001 certificates issued, some countries are already reaching a market saturation level regarding the number of ISO 9001 certified entities.
- ISO 9001 motivations and benefits can be categorised as being mostly external or internal ones. The first group is essentially related with marketing and promotional issues, while the internal category is related to internal organisational improvements.
- There is an interesting relationship between ISO 9001 motivations and the corresponding benefits. According to the literature, companies maximise their benefits if they achieve ISO 9001 certification based on internal motivations.
- An apparent erosion of ISO 9001 perceived benefits over time, after registration occurs, does seem to occur and deserves further exploration.
- Lack of top management involvement is considered to be the main obstacle faced by companies during ISO 9001 implementation and certification.
- Quality management systems implementation does seem to have positive and significant impacts over the companies' performance. However, if the analysis is focused over its impact only over business financial performance, results of a contradictory nature are reported.
- The majority of researchers do argue that ISO 9001 should be faced as the first step to a posterior TQM implementation, but there is no general agreement in this regard either.

Regardless of all the efforts and research projects already carried out within the scope of the ISO 9001 standard, significant contradictory results and unanswered questions still remain. Therefore, using this state-of-the-art as a starting point, we suggest the following as interesting topics that deserve a deeper future analysis:

- What is the real ISO 9001 impact over business performance in a long-term perspective?
- Are “quality organisations” more profitable and competitive than others?
- Which would be the companies' and world's competitive levels if the ISO 9001 phenomenon had not taken place?
- Is there a relationship between the percentage of certified companies per country and its competitiveness?

- Is there a relationship between the percentage of certified companies in a certain activity sector and its competitiveness?
- Is there a relationship between ISO 9001 audit non-conformities and a company's activity sector and/or certification motivations?
- Do auditors and certification bodies have the same perception as certified companies, concerning the ISO 9001 impact over organisational performance?
- Was the certification market saturation level reached in those countries where ISO 9001 certification begun earlier on?
- Which are the ISO 9001 certification critical success factors?

At present, we are leading a research project in Portugal that tries to address the above set of topics, in close collaboration with the leading national registration body.

### References

- Aarts, F. and Vos, E. (2001), "The impact of ISO registration in New Zealand firms' performance: a financial perspective", *The TQM Magazine*, Vol. 13 No. 3, pp. 180-91.
- Adam, E. Jr, Corbett, L., Flores, B., Harrison, N., Lee, T., Rho, B., Ribera, J., Samson, D. and Westbrook, R. (1997), "An international study of quality improvement approach and firm performance", *International Journal of Quality & Reliability Management*, Vol. 17 No. 9, pp. 842-73.
- Al-khalifa, K. and Aspinwall, E. (2000), "The development of total quality management in Qatar", *The TQM Magazine*, Vol. 12 No. 3, pp. 194-204.
- Beirão, G. and Sarsfield Cabral, J. (2002), "The reaction of the Portuguese stock market to ISO 9000 certification", *Total Quality Management*, Vol. 13 No. 4, pp. 465-74.
- Bhuiyan, N. and Alam, N. (2004), "ISO 9001:2000 implementation-the North American experience", *International Journal of Quality & Reliability Management*, Vol. 53 No. 1, pp. 10-17.
- Boulter, L. and Bendell, T. (2002), "How can ISO 9000:2000 help companies achieve excellence?", *Measuring Business Excellence*, Vol. 6 No. 2, pp. 37-41.
- Brown, A., van der Wiele, T. and Loughton, K. (1998), "Smaller enterprises' experiences with ISO 9000", *International Journal of Quality & Reliability Management*, Vol. 15 No. 3, pp. 273-85.
- Brust, P.J. and Gryna, F.M. (2002), "Quality and economics: five key issues", *Quality Progress*, Vol. 35 No. 10, pp. 64-9.
- Bryde, D. and Slocock, B. (1998), "Quality management systems certification: a survey", *International Journal of Quality & Reliability Management*, Vol. 15 No. 5, pp. 467-80.
- Buttle, F. (1997), "ISO 9000: marketing motivations and benefits", *International Journal of Quality & Reliability Management*, Vol. 14 No. 9, pp. 936-47.
- Casadesús, M. and Karapetrovic, S. (2005a), "An empirical study of the benefits and costs of ISO 9001:2000 compared to ISO 9001/2/3: 1994", *Total Quality Management*, Vol. 16 No. 1, pp. 105-20.
- Casadesús, M. and Karapetrovic, S. (2005b), "The erosion of ISO 9000 benefits: a temporal study", *International Journal of Quality & Reliability Management*, Vol. 22 No. 2, pp. 120-36.
- Casadesús, M., Giménez, G. and Heras, I. (2001), "Benefits of ISO 9000 implementation in Spanish industry", *European Business Review*, Vol. 13 No. 6, pp. 327-35.

- Casadesús, M., Heras, I. and Arana, G. (2004), "Costes y beneficios de la implantación de la normativa de calidad ISO 9000. Evolución temporal", *Proceedings of the XIV Congreso Nacional ACEDE, Murcia, Spain*.
- Chapman, R., Murray, P. and Mellor, R. (1997), "Strategic quality management and financial performance indicators", *International Journal of Quality & Reliability Management*, Vol. 14 No. 4, pp. 432-48.
- Chow-Chua, C., Goh, M. and Boon Wan, T. (2003), "Does ISO 9000 certification improve business performance?", *International Journal of Quality & Reliability Management*, Vol. 20 No. 8, pp. 936-53.
- Coleman, S. and Douglas, A. (2003), "Where next for ISO 9000 companies?", *The TQM Magazine*, Vol. 15 No. 2, pp. 88-92.
- Conca, F., Llopis, F. and Tari, J. (2004), "Development of a measure to assess quality management in certified firms", *European Journal of Operational Research*, Vol. 156 No. 3, pp. 683-97.
- Corbett, C., Luca, A. and Pan, J. (2003), "Global perspectives on global standards", *ISO Management Systems*, January-February.
- Corbett, C., Montes, M., Kirsch, D. and Alvarez-Gil, M. (2002), "Does ISO 9000 certification pay?", *ISO Management Systems*, July-August.
- Curkovic, S. and Pagell, M. (1999), "A critical examination of the ability of ISO 9000 certification to lead to a competitive advantage", *Journal of Quality Management*, Vol. 4 No. 1, pp. 51-67.
- Dick, G., Gallimore, K. and Brown, J. (2002), "Does ISO 9000 accreditation make a profound difference to the way service quality is perceived and measured?", *Managing Service Quality*, Vol. 12 No. 1, pp. 30-42.
- Dimara, E., Sakuras, D., Tsekouras, K. and Goutsos, S. (2004), "Strategic orientation and financial performance of firms implementing ISO 9000", *International Journal of Quality & Reliability Management*, Vol. 21 No. 1, pp. 72-89.
- Douglas, A., Coleman, S. and Oddy, R. (2003), "The case for ISO 9000", *The TQM Magazine*, Vol. 15 No. 5, pp. 316-24.
- Dwyer, G. (2002), "Business excellence versus ISO 9000 in an Irish context-which delivers?", *Managerial Auditing Journal*, Vol. 17 No. 7, pp. 404-11.
- Escanciano, C., Fernández, E. and Vasquez, C. (2001a), "ISO 9000 certification and quality management in Spain: results of a national survey", *The TQM Magazine*, Vol. 13 No. 3, pp. 192-200.
- Escanciano, C., Fernández, E. and Vasquez, C. (2001b), "Influence of ISO 9000 certification on the progress of Spanish industry towards TQM", *International Journal of Quality & Reliability Management*, Vol. 18 No. 5, pp. 481-94.
- Escanciano, C., Fernández, E. and Vasquez, C. (2002), "Linking the firm's technological status and ISO 9000 certification: results of an empirical research", *Technovation*, Vol. 22 No. 8, pp. 509-15.
- Franceschini, F., Galetto, M. and Gianni, G. (2004), "A new forecasting model for the diffusion of ISO 9000 standard certifications in European countries", *International Journal of Quality & Reliability Management*, Vol. 21 No. 1, pp. 32-50.
- George, S. (2002), "Bull or bear?", *Quality Progress*, Vol. 35 No. 4, p. 32.
- Gotzamani, K. and Tsiotras, G. (2001), "An empirical study of the ISO 9000 standards' contribution towards total quality management", *International Journal of Operations & Production Management*, Vol. 21 No. 10, pp. 1326-42.

- 
- Gotzamani, K. and Tsiotras, G. (2002), "The true motives behind ISO 9000 certification: their effect on the overall certification benefits and long term contribution towards TQM", *International Journal of Quality & Reliability Management*, Vol. 19 No. 2, pp. 151-69.
- Gupta, A. (2000), "Quality management practices of ISO vs non-ISO companies: a case of Indian industry", *Industrial Management & Data Systems*, Vol. 100 No. 9, pp. 451-5.
- Gustafsson, R., Klefsjo, B., Berggren, E. and Granfors-Wellemets, U. (2001), "Experiences from implementing ISO 9000 in small enterprises – a study of Swedish organizations", *The TQM Magazine*, Vol. 13 No. 4, pp. 232-46.
- Halis, M. and Oztas, A. (2002), "Quality cost analysis in ISO 9000 certified Turkish companies", *Managerial Auditing Journal*, Vol. 17 No. 1, pp. 101-4.
- Haversjo, T. (2000), "The financial effects of ISO 9000 registration for Danish companies", *Managerial Auditing Journal*, Vol. 15 No. 1, pp. 47-52.
- Heras, I., Casadéus, M. and Dick, G. (2002a), "ISO 9000 certification and the bottom line: a comparative study of the profitability of Basque region companies", *Managerial Auditing Journal*, Vol. 17 No. 1, pp. 72-8.
- Heras, I., Casadéus, M. and Ochoa, C. (2001), "Effects of ISO 9000 certification on companies' profitability: an empirical study", *Proceedings of the 6th International Conference on ISO 9000 and TQM*, Ayr, Scotland.
- Heras, I., Dick, G. and Casadéus, M. (2002b), "ISO 9000 registration's impact on sales and profitability: a longitudinal analysis of performance before and after accreditation", *International Journal of Quality & Reliability Management*, Vol. 19 No. 6, pp. 774-91.
- Idris, M., McEwan, W. and Belavendram, N. (1996), "The adoption of ISO 9000 and total quality management in Malaysia", *The TQM Magazine*, Vol. 8 No. 5, pp. 65-8.
- International Organization for Standardization (ISO) (2007), *The ISO Survey of ISO 9001:2000 and ISO 14001 Certificates – 2006*, IOS, Geneva.
- ISO/TC 176 (2002), "Feedback on ISO 9001:2000", *ISO Management Systems*, January-February.
- Janas, I. and Luczak, H. (2002), "Explorative study of the expected consequences for existing quality management systems due to the revision of ISO 9001 in certified companies in Germany", *The TQM Magazine*, Vol. 14 No. 2, pp. 127-32.
- Jones, R., Arndt, G. and Kustin, R. (1997), "ISO 9000 among Australian companies: impact of time and reasons for seeking certification on perceptions of benefits received", *International Journal of Quality & Reliability Management*, Vol. 14 No. 7, pp. 650-60.
- Kannan, V., Tan, K., Handfield, R. and Ghosh, S. (1999), "Tools and techniques of quality management: an empirical investigation of their impact on performance", *Quality Management Journal*, Vol. 6 No. 3, pp. 34-49.
- Lee, C., Lee, T. and Chang, C. (2001), "Quality/productivity practices and company performance in China", *International Journal of Quality & Reliability Management*, Vol. 18 No. 6, pp. 604-25.
- Lee, K. and Palmer, E. (1999), "An empirical examination of ISO 9000 registered companies in New Zealand", *Total Quality Management*, Vol. 10 No. 6, pp. 887-99.
- Leung, H., Chan, K. and Lee, T. (1999), "Costs and benefits of ISO 9000 series: a practical study", *International Journal of Quality & Reliability Management*, Vol. 16 No. 7, pp. 675-90.
- Liebman, S. (2002), "Implementing ISO 9001:2000 – US survey of user experiences", *ISO Management Systems*, November-December.
- Lima, M., Resende, M. and Hasenclever, L. (2000), "Quality certification and performance of Brazilian firms: an empirical study", *International Journal of Production Economics*, Vol. 66 No. 2, pp. 143-7.



- Lipovatz, D., Stenos, F. and Vaka, A. (1999), "Implementation of ISO 9000 quality systems in Greek enterprises", *International Journal of Quality & Reliability Management*, Vol. 16 No. 6, pp. 534-51.
- Llopis, J. and Tari, J. (2003), "The importance of internal aspects in quality improvement", *International Journal of Quality & Reliability Management*, Vol. 20 No. 3, pp. 304-24.
- Lloyd's Register Quality Assurance (LRQA) (1996), "Fitter finance: the effects of ISO 9000 on business performance" available at: [www.lrqa.com](http://www.lrqa.com)
- Maani, K., Putterill, M. and Sluti, D. (1994), "Empirical analysis of quality improvement in manufacturing", *International Journal of Quality & Reliability Management*, Vol. 11 No. 7, pp. 19-37.
- Magd, H. and Curry, A. (2003a), "An empirical analysis of management attitudes towards ISO 9001:2000 in Egypt", *The TQM Magazine*, Vol. 15 No. 6, pp. 381-90.
- Magd, H. and Curry, A. (2003b), "ISO 9000 and TQM: are they complementary or contradictory to each other", *The TQM Magazine*, Vol. 15 No. 4, pp. 244-56.
- Mann, R. and Kehoe, D. (1994), "An evaluation of the effects of quality improvement activities on business performance", *International Journal of Quality & Reliability Management*, Vol. 11 No. 4, pp. 29-44.
- Martínez-Costa, M. and Martínez-Lorente, A. (2003), "Effects of ISO 9000 certification on firms' performance: a vision from the market", *TQM & Business Excellence*, Vol. 14 No. 10, pp. 1179-91.
- Martínez-Costa, M. and Martínez-Lorente, A. (2004), "ISO 9000 as a tool for TQM: a Spanish case study", *Quality Management Journal*, Vol. 11 No. 4, pp. 20-30.
- Martínez-Lorente, A. and Martínez-Costa, M. (2004), "ISO 9000 and TQM: substitutes or complementaries? An empirical study in industrial companies", *International Journal of Quality & Reliability Management*, Vol. 21 No. 3, pp. 260-76.
- Mo, J. and Chan, A. (1997), "Strategic for the successful implementation of ISO 9000 in small and medium manufacturers", *The TQM Magazine*, Vol. 9 No. 2, pp. 135-45.
- Naser, K., Karbhari, Y. and Mokhtar, M. (2004), "Impact of ISO 9000 registration on company performance", *International Journal of Quality & Reliability Management*, Vol. 19 No. 4, pp. 509-16.
- Nicolau, J. and Sellers, R. (2002), "The stock market's reaction to quality certification: empirical evidence from Spain", *European Journal of Operational Research*, Vol. 142, pp. 632-41.
- Ozgur, C., Meek, G. and 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*, Vol. 9 No. 2, pp. 57-69.
- Poksinska, B., Dahlgaard, J. and Antoni, M. (2002), "The state of ISO 9000 certification: a study of Swedish organizations", *The TQM Magazine*, Vol. 14 No. 5, pp. 297-306.
- Quazi, H. and Jacobs, R. (2004), "Impact of ISO 9000 certification on training and development activities", *International Journal of Quality & Reliability Management*, Vol. 21 No. 5, pp. 497-517.
- Quazi, H., Hong, C. and Meng, C. (2002), "Impact of ISO 9000 certification on quality management practices: a comparative study", *Total Quality Management*, Vol. 13 No. 1, pp. 53-67.
- Ragothaman, S. and Korte, L. (1999), "The ISO 9000 international quality registration: an empirical analysis of implications for business firms", *International Journal of Applied Quality Management*, Vol. 2 No. 1, pp. 59-73.

- 
- Rahman, S. (2001), "A comparative study of TQM practice and organizational performance of SMEs with and without ISO 9000 certification", *International Journal of Quality & Reliability Management*, Vol. 18 No. 1, pp. 35-49.
- Romano, P. (2000), "ISO 9000: what is its impact on performance?", *Quality Management Journal*, Vol. 7 No. 3, pp. 38-56.
- Saraiva, P. and Duarte, B. (2003), "ISO 9000: some statistical results for a worldwide phenomenon", *TQM & Business Excellence*, Vol. 14 No. 10, pp. 1-10.
- Singels, J., Ruel, G. and van de Water, H. (2001), "ISO 9000 series: certification and performance", *International Journal of Quality & Reliability Management*, Vol. 18 No. 1, pp. 62-75.
- Sousa, R. and Voss, C. (2002), "Quality management re-visited: a reflective review and agenda for future research", *Journal of Operations Management*, Vol. 20 No. 1, pp. 91-109.
- Staines, A. (2000), "Benefits of an ISO 9001 certification-the case of a Swiss regional hospital", *International Journal of Health Care Quality Assurance*, Vol. 13 No. 1, pp. 27-33.
- Stevenson, T. and Barnes, F. (2001), "Fourteen years of ISO 9000: impact, criticisms, costs and benefits", *Business Horizons*, May-June, pp. 45-51.
- Sun, H. (2000), "Total quality management. ISO 9000 certification and performance improvement", *International Journal of Quality & Reliability Management*, Vol. 17 No. 2, pp. 168-79.
- Tari, J. and Molina, J. (2002), "Quality management results in ISO 9000 certified Spanish firms", *The TQM Magazine*, Vol. 14 No. 4, pp. 232-9.
- Tari, J. and Sabater, V. (2004), "Quality tools and techniques: are they necessary for quality management?", *International Journal of Production Economics*, Vol. 92, pp. 267-80.
- Terziovski, M. and Samson, D. (1999), "The link between total quality management practice and organizational performance", *International Journal of Quality & Reliability Management*, Vol. 16 No. 3, pp. 226-37.
- Terziovski, M., Power, D. and Sohal, A. (2003), "The longitudinal effects of the ISO 9000 certification process on business performance", *European Journal of Operational Research*, Vol. 146 No. 3, pp. 580-95.
- Terziovski, M., Samson, D. and Dow, D. (1997), "The business value of quality management systems certification: evidence from Australia and New Zealand", *Journal of Operations Management*, Vol. 15 No. 1, pp. 1-18.
- Torre, P., Adenso-Diaz, B. and González, B. (2001), "Empirical evidence about managerial issues of ISO certification", *The TQM Magazine*, Vol. 13 No. 5, pp. 355-60.
- Tsekouras, K., Dimara, E. and Skuras, D. (2002), "Adoption of a quality assurance scheme and its effect on firm performance: a study of Greek firms implementing ISO 9000", *Total Quality Management*, Vol. 13 No. 6, pp. 827-41.
- van der Wiele, T., Iwaarden, J., Williams, R. and Dale, B. (2005), "Perceptions about the ISO 9000 (2000) quality system standard revision and its value: the Dutch experience", *International Journal of Quality & Reliability Management*, Vol. 22 No. 2, pp. 101-19.
- Wayhan, V., Kirche, E. and Khumawala, B. (2002), "ISO 9000 certification: the financial performance implications", *Total Quality Management*, Vol. 13 No. 2, pp. 217-31.
- Williams, J. (2004), "The impact of motivating factors on implementation of ISO 9001:2000 registration process", *Management Research News*, Vol. 27 Nos 1/2, pp. 74-84.
- Wisner, J. and Eakins, S. (1994), "A performance assessment of the US Baldrige Quality Award winners", *International Journal of Quality & Reliability Management*, Vol. 11 No. 2, pp. 8-25.

Withers, B. and Ebrahimpour, M. (2000), "Does ISO 9000 certification affect the dimensions of quality used for competitive advantage?", *European Management Journal*, Vol. 18 No. 4, pp. 431-43.

Withers, B. and Ebrahimpour, M. (2001), "Impacts of ISO 9000 registration on European firms: a case analysis", *Integrating Manufacturing Systems*, Vol. 12 No. 2, pp. 139-51.

---

#### Further reading

Albuquerque, P., Bronnenberg, B. and Corbett, C. (2006), "A spatio-temporal analysis of the global diffusion of ISO 9000 and ISO 14000 certification", working paper, University of California, Los Angeles, CA.

Casadesús, M., Marimon, F. and Heras, I. (2005), "ISO 9000 and ISO 14000 standards: an international diffusion model", *Proceedings of the TQM and 6-sigma for Competitiveness Conference, Shanghai, China*.

Corbett, C. (2005), "Global diffusion of ISO 9000 certification through supply chains", working paper, University of California, Los Angeles, CA.

Corbett, C., Montes-Sancho, M. and Kirsch, D. (2005), "The financial impact of ISO 9000 certification in the US: an empirical analysis", *Management Science*, Vol. 51 No. 7, pp. 1046-59.

Franceschini, F., Galetto, M. and Cecconi, P. (2006), "A worldwide analysis of ISO 9000 standard diffusion", *Benchmarking: An International Journal*, Vol. 13 No. 4, pp. 523-41.

International Organization for Standardization (ISO) (2006), *The ISO Survey of ISO 9001:2000 and ISO 14001 Certificates – 2005*, ISO, Geneva.

Juran, J. and Godfrey, A.B. (1998), *Juran's Quality Handbook*, 5th ed., McGraw-Hill, New York, NY.

Sampaio, P., Saraiva, P. and Guimarães Rodrigues, A. (2008), "Sistemas de Gestão: da Qualidade para outros sistemas", *Proceedings of the International Symposium on Occupational Safety and Hygiene. Universidade do Minho, Guimarães, Portugal*.

World Bank (n.d.), "Data and statistics", available at: [www.worldbank.org](http://www.worldbank.org)

#### About the authors

Paulo Sampaio is PhD Student in Systems and Production Engineering at University of Minho – Portugal. His research areas include quality management, ISO 9001 certification, ISO 9000 standards, and quality management systems. Paulo Sampaio is the corresponding author and can be contacted at: [paulosampaio@dps.uminho.pt](mailto:paulosampaio@dps.uminho.pt)

Pedro Saraiva is Associate Professor in the Chemical Engineering Department, University of Coimbra – Portugal. He received a PhD in Chemical Engineering at Massachusetts Institute of Technology (MIT), USA, in 1993. At present he is Vice-Rector of the University of Coimbra. His current research includes strategic management, innovation, process systems engineering, applied statistics and quality management.

António Guimarães Rodrigues is Full Professor in the Systems and Production Department, University of Minho – Portugal. He received a PhD in Production Engineering at Birmingham University, UK, in 1980. At present he is the Rector of the University of Minho. His current research includes management, simulation and operational research.