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Original

A proposal of a new paradigm for national quality certification systems / Franceschini F.; Galetto M.; Maisano D.; Mastrogiacomo L.. - In: INTERNATIONAL JOURNAL OF QUALITY AND RELIABILITY MANAGEMENT. - ISSN 0265-671X. - 28:4(2011), pp. 364-382. [10.1108/02656711111121799]

Availability:

This version is available at: 11583/2407855 since:

Publisher:

Emerald

Published

DOI:10.1108/02656711111121799

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A proposal of a new paradigm for national quality certification systems

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Abstract

Purpose – The goal of this paper is to suggest a new incentive model that is capable of creating the conditions for the autonomous growth of diffusion and credibility of the ISO 9000 national quality certification system.

Design/methodology/approach – The first part of this work contains some considerations about the general interest of organisations in quality certification systems, emphasising the advantages and the drawbacks in being certified. Next, the attention shifts to future scenarios. Specifically, a new model is proposed that is capable of encouraging certified organisations (COs) and certification bodies (CBs) that operate blamelessly and seriously, while at the same time penalising those that do not.

Findings – The suggested model consists of two inter-connected sub-models relative to COs and CBs, respectively. Each sub-model includes different states with different incentives/penalties. The switch-over from one state to another depends on the practical results recorded in recent years by the CO/CB of interest. The switching rules are based on a set of objective, transparent, and non-manipulable indicators.

Research limitations/implications – On-site analyses and simulations are necessary so as to tune optimal switching rules to balance the whole model.

Practical implications – The (possible) future implementation of the model could have great impact on COs' and CBs' *modi operandi*, promoting the real implementation of quality management practices but – at the same time – not requiring significant additional effort from the state and the authorities accrediting/controlling CBs.

Originality/value – The proposed model is absolutely new and may represent a proper way to combine the interests and expectations of COs and CBs into a unique “virtuous circle” for improving the real implementation of quality management.

Keywords ISO 9000 series, Quality management, Quality assessment, Incentives (psychology)

Paper type Research paper

1. Introduction

Since its introduction in 1987, the ISO 9000 series of quality standards has spread all over the world. An indirect sign of the popularity of these standards is the large number of articles in the scientific literature that are addressed to them. Some of the most relevant concern:

- analysis of the motivations for certification (Poksinska *et al.*, 2002; Douglas *et al.*, 2003; Magd and Curry, 2003; Williams, 2004; Heras, 2006; Heras *et al.*, 2006);

The authors would like to thank the anonymous reviewers for their valuable suggestions for improving the manuscript.

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- analysis of the benefits of certification, the evolution of organisations' perceptions of these benefits, and obstacles/drawbacks to certification (Gotzamani and Tsiotras, 2002; Llopis and Tari, 2003; Tari and Sabater, 2004; Casadesús and Karapetrovic, 2005a; Boiral and Roy, 2007; Zeng *et al.*, 2007; Karapetrovic *et al.*, 2010);
 - the impact of quality certification on the organisational and financial performance of companies (Alvarez *et al.*, 2002; Chow-Chua *et al.*, 2003; Conca *et al.*, 2004; Casadesús and Karapetrovic, 2005b; Dick *et al.*, 2006);
 - possible integration and/or competition between quality certification and TQM (Dwyer, 2002; Martínez-Lorente and Martínez-Costa, 2004; Karapetrovic *et al.*, 2006); and
 - analysis and forecasting of the diffusion of certification (Franceschini *et al.*, 2004, 2006; Albuquerque *et al.*, 2007; Franceschini *et al.*, 2008, 2010).

A large number of studies concerning these topics are mentioned and discussed in detail in the recent review paper by Sampaio *et al.* (2009). On the basis of a worldwide analysis, two distinct tendencies emerge:

- (1) In recent years, the number of certified companies in some Eastern countries, such as China and India, has increased very rapidly – even more rapidly than occurred in some European countries at the end of the last century (Corbett, 2008). A representative example is Pakistan (Malik and YeZhua, 2006).
- (2) A tendency to saturation and/or decline has been seen in countries where certifications were traditionally more diffuse in terms of the percentage of certified organisations (COs) (International Organisation for Standardisation, 2009). For example, in the UK, Ireland and Denmark, in the last five to six years this tendency has degenerated into a reduction of the total number of certified companies. This phenomenon is known as “decertification”. In future, a similar tendency will probably occur in other European countries where certifications are popular and largely diffused, such as Belgium, France, Germany and Sweden (International Organisation for Standardisation, 2009; Franceschini *et al.*, 2010).

Some of the possible reasons for this initial decline include:

- the perception of little incentive towards improvement;
- the bureaucratic burden in the application of ISO 9000 standards; and
- the apparent lack of advantages for organisations with a well-rooted quality culture.

These (and other) aspects contribute to the so-called “erosion of perceived benefits” related to ISO 9000 certification. For a detailed explanation, we refer the reader to the relevant literature (Casadesús and Karapetrovic, 2005a, b; Marimon *et al.*, 2009; Karapetrovic *et al.*, 2010).

The goal of this paper is to suggest a new incentive model to ISO certification that is capable of favouring those COs and certification bodies (CBs) that operate seriously and blamelessly. The basic elements of this model are:

- creating the conditions for the autonomous growth of diffusion and credibility of the quality certification system;
- creating an interest in certification in those countries where it seems to have decreased; and
- favouring the effective implementation of quality within COs.

This model, which is based on incentives and penalties, is inspired by the MIL STD 105E standard (Duncan, 1994; Montgomery, 2009). The criteria used to incentivise/penalise COs and CBs respond to three primary characteristics:

- (1) objectivity;
- (2) transparency; and
- (3) non-manipulability.

The remainder of the paper is organised into three sections. Section 2 summarises the major benefits and criticalities of the current quality certification system. Section 3 presents and discusses in detail the new incentive model, showing an example of application based on realistic data. Section 4 contains further comments and reflections on the potential benefits and drawbacks derived from the practical application of the model. Finally, the conclusions are given, summarising the original contribution of the paper and future research directions.

2. Strengths and criticalities of the national certification systems

The following subsections summarise the strengths and weak points of the current national certification system. These considerations are derived from the large scientific literature on the matter. A typical national certification scheme is represented synthetically in Figure 1 (Rodholma and Drora, 1993).

2.1 Benefits of certification

In the scientific literature there is plenty of debate on the quality certification benefits to COs (Corbett *et al.*, 2002). The classification suggested by Sampaio *et al.* (2009) is particularly effective. Quality certification benefits and motivations are classified in two main categories:

- (1) internal; and
- (2) external.

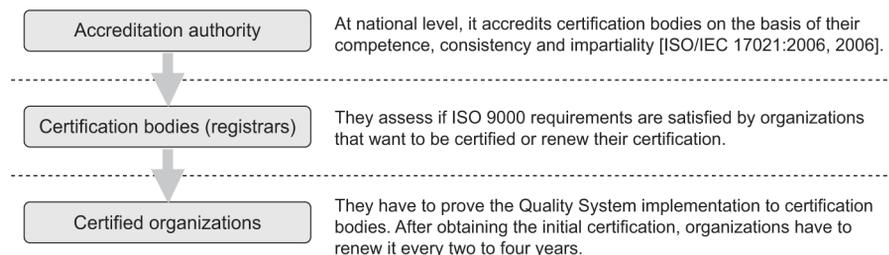


Figure 1.
Simplified representation
of the current national ISO
9000 certification scheme

Internal benefits are related to the goal of achieving organisational improvement, while external benefits are mainly related to promotional and marketing issues, customer pressures, improvement of market share, etc. (see Table I).

Summarising the most common positions, it generally appears that the ISO 9000 series of standards represents a good guide for implementing a basic quality system within companies that are in the initial stages of their quality journey. In other words, certification may represent a milestone for introducing a new organisational *modus operandi*, especially for those companies where a quality culture is not well-rooted (Dahlgaard *et al.*, 1998). In the literature, there is a consensual opinion that benefits are related to company certification motivations, i.e. when certification is seen as an opportunity for long-term improvement of internal processes and systems, the derived benefits are fulfilled on a more global dimension (Brown *et al.*, 1998).

Apart from the advantages for public or private organisations, it should be noticed that certification is a potential advantage for the whole national state: a large number of COs should mean better competitiveness of the overall production system. This is the reason why quality certification is encouraged by the governments of many different countries (Masternak and Kleiner, 1995).

2.2 Critical aspects of the current system

The national quality certification system has some critical aspects that can be associated to the involved actors, i.e. organisations to be certified; CBs and quality auditors; and authorities accrediting and controlling CBs.

2.2.1 Difficult interpretation. ISO 9000 standards are applied to many different kinds of organisation. This is the reason why these standards are deliberately general-purpose. According to some, they are sometimes rather abstract and not easily interpretable, particularly for those areas in which they are not largely diffused. For example, among the most unusual COs can be found police departments (USA), professional soccer teams (Mexico) and city councils (UK). Correct interpretation can be problematic, not only for organisations to be certified, but also for quality auditors, because they may not necessarily have the necessary expertise required to range over a wide variety of different fields. To limit this problem, over time, various industry

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 time improvements
Customer satisfaction	Internal organisation improvements
Customer communication improvements	Non-conformities decrease
	Customer complaints decrease
	Internal communication improvements
	Product quality improvement
	Competitive advantage improvement
	Personnel motivation

Table I.
Most commonly stated
ISO 9000 certification
benefits reported in the
literature

Source: Adapted from Sampaio *et al.* (2009)

sectors have integrated ISO 9000 with other standards, for example QS 9000 and ISO/TS 16949:2002 in the automotive sector, AS 9000 in the aerospace industry, TL 9000 in the telecommunications industry, etc.

2.2.2 Evaluation heterogeneity. Despite training, the rules given by the accreditation authorities and periodical controls, it is not rare to observe heterogeneity and lack of objectivity in the audits/evaluations. Each auditor, depending on his “professional sensitivity” and background, tends to focus his attention on certain quality aspects, neglecting others (Karapetrovic and Willborn, 2002; Franceschini *et al.*, 2007). The practical result is that evaluations are sometimes heterogeneous. Although we are aware of the fact that this problem will never be solved completely, it should be noted that it often raises some perplexity with respect to CBs and – as a consequence – to the practice of quality certification.

2.2.3 Role and conduct of CBs. The boundary between the role of an auditor and that of a consultant is fine. In some cases, the “privileged relationship” between an organisation and an auditor/consultant may degenerate in a kind of “settlement”. This behaviour should be discouraged, because of the inherent conflict of interests (International Organisation for Standardisation, 2006).

Fortunately, these situations are not so frequent, but they do have a huge negative impact on CBs’ credibility (Conti, 2004). Undoubtedly, the origin of this “distorted” behaviour is the economic junction between organisations and CBs. The CBs’ interest in attracting more and more organisations to certify may degenerate into the situation described above.

2.2.4 Little incentive toward improvement. For some organisations with a consolidated culture of quality management, ISO 9000 does not necessarily represent the “first choice” as a quality standard. Other “alternative” awards/standards/programs for quality (such as the Malcolm Baldrige Award, TQM, EFQM) are relatively diffused and, in some cases, may appear more suitable for the implementation of continuous improvement (Sun *et al.*, 2004; European Foundation for Quality Management, 2009). According to some organisations, they provide an additional distinction, especially in those markets in which ISO 9000 standards are relatively diffused and many organisations are certified.

3. Proposal for an incentive model

Here we present an incentive model, which is aimed at encouraging:

- a re-increase of the value of ISO 9000 certificates;
- the diffusion of a culture of quality;
- the real and constant implementation of good quality practices within organisations; and
- the autonomous development of the whole system of quality.

At the same time, it should favour CBs that operate with zeal and rigour, and penalise those that release certificates “too accommodatingly”. In order to reach this ambitious goal, we conceived a dynamic/adaptive model, which is inspired by the MIL-STD-105E standard (Weber, 1991; Juran and Gryna, 1993; Duncan, 1994; Montgomery, 2009). This standard is used to support the design of acceptance sampling plans for controlling the quality of lots of products. Three inspection levels with different

severity/discrimination power (i.e. reduced, normal and tightened) are alternated, depending on the result (i.e. lot defectiveness) of previous inspections. When the results are good, the inspection severity decreases; when the results worsen, the inspection severity increases, along with inspection time and costs. The switching procedures are illustrated in Figure 2.

A similar adaptive logic can be “exported” to the national quality certification framework. The following subsections illustrate two inter-connected incentive sub-models, promoting the growth/development of COs and CBs, respectively. We point out that, at the present time, the values and parameters of the model should be considered purely as a rough guide.

3.1 Sub-model for COs

Each CO lies in one of three possible states, depending on the practical results recorded in recent years (see Figure 3). The sub-model also provides some procedures/rules for switching from one state to another. The rules are based on a set of objective, transparent, easily determinable, not bureaucratically burdensome, and non-manipulable indicators (Franceschini *et al.*, 2007). The three possible states are:

- (1) critical (C_{CO});
- (2) normal (N_{CO}); and
- (3) virtuous (V_{CO}).

Transfers from one state to the other are regulated by specific incentives/penalties.

State N_{CO} includes those organisations that have been certified for the first time. In this state, there is no incentive or disincentive related to the cost of periodical certificate renewal. From state N_{CO} there are two possible switching procedures:

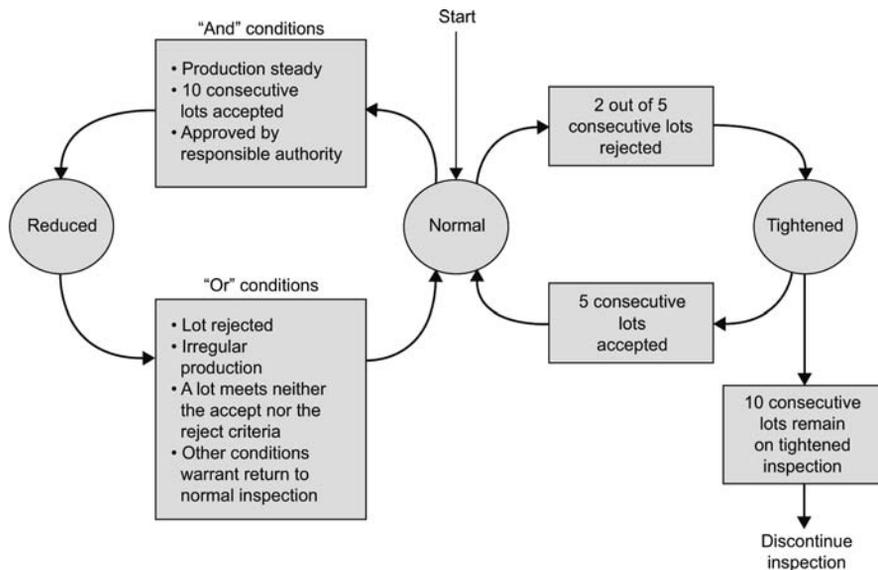
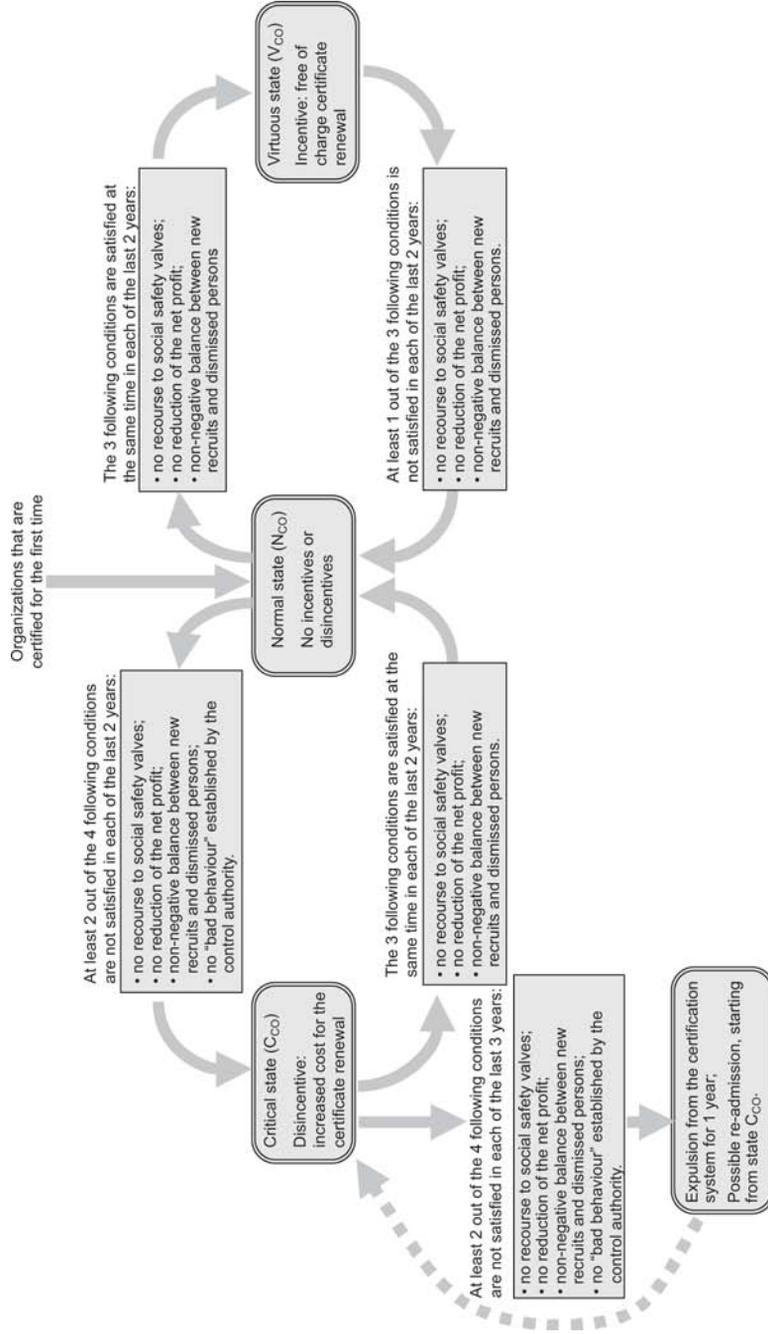


Figure 2. Graphical representation of the switching rules for normal, tightened and reduced inspection in the MIL-STD-105E standard, to support the design of acceptance sampling plans

Source: US Department of Defence (1989); Montgomery (2009)

Figure 3.
Incentive sub-model to support the growth/development of COs



Notes: This conceptual model is based on some switching rules/parameters, which – at present – should be considered purely as a rough guide. They will be balanced and optimized by means of further analyses and simulations based on real data

-
- (1) To V_{CO} , when the following three conditions are satisfied at the same time, for two consecutive years:
 - no recourse to redundancy payment or other social safety valves;
 - no reduction in the organisation's net profit; and
 - non-negative balance between new recruits and dismissed persons.
 - (2) To C_{CO} , if at least two out of the four following conditions are not satisfied in each of the last two years:
 - no recourse to redundancy payment or other social safety valves;
 - no reduction of the organisation's net profit;
 - non-negative balance between new recruits and dismissed persons; and
 - no suppliers or customers denounce the organisation for "bad behaviour" with reference to the dictates of ISO 9000 standards (and this "bad behaviour" is later established by the control authority).

State C_{CO} includes those organisations that are already certified and, in recent years, have been distinguished by negative results in terms of profit, job creation and/or their relationship with suppliers/customers. These organisations are considered "under observation" and are strongly invited to change their course quickly. In this state, there is a disincentive represented by the increased cost for periodical certificate renewal, to be paid to the committed CB. From C_{CO} there are two possible switching procedures:

- (1) To N_{CO} , if the three conditions for switching from N_{CO} to V_{CO} are satisfied at the same time, in each of the last two years.
- (2) If an organisation persists in "negative" behaviours, then it will lose the right to renew its certificate and will be temporarily "expelled" (for one year) from the certification system. This expulsion is effected when two out of the same four conditions for switching from N_{CO} to C_{CO} are not satisfied in each of the last three years.

The most probable consequences of expulsion for a CO are damage to its image and the loss of customers, in particular those customers who require that their suppliers are certified. However, we believe that this punishment is necessary since it acts as a stimulus for future improvement and a deterrent to avoid bad conduct by COs. Moreover, it represents a form of "protection" for virtuous COs and the entire certification system.

As a further stimulus to improvement, an organisation that wants to re-enter the system after being previously excluded, is readmitted in state C_{CO} instead of N_{CO} .

State V_{CO} includes those COs that in recent years have obtained positive results from the point of view of profit, job creation and fairness to customers/suppliers. The incentive for those organisations is represented by the cancellation of the cost of periodical certificate renewal to be paid to the CB of interest. If an organisation in V_{CO} does not maintain its "good behaviour" over time, it is relegated to N_{CO} . In particular, this downgrading changeover is performed when one (or more) of the following conditions is not satisfied in each of the last two consecutive years:

-
- no recourse to redundancy payment or other social safety valves;
 - no reduction in the organisation's net profit; or
 - non-negative balance between new recruits and dismissed persons.

It can be seen that the whole sub-model encourages organisations to reach V_{CO} . Thus, it would yield clear benefits for the country, both in terms of job creation and a reduction in the use of social safety valves. On the other hand, this growth would seem to produce an apparent disadvantage for CBs, due to the non-payment of renewal fees from V_{CO} organisations. In the next subsection we show how this apparent “inconvenience” is counterbalanced.

The two-year period to switch from one state to another appears to be a reasonable compromise solution. A longer period could make the model insufficiently responsive, since one CO may perhaps not be assigned to the state that best reflects its current condition. On the other hand, a shorter period could make the model too sensitive, leading to overly frequent switchovers from one state to another, due to fluctuations of the moment (e.g. in the net profit or staff numbers, related to the seasonal effects) and not necessarily attributable to the actual state of health of the CO. However, optimal time periods will be defined after on-site analyses and simulations.

3.2 Sub-model for CBs

This sub-model is similar to the one for COs and is aimed at incentivising the most zealous CBs, penalising the “less fair” ones (see Figure 4).

In this case there are two possible states – i.e. critical (C_{CB}) and virtuous (V_{CB}) – which are based on the assumptions that:

- virtuous CBs generally certify organisations adopting virtuous behaviours; and
- less fair CBs give certificates to organisations that do not implement quality effectively.

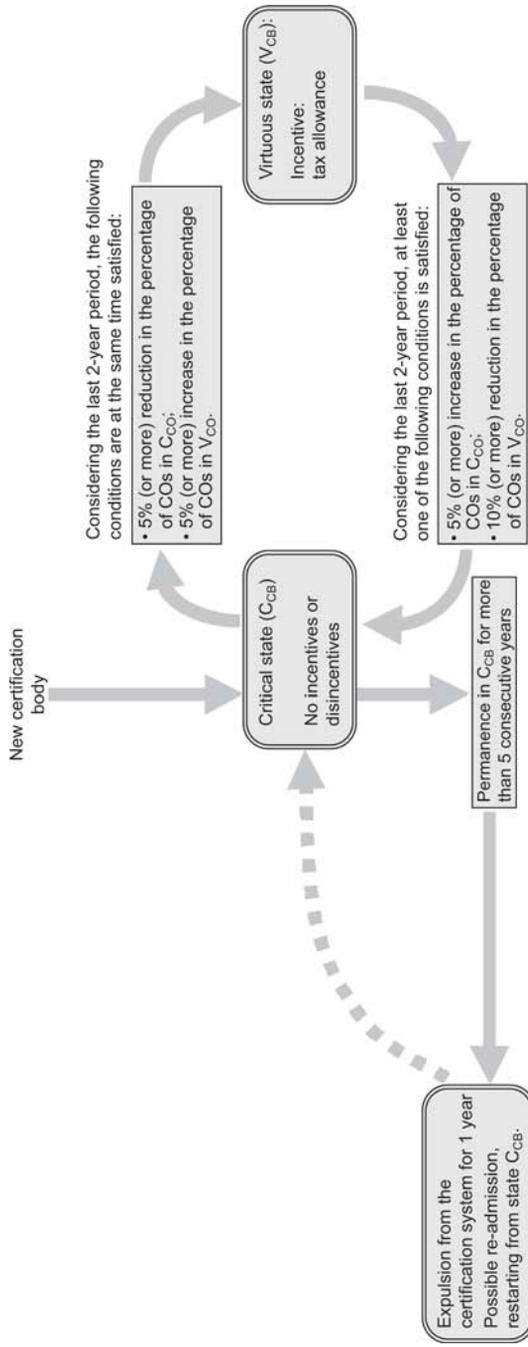
A CB enters V_{CB} when, considering the last two-year period, the following two conditions are satisfied:

- 5 per cent (or more) reduction in the percentage of COs (certified by the CB of interest) in C_{CO} ; and
- 5 per cent (or more) increase in the percentage of COs (certified by the CB of interest) in V_{CO} .

The incentive for the organisations of V_{CB} is represented by a tax allowance (for instance, reduction of 10 per cent of the taxable income).

A CB is downgraded to state C_{CB} if, considering the last two-year period, at least one of the following conditions is satisfied:

- 5 per cent (or more) increase in the percentage of COs (certified by the CB of interest) in C_{CO} ; and
- 10 per cent (or more) reduction in the percentage of COs (certified by the CB of interest) in V_{CO} .



Notes: This conceptual model is based on some switching rules/parameters, which – at present – should be considered purely as a rough guide. They will be balanced and optimized by means of further analyses and simulations, based on real data

Figure 4.
Incentive sub-model to support the growth/development of CBs

Since for CBs in the C_{CB} state, there is no tax allowance, the advantage in gaining a “promotion” from C_{CB} to V_{CB} is clear. To incentivise CBs to work well just from the beginning, a new CB entering the model will start from C_{CB} .

Finally, a CB that remains in C_{CB} for more than five consecutive years is temporarily expelled from the system (for one year), because of the evident incapacity to improve. Possible consequences of expulsion are image damage and loss of customers, due to the “forced break” of activity of the CB. On the other hand, these expulsions may protect CBs that operate blamelessly.

Differently from the sub-model for COs, this sub-model has only two states (V_{CB} and C_{CB}), without an intermediate “limbo”, such as state N_{CO} for the first sub-model. The reason is that, according to us, evaluating the effect of the work of CBs deserves great resolution and responsiveness, since CBs are supposed to be a guide for COs. Moreover, unless there is the risk of expulsion, it is noteworthy that state C_{CB} is not particularly severe since it is not associated to any disincentive.

Since the sub-model for CBs includes only two states, there is a potential ease of overturning in a relatively limited time period of two years. This feature may contribute to reduce the risk of generating a possible monopoly situation of some virtuous CBs.

3.3 Application example

To better understand how the two suggested sub-models work, two application examples are presented here. The first (see Figure 5) shows the progress of a hypothetical CO, depending on its performance in terms of:

- recourse to social safety valves;
- balance between new recruits and dismissed workers;
- net profit; and
- bad behaviour established by the control authority.

The example is based on realistic data, considering a 20-year period.

For the purpose of example, the shift from N_{CO} to C_{CO} in the third year is a consequence of the negative balance between new recruits and dismissed workers in

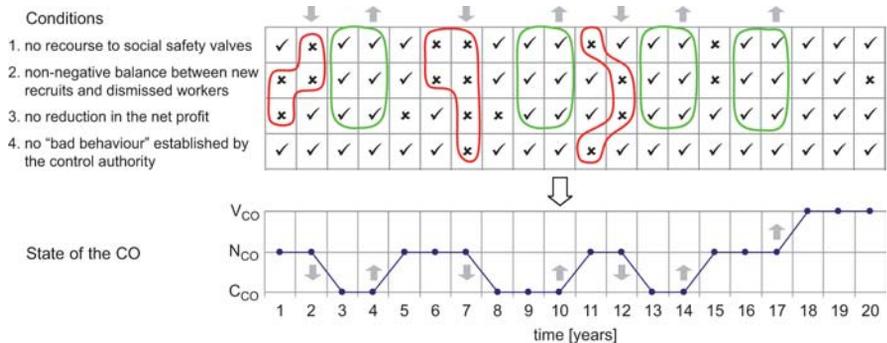


Figure 5. Application example of the incentive sub-model to a hypothetical CO

Notes: Switchover from one state to another depends on the results recorded in the last two years by the CO of interest. Conditions determining any transfer – respectively increase (\uparrow) and decrease (\downarrow) – are highlighted by a contour

the first and second year, combined with the negative net profit in the first year and the recourse to social safety valves in the second year. On the other hand, the shift from N_{CO} to V_{CO} in the 18th year is due to the fact that, in the two previous consecutive years, the performance of the organisation has been positive with respect to the performance indicators of interest.

Similarly, let us consider a hypothetical CB with a certain portfolio of COs. Table II reports the yearly percentage of COs in the states V_{CO} , N_{CO} and C_{CO} , for 20 consecutive years.

Figure 6 shows the progress of the CB of interest, depending on the evolution of the corresponding COs. For the purpose of example, the shift from C_{CB} to V_{CB} in the 11th year is a consequence of the fact that, in the last two years, the percentage of COs in C_{CO} reduced by 7 per cent, while the percentage of COs in V_{CO} increased by 6 per cent. In contrast, the shift from V_{CB} to C_{CB} in the 20th year is determined by the fact that, in the last two years, the percentage of COs in C_{CO} increased by 7 per cent.

4. Further reflections on the proposed model

The suggested model is aimed at combining the personal interest of COs and CBs in a joint course towards the progressive growth. Also, it may improve many of the critical aspects discussed in section 2. In particular, it could:

- encourage COs to give greater importance to the actual implementation of quality practices;
- discourage “bad behaviours” of COs and CBs and stimulate their improvement; and
- increase credibility of COs, CBs and the whole certification system.

Major benefits, with particular reference to the traditional certification procedure, are summarised in Table III.

Concerning the logic and the practical effects of the model, it is worth noting the following aspects:

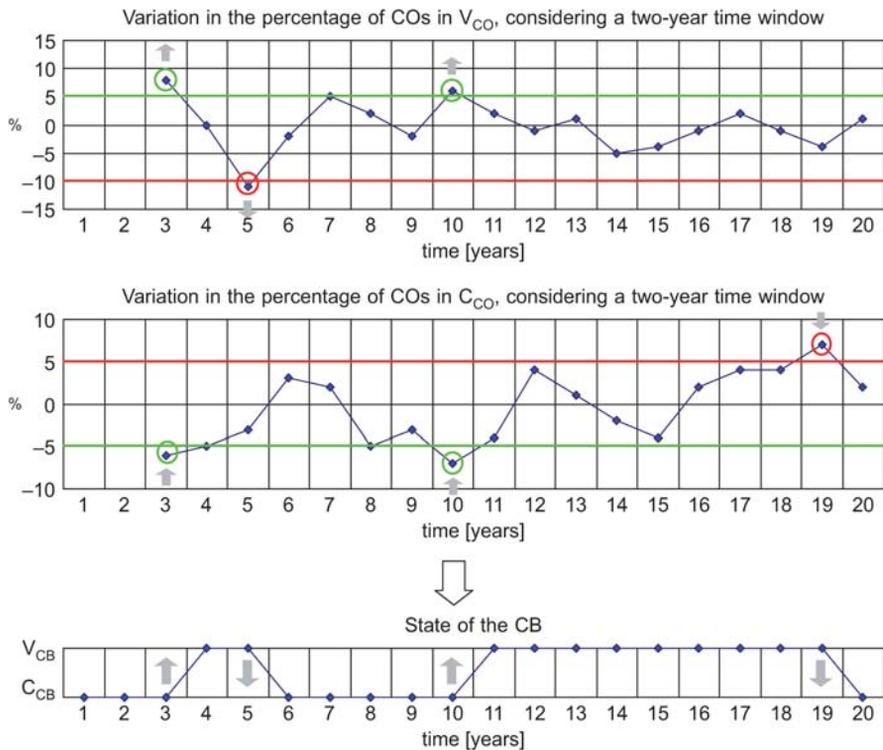
- Virtuous organisations (in V_{CO}) enjoy an economic incentive, consisting of the non-payment of periodic certificate renewal fees to CBs. The state, “in return” for the tax allowances for virtuous CBs, receives the benefit of having more growing organisations that do not recur to social safety valves and tend to create an increasing number of jobs. On the one hand, organisations that are in the C_{CO} state apparently seem to favour CBs, due to the increased cost for their periodic certificate renewal. In the long term, conversely, these organisations will tend to penalise CBs and to make them switch to the C_{CB} state. The aim of the model, consequently, is to encourage the pursuit of long-term advantages for a global system consisting of certified organisations, CBs and states. In view of the benefit produced, this model does not reasonably burden the state and does not represent a type of undisputed “charity” for virtuous CBs. In addition, the model is relatively agile and does not significantly increase bureaucracy. One of the most important effects is that CBs and auditors would be strongly discouraged to release their certification “too easily”.
- In this preliminary analysis, the attention is focused on the philosophy behind the suggested model, rather than the precise and complete definition of the

Table II.

Yearly percentage of the COs (certified by a hypothetical CB) in the states V_{CO} , N_{CO} and C_{CO} , considering a 20-year period

	Time (years)																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Percentage of COs in V_{CO}	10	11	18	11	7	9	12	11	10	17	12	16	13	11	9	10	11	9	7	10
	(-)	(-)	(+8)	(0)	(-11)	(-2)	(+5)	(+2)	(-2)	(+6)	(+2)	(-1)	(+1)	(-5)	(-4)	(-1)	(+2)	(-1)	(-4)	(+1)
Percentage of COs in N_{CO}	60	63	58	68	72	67	65	70	70	71	72	68	70	75	78	74	72	71	69	68
Percentage of COs in C_{CO}	30	26	24	21	21	24	23	19	20	12	16	16	17	14	13	16	17	20	24	22
	(-)	(-)	(-6)	(-5)	(-3)	(+3)	(+2)	(-5)	(-3)	(-7)	(-4)	(+4)	(+1)	(-2)	(-4)	(+2)	(+4)	(+4)	(+7)	(+2)

Note: Figures in parentheses are the relative percentage variations, with respect to the situation of two years previously



Notes: Switchover from one state to another depends on the position of the COs (certified by the CB of interest) in the last two years. Conditions determining any transfer – respectively increase (↑) and decrease (↓) – are highlighted by a circle

Figure 6.
Application example of the incentive sub-model to a hypothetical CB

corresponding parameters and switching rules. In future, specific analyses and simulations will be carried out so as to identify the optimal parameters and switching rules to balance the whole model. For example, some indicators could be modified or replaced by others that prove to be better. This aspect will be essential for the possible adoption and acceptance of the model by the actors involved in it.

- The two sub-models are very different in terms of switching rules: the first focuses on the performance of a specific CO, while the second focuses on the group performance of the COs certified by a specific CB. The link between the two models is that the “survival” of a CO depends on its own practical performance, while the one of a CB depends on the practical results achieved by the organisations that it certifies.
- A possible criticism of the proposed model is that criteria for incentivising/penalising COs (recourse to social valves, lay-offs, etc.) are not necessarily correlated to the organisations’ compliance with ISO 9000 certification requirements. We believe that this potential objection can be turned into a practical improvement of the current system of certification. In fact,

Benefits/advantages	Traditional procedure	Suggested model	Comments
“Dynamic” discrimination of COs	No	Yes	According to the new model, each CO is associated to one of three possible states (C_{CO} , N_{CO} and V_{CO}), depending on the practical results recorded in recent years
“Dynamic” discrimination of CBs	No	Yes	According to the new model, each CB is associated to one of two possible states (C_{CB} and V_{CB}), depending on the performance of the corresponding COs
Cost for periodic certification renewal	Fixed	Variable	According to the new model, the cost for periodic certificate renewal – charged to COs – may change, depending on their state
Tax allowance for “virtuous” CBs	No	Yes	CBs with a relatively large portion of virtuous COs enjoy a tax allowance
Favourable social effects	Weak	Strong	The new model encourages COs not to recur to social valves and to create new jobs
Role of accreditation authority	The same	The same	The new model does not entail any additional task/activity by the accreditation authority
Link between potential quality and real quality	Weak	Strong	This aspect, which is one of the disputed imperfections of the traditional ISO 9000 certification system, is encouraged by the new model

Table III.
Summary of major benefits of the suggested model, with reference to the traditional quality certification procedure

one of the most common criticisms of ISO 9000 standards is that COs do not necessarily implement quality because of the lack of a link between potential quality (conformance to certification requisites) and real quality (real implementation of quality procedures and good practices) (Wade, 2002). Consequently, the fact that the model considers some aspects beyond ISO 9000 standards is not a limit, but rather a new way to enhance and complete the whole certification system.

- Another possible criticism is that there are several reasons why both COs and CBs could change their state, whether or not they are committed to quality; for example, general economic crisis, financial speculation, favourable economic environment, new investments, etc. However, we believe that in the medium to long term, COs that are committed to quality are reasonably intended to be healthy and to contribute to the wealth of their own country, independently of the causes of external influences.
- With some modifications to the switching procedures and indicators in use, similar models could be created for other certification systems, such as ISO 14000 certification, EFQM, the Malcolm Baldrige Award, etc. (Pyzdek, 2003). For example, regarding ISO 14000 standards, switching rules should be focused on indicators of the environmental impact of the organisation.

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- The new model and MIL-STD-105E (i.e. the standard that inspired it) are totally different in terms of application context. Despite this, a parallel between them can be drawn. MIL-STD-105E introduces a mechanism by which the severity related to the sampling inspection of lots received from a supplier may change depending on the result of previous inspections. This makes the inspection system flexible and encourages suppliers to provide products of good quality. Similarly, the new model incentivises COs that really improve, as well as CBs that do not release certifications “too easily”.

5. Conclusions

The reflections included in the first part of the paper provide an interpretation of the current trends concerning the diffusion of national quality certifications. While, on the one hand, the recourse to certifications is increasing in the Eastern countries, on the other hand, it tends to saturate in some countries of the “Old Continent”. The case of the UK is emblematic and makes you think. It seems that once a certain reputation and market share are gained, the role of certification tends to decline. In some cases, the benefits of certification do not respond to expectations, especially for organisations with a consolidated culture of quality. In other (worst) cases, the importance of certification is not at all perceived, to the point of being considered as a superfluous burden.

To contrast this phenomenon it is worthwhile reacting. The greatest challenge is to identify a proper way to combine the interest and expectations of CBs and COs into a unique “virtuous circle” for improving the real implementation of quality management. The introduction of a model based on incentives/penalties is aimed at encouraging the autonomous growth of the actors involved in the national quality system (COs, CBs and state), focalising the attention on the advantages that a correct implementation of quality may produce for them.

The suggested model consists of two interconnected sub-models, relative to COs and CBs, respectively. Each sub-model includes different states with different incentives/penalties. The switchover from one state to another depends on the practical results, recorded in the last years by the CO/CB of interest. The link between the two models is that the “survival” of a CO depends on its own practical performance, while that of a CB depends on the practical results achieved by the organisations that it certifies.

Switching rules are based on a set of objective, transparent, and non-manipulable indicators. In future, on-site analyses and simulations will be carried out so as to identify optimal switching rules to balance the whole model.

To conclude, we think that the suggested model could represent the missing link between potential quality (conformance to certification requisites) and real quality (real implementation of quality procedures and good practices). Moreover, its implementation would not require significant additional effort from the state and the authorities accrediting and controlling CBs.

References

- Albuquerque, P., Bronnenberg, B.J. and Corbett, C.J. (2007), “A spatiotemporal analysis of the global diffusion of ISO 9000 and ISO 14000 certification”, *Management Science*, Vol. 53 No. 3, pp. 451-68.
- Alvarez, M.J., Corbett, C. and Montes, M.J. (2002), “El impacto financiero de la ISO 9000: un análisis empírico”, paper presented at the XII Congreso Nacional ACEDE, Palma de Mallorca.

-
- Boiral, O. and Roy, M.J. (2007), "ISO 9000: integration rationales and organisational impacts", *International Journal of Operations & Production Management*, Vol. 27 No. 2, pp. 226-47.
- 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.
- 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), "Has ISO 9000 lost some of its lustre? A longitudinal impact study", *International Journal of Operations & Production Management*, Vol. 25, pp. 580-96.
- 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.
- 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.
- Conti, T. (2004), *Qualità un'occasione perduta?*, Etas, Milano.
- Corbett, C.J. (2008), "Global diffusion of ISO 9000 certification through supply chains", in Tang, C.S., Teo, C.P. and Wei, K.K. (Eds), *Supply Chain Analysis – A Handbook on the Interaction of Information, System and Optimization*, Springer, New York, NY, pp. 169-99.
- Corbett, C.J., Montes, M., Kirsch, D. and Alvarez-Gil, M. (2002), "Does ISO 9000 certification pay?", *ISO Management Systems*, July/August.
- Dahlggaard, J.J., Kristensen, K. and Kanji, G.K. (1998), *Fundamentals of Total Quality Management*, Chapman & Hall, London.
- Dick, G.P.M., Heras, I. and Casadesús, M. (2006), "Exposing the influence of reverse causation in the attribution of better performance to ISO 9000 quality management systems", Working Paper No. 115, Kent Business School, University of Kent, Canterbury.
- Douglas, A., Coleman, S. and Oddy, R. (2003), "The case for ISO 9000", *The TQM Magazine*, Vol. 15 No. 5, pp. 316-24.
- Duncan, A.J. (1994), *Quality Control and Industrial Statistics*, 5th ed., McGraw-Hill, New York, NY.
- Dwyer, G. (2002), "Business excellence versus ISO 9000 in an Irish context – which delivers?", *Managerial Auditing Journal*, Vol. 17 No. 7, pp. 404-11.
- European Foundation for Quality Management (2009), available at: <http://www.efqm.org>
- 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.
- 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.
- Franceschini, F., Galetto, M. and Maisano, D. (2007), *Management by Measurement: Designing Key Indicators and Performance Measurement Systems*, Springer, Berlin.
- Franceschini, F., Galetto, M., Maisano, D. and Mastrogiacomo, L. (2010), "Clustering of European countries based on ISO 9000 certification diffusion", *International Journal of Quality & Reliability Management*, Vol. 27 No. 5, pp. 558-75.
- Franceschini, F., Galetto, M., Mastrogiacomo, L. and Viticchiè, L. (2008), "Diffusion of ISO 9000 and ISO 14000 certification in Italian commodity sectors", *International Journal of Quality & Reliability Management*, Vol. 25 No. 5, pp. 452-64.

-
- 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.
- Heras, I. (2006), "How quality management models influence company results: conclusions of an empirical study based on the Delphi method", *Total Quality Management & Business Excellence*, Vol. 17, pp. 775-94.
- Heras, I., Arana, G. and Casadesus, M. (2006), "A Delphi study on motivation for ISO 9000 and EFQM", *International Journal of Quality & Reliability Management*, Vol. 23, pp. 807-27.
- International Organisation for Standardisation (2006), *ISO/IEC 17021:2006. Conformity Assessment – Requirements for Bodies Providing Audit and Certification of Management Systems*, International Organisation for Standardisation, Geneva.
- International Organisation for Standardisation (2009), *The ISO Survey of ISO 9000 and ISO 14000 Certificates – 18th Cycle, 2008*, International Organisation for Standardisation, Geneva.
- Juran, J.M. and Gryna, F.M. (1993), *Quality Planning and Analysis*, 3rd ed., McGraw-Hill, New York, NY.
- Karapetrovic, S. and Willborn, W. (2002), "Self-audit of process performance", *International Journal of Quality & Reliability Management*, Vol. 19 No. 1, pp. 24-45.
- Karapetrovic, S., Casadesús, M. and Heras, I. (2006), "Dynamics and integration of standardized management systems", *Documenta Universitaria, Serie GITASP No. 1*, Girona.
- Karapetrovic, S., Casadesús, M. and Heras, I. (2010), "What happened to the ISO 9000 lustre? An eight-year study", *Total Quality Management*, Vol. 21 No. 3, pp. 245-67.
- 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.
- Magd, H. and Curry, A. (2003), "An empirical analysis of management attitudes towards ISO 9001:2000 in Egypt", *The TQM Magazine*, Vol. 15 No. 6, pp. 381-90.
- Malik, S.A. and YeZhua, T. (2006), "ISO certification: the trend and scope from Pakistani industry's perspective", *Proceedings of the IEEE International Conference on Management of Innovation and Technology (ICMIT2006)*, Singapore, pp. 766-71.
- Marimon, F., Heras, I. and Casadesús, M. (2009), "ISO 9000 and ISO 14000 standards: a projection model for the decline phase", *Total Quality Management & Business Excellence*, Vol. 20 No. 1, pp. 1-21.
- 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.
- Masternak, T. and Kleiner, B.H. (1995), "ISO 9000 – what it means to international business today", *Training for Quality*, Vol. 3 No. 4, pp. 15-18.
- Montgomery, D.C. (2009), *Introduction to Statistical Quality Control*, 6th ed., Wiley, New York, NY.
- Poksinska, B., Dahlgaard, J. and Antoni, M. (2002), "The state of ISO 9000 certification: a study of Swedish organisations", *The TQM Magazine*, Vol. 14 No. 5, pp. 297-306.
- Pyzdek, T. (2003), *Quality Engineering Handbook*, 2nd ed., Marcel Dekker, New York, NY.
- Rodholma, P. and Drora, Y. (1993), "The concept of accredited certification (registration) of quality systems to ISO 9000 in the European Community", *Total Quality Management*, Vol. 32 No. 1, pp. 81-5.

-
- Sampaio, P., Saraiva, P. and Rodrigues, A.G. (2009), "ISO 9001 certification research: questions, answers and approaches", *International Journal of Quality & Reliability Management*, Vol. 26 No. 1, pp. 38-58.
- Sun, H., Li, S., Ho, K., Gertsen, F., Hansen, P. and Frick, J. (2004), "The trajectory of implementing ISO 9000 standards versus total quality management in Western Europe", *International Journal of Quality & Reliability Management*, Vol. 21 No. 2, pp. 131-53.
- 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.
- US Department of Defence (1989), *MIL-STD-105E*, US Department of Defence, Arlington, VA.
- Wade, J. (2002), "Is ISO 9000 really a standard?", *ISO Management Systems*, May/June, available at: www.a-t.co.uk/PDF/Free_ideas/jim_isitastandard.pdf
- Weber, R.T. (1991), *An Easy Approach to Acceptance Sampling: How to Use MIL-STD-105E*, American Society for Quality Press, Milwaukee, WI.
- 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.
- Zeng, S.X., Tian, P. and Tam, C.M. (2007), "Overcoming barriers to sustainable implementation of the ISO 9001 system", *Managerial Auditing Journal*, Vol. 22, pp. 244-54.

Further reading

- British Standards Institution (1987), *British Standard Quality Systems BS 5750: Part 1, ISO 9001-1987, EN 29001-1987*, British Standards Institution, London.
- Casadesús, M., Marimon, F. and Heras, I. (2008), "ISO 14001 diffusion after the success of the ISO 9001 model", *Journal of Cleaner Production*, Vol. 16, pp. 1741-54.
- Clifford, S. (2005), "So many standards to follow, so little payoff", *Inc. Magazine*, May, available at: www.inc.com/magazine/20050501/management.html

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