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Exploring performance attribution

Exploring
performance
attribution

The case of quality management standards adoption and business performance

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Abstract

Purpose – Accreditation to the ISO 9001 Quality Management Systems Standard has proven to be a persistent and growing phenomenon in services and manufacturing, yet to date little attempt has been made to explore how performance results in cross-sectional research may be attributed to different causation mechanisms and how their influences may alter over time. This paper aims to fill this gap.

Design/methodology/approach – The paper defines four possible causation mechanisms before searching and analysing the empirical literature on quality management system certification to ISO 9001 and business performance for evidence of their causal influence.

Findings – From the analyses, it is found that the benefit that can safely be attributed to the treatment-effect of ISO 9001 accreditation is lower waste; while the benefits of lower costs and better quality are less likely unless motives for adoption are developmental rather than externally driven. From an analysis of longitudinal studies a strong selection-mechanism is found where more profitable firms have a greater propensity to adopt than less profitable firms. From the finding propositions are developed to show how the influence of these mechanisms change over time.

Research limitations/implications – The existence of the selection-mechanism has profound implications for interpreting business performance achievements because the benefits that are attributed to the treatment-effect from adopting quality management system standards are likely to be greatly inflated by the influence of the selection-mechanism. The author suggests that richer theory is needed that can incorporate bi-directional influences and new research is needed to explore the underlying causes of the selection effect.

Originality/value – The paper is believed to be the first to systematically explore attribution of performance in the ISO 9001 literature. Its findings provide new insights into the complexities of attribution of performance in studies of new practices and systems.

Keywords Performance management, Quality, ISO 9000 series, Business performance

Paper type Research paper

Introduction

The possible influence of reverse causation is acknowledged by management scholars when discussing results that link business performance and management initiatives. However, there appears to be little written that explores what the scale of counterintuitive causation mechanisms may be or how their influence may vary over time. Despite researchers acknowledging that cause and effect cannot be proven, when findings enter the world of the practitioner they are often interpreted as evidence that adoption of new systems or practices are a route to performance improvement. For instance, ANAB the leading ISO 9001 Registrar in the USA (2008) makes bold claims for the business advantages of adopting ISO 9001 Management System Standards



when they claim 16 benefits from accreditation. These include increased operational efficiency, cost savings from less rework, customer satisfaction and competitive edge, perceived higher quality and increased market share. In Europe similar advantages are claimed by leading national registrars as being supported by academic research (Breeze, 2004; CEO British Standards Institution) but are these claims for attribution of improved performance to management system certification to ISO 9001 Standards valid?

The objective of this paper is to explore how different causal mechanisms can influence performance results observed in empirical studies. The paper uses as an illustration the literature's findings on the performance benefits associated with Quality Management System Certification to the ISO 9001 Standard (hereafter referred to as QCert). QCert is chosen for this exploration because it provides a number of desirable features that other areas of best practice do not possess together. First, it requires a standardised third party accreditation process, second, its adoption is widespread and the standard has remained largely unchanged in the 1987 to 2001 period examined. Finally, it has been an area attracting a large number of studies.

The paper starts by defining causal performance mechanisms that are then used as a framework for analysing the business benefits reported in the empirical literature. Particular attention is given to the results of five longitudinal studies that can indicate the direction of causation. Propositions on how causal mechanisms interact are then expounded and the paper then speculates on how the influence of causal mechanisms may alter over time and what this implies for the interpretation of findings in cross-sectional studies of business performance.

A quality management systems causal model

Although most "new" ideas in management have short life spans and are discarded when eclipsed by the next fad (Carson *et al.*, 2000), QCert adoption has proven to be a persistent and growing phenomenon. Its persistence suggests that it is not simply another management fad but will remain an influential global management meta-standard (Uzumeri, 1997).

Despite the high cost^[1] of achieving and maintaining registration to the ISO 9001:2000 Management Systems standard, nearly 900,000 organizations in 170 countries have made the investment (ISO, 2007). But is there evidence to support whether this is an investment that will confer business gains? If improved business performance is found in organizations that are registered (compared to others who are not), does QCert cause this association? Or could it be that there are other causation mechanisms at work?

The literature is in broad agreement on the potential causal chain between improved quality systems and better performance. Both Garvin's (1984) Quality Model and Deming's (1986) reason that as quality improves, waste is eliminated, costs are reduced, and financial performance improves. In the context of QCert the causal links can be extended as follows. A certified quality management system can achieve an increased emphasis on quality (Dick *et al.*, 2000) leading to less waste and duplication of effort, and improvement in product quality. This means there are lower costs and less customer attrition that leads to increased sales volume, while lowering the average cost of acquiring new business. This leads to improved profitability from a combination of lower cost of production, lower sales expenses and scale economies

from greater sales volume. Indeed, even if not all the quality benefits materialize, the possession of the “Quality Badge” alone could lead to increased sales opportunities and so, improve profitability from increased sales volume. This causal model of improvements flowing from QCert to improved business performance is summarized in Figure 1.

Before exploring the attribution of performance there is a need to define the underlying mechanisms that can explain the attribution of performance differences observed in the research. Two can be directly observed in Figure 1. First, a signalling-mechanism can be recognized. The “badge of quality” has potential marketing benefits by signalling a firm’s quality capability, which may well result in attracting some additional business. Second, a treatment-mechanism can be seen in Figure 1 where the approved quality management system creates a chain of benefits that result in improved business performance.

However, studies have suggested that benefits are conditional on the motives of firms pursuing accreditation. When firms are reacting to external pressure for certification, they may see ISO 9001 registration as the prime objective, and adopt a minimalist approach to achieve it (Gore, 1994). These firms may possess quality certification but they posture rather than operate the quality management system that quality certification requires, so achieve limited benefits. Therefore, the treatment-mechanism may be conditional on intermediate variables that reflect the motives of firms for pursuing accreditation to the ISO 9001 standard which I label as a posturing-mechanism. Here, non-posturing firms achieve benefits from the treatment-mechanism while firms influenced by the posturing-mechanism (those who do not have “developmental” motives) do not increase their quality emphasis and so achieve no treatment-mechanism benefits.

Finally, there exists the possibility of reverse causation of performance due to a self-selection bias, which I label as a selection-mechanism, where already high performing organizations have a greater propensity to adopt new management systems than lower performing organizations. I am not suggesting that the mechanisms act alone but rather that they are discrete, each one having the potential to

ISO certification	Management system	Quality emphasis	Quality improvement	Business benefits	Business performance
Certified by a third party Registrar as meeting the ISO 9001 Quality Management Standard	The approved management system brings an increased emphasis on quality and how it may be achieved consistently	Increased emphasis on internal quality dimensions	<u>Internal</u> Less waste and duplication of effort	Reduced costs improve competitive-ness	Cost of sales reduces leading to increased profits
		Increased emphasis on external quality dimensions	<u>External</u> Service and product quality received by customers improves	Less customer attrition Badge of quality opens more sales opportunities	Profitability benefits from scale economies, and lower sales acquisition costs Sales volume increases

Figure 1.
The expected links
between management
system certification to
ISO 9001 and business
performance

influence the cause and effect relationship between accreditation to ISO 9001 and business performance.

Next the ISO 9001 literature is screened and then analysed for evidence for the different performance attribution mechanisms.

ISO 9001 quality management and performance literature

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The literature screening analyses the empirical work in peer-reviewed journals from 1990-2005 that include reference to ISO 9001, certification, and performance or benefits. The search used the BIDS, Emerald Management Reviews (formerly ANBAR) and EBSCO databases to identify source materials. A six-stage approach to selection of articles was used. Initial screening of the 2000 or so search listing excluded materials that were not in peer reviewed journals, followed by a relevance screening to exclude articles that did not explicitly measure business benefits or performance variables. At this stage it was found that there are many studies reporting expectations of increased market share and improved product quality from ISO 9001 implementation (Ebrahimpour *et al.*, 1997), but there were less than 100 empirical studies that examined the actual business performance achieved.

Of these articles only those that explicitly measured benefits that could be related to the model (Figure 1) were included, i.e. measurement of any of the following: waste, costs, better quality, higher sales, market share or profitability ratios. A few articles were included that aggregated lower waste and lower cost as these can be viewed as closely related operational measures. Next, the research methods of each article were assessed and only research that reported the statistical significance of their results and had sample sizes with sufficient power were selected. In this Cohen's table (1988) was used that calculates that samples larger than 76 are needed to ensure that a relationship > 0.4 will be detected at a significance level of 0.05 and a power of 0.8. This ensures that the analysis avoids studies that are unlikely to detect statistically significant effects that are medium in magnitude and very unlikely to detect lesser effects.

Next, papers that included firms registered after 2000 were excluded, so that the findings could be viewed as being uninfluenced by the major quality standards revision (ISO 9001:2000) that applied from 2001 onwards. Finally, where an author had multiple publications from the same research data, the paper that most suited the criteria was selected. Clearly, this process cannot claim to have captured every item of relevant research but it can be viewed as a substantial sample of the literature, which is unlikely to have any systematic bias in its selection.

This methodology resulted in a set of 26 research study results which may seem a small number compared to the apparently vast research output relating to ISO 9001 but it is comparable to findings of Ahire *et al.* (1995) who found only 29 empirical articles from the 226 on Total Quality Management and business performance that they reviewed.

The analysis that follows breaks the quality management system certification (QCert) papers that have been selected into two groups. The first of these consists of "snapshot" (cross-sectional) studies or studies analysed on a cross-sectional basis that provide evidence of statistical validity. Peer-reviewed papers of this type started to appear in 1997 and continue with many of these using intervening variables on the firms' motivation for pursuing QCert to explain when performance gains were achieved. The analysis starts by briefly summarizing the findings of this first group

and the listed benefits. I start by summarising the studies in the upper part of Table I that do not include the influence of intervening variables. Overall, the strongest findings are for internal benefits associated with QCert. Five studies from seven (Buttle, 1997; Sun, 2000; Prabhu *et al.*, 2000; Briscoe *et al.*, 2005) report lower waste as a benefit while two (Terziovski *et al.*, 1997; Chou-Chua *et al.*, 2003) fail to find any evidence for it. Lower costs that should follow from less waste are found in five out of nine studies (Buttle, 1997; Huarng *et al.*, 1999; Sun, 2000; Briscoe *et al.*, 2005; Tzelepis *et al.*, 2006), while four studies report no association of QCert with lower costs (Terziovski *et al.*, 1997; Singles *et al.*, 2001; Santos and Escanciano, 2001; Chou-Chua *et al.*, 2003).

Evidence is weaker for external benefits such as better quality being associated with QCert. Only four studies (Huarng *et al.*, 1999; Sun, 2000; Santos and Escanciano, 2001; Terziovski *et al.*, 2003) find evidence for better quality while four studies find no evidence (Terziovski *et al.*, 1997; Prabhu *et al.*, 2000; Singles *et al.*, 2001; Chou-Chua *et al.*, 2003). Sales and market share growth evidence continue this weaker trend with five studies (Buttle, 1997; Huarng *et al.*, 1999; Lima *et al.*, 2000; Heras *et al.*, 2002a; Terziovski *et al.*, 2003), supporting gains for QCert while seven disconfirm this (Terziovski *et al.*, 1997; Simmons *et al.*, 1999; Singles *et al.*, 2001; Santos and Escanciano, 2001; Chou-Chua *et al.*, 2003; Dimara *et al.*, 2004; Briscoe *et al.*, 2005). Evidence for higher profitability being associated with QCert is mixed with five studies finding profitability improvement (Buttle, 1997; Simmons *et al.*, 1999; Huarng *et al.*, 1999; Heras *et al.*, 2002a; Tzelepis *et al.*, 2006) while six find no evidence to support higher profits being associated with QCert (Lima *et al.*, 2000; Singles *et al.*, 2001; Santos and Escanciano, 2001; Tsekouras *et al.*, 2002; Chou-Chua *et al.*, 2003; Dimara *et al.*, 2004).

Overall, the preceding evaluation of the links between QCert and improved performance reveals that there is evidence in the field's empirical research to suggest that the broad range of treatment-mechanism benefits shown in Figure 1 are possible. Overall, evidence for internal benefits is stronger than evidence for external benefits, which is consistent with the idea that that the gains will be attenuated when moving forward through the model. By attenuation I mean that in each step in the model (Figure 1) the effect is less than the cause that precedes it which cumulatively results in a reduction in performance gains as you move through the causal paths in the model.

Posturing-mechanism and treatment-mechanism studies

In the lower part of Table I can be seen the research that uses "motivation" intervening variables where the common theme is whether the motives for adoption are internal or developmental rather than external motives (such as marketing benefits or customer pressure). The lower part of Table I shows that when "internal/developmental" motives variables are present then most studies report a range of benefits from QCert. All eight studies (Jones *et al.*, 1997; Brown *et al.*, 1998; Abraham *et al.*, 2000; Yahya and Goh, 2001; Singles *et al.*, 2001; Yeung *et al.*, 2003; Terziovski *et al.*, 2003; Naveh and Marcus, 2005) find internal benefits of lower waste and/or lower costs while four from six studies report better quality (Jones *et al.*, 1997; Brown *et al.*, 1998; Abraham *et al.*, 2000; Singles *et al.*, 2001). Mixed results are found for higher sales/market share with three from six studies finding evidence (Jones *et al.*, 1997; Brown *et al.*, 1998; Singles *et al.*, 2001), and this continues for profitability as Singles *et al.* (2001) finds benefits

while Naveh and Marcus (2005) does not. However, what is striking is that when internal/developmental motives for QCert adoption are absent, all the eight studies find that there are no business benefits to report. Clearly, there is evidence here that there is no benefits found when the posturing-mechanism is present while there are benefits when the posturing-mechanism is absent. This indicates that there is no treatment-effect or signalling-mechanism influence when the posturing-mechanism is present. However, the signalling-mechanism should be unaffected by the posturing-mechanism so it can be deduced that the influence of the “badge of quality’s” signalling-mechanism is too small to be detected.

At face value most of the research that has used intermediate “motives” variables to study management reasons for pursuing QCert seems to support the existence of a posturing-mechanism as benefits are found only if the reason for adoption is not solely because of external pressure. Indeed, all these studies (eight from eight) find internal benefits are present alongside QCert when management has “developmental motives”[2], while they are absent when adoption is for customer pressure alone. However, the same studies show external benefits are less certain (five from eight) with Yahya and Goh (2001) and Yeung *et al.* (2003) finding no evidence for better quality or improved sales (Naveh and Marcus, 2005) regardless of the motives for accreditation. In summary, a treatment-effect has been found which is dependent on the absence of a posturing-mechanism; while no evidence has been found to support the existence of anything other than perhaps a very weak signalling-mechanism.

Longitudinal studies of treatment-mechanism and selection-mechanism influences

Although studies have been identified that imply the existence of a treatment-mechanism and posturing-mechanism, caution is needed in suggesting that the treatment-mechanism is the cause of the benefits found since the methodologies used in all the studies that have been reviewed so far can only indicate association. Could the causal model shown in Figure 1 that shows only forward causality between ISO 9001 certification and improved business performance be erroneous? Could it be that a selection-mechanism also exists, i.e. that better business performance precedes QCert and is being mistakenly attributed to QCert. In other words, could it be that organizations with above average business performance tend to pursue QCert more than less profitable firms and this explains or inflates the better performance found in the presence of QCert?

At this point it is necessary to consider what conditions are needed to judge attribution of performance. In the social sciences causality is usually accepted as requiring three conditions. Variables that logically might influence one another must be associated, the causal variable must produce its influence before the outcome occurs, and other possible explanations must be eliminated such as the effect of unknown variable(s) that might be a common influence (Blaikie, 2003).

So in this context QCert has been shown in the literature to have a chain of influences that might be a sufficient condition for the occurrence of better financial and sales performance. In other words the research meets the first condition for causation since Figure 1 shows a plausible sequence of relationships that can be viewed as a causal chain that can explain why QCert could cause improved financial performance and associations between them have been found that indicate that a cause and effect relationship exists. However, for causation to be attributed two other conditions need

to be satisfied. QCert needs to precede better performance and ways of separating the influence of the treatment-mechanism and selection-mechanism need to be found.

Only five longitudinal research studies were found that meet the attribution conditions just described. Each of these articles (apart from Heras *et al.*, 2002b) has a focus on treatment-mechanism explanations for better performance. Because of this, I analyse their empirical material rather than report their findings. Each of these longitudinal studies starts at the point when registration to ISO 9001 standards first began in the country or sector examined.

The first was Häversjö's (2000, p. 48) longitudinal analysis of the returns on capital employed of Danish companies between 1989 and 1995. In this study, the 871 companies who were registered by 1995 were compared with a control group of 644 firms matched by size, to see if the abnormal rate of return on capital employed improved after registrations. Häversjö's longitudinal results (Häversjö's Table I; summarized here in Figure 2) shows that the average financial performance of the certified organizations was superior to the non-certified organizations both before and after their registration but no consistent pattern of post-registration performance gains of significance can be detected. The empirical material thus indicates that the better performance of the Certified than Non-Certified firms is nearly all due to the selection-mechanism.

The second article that used a research design that could provide evidence of causality is the study of Heras *et al.* (2002b) that explores financial and sales performance of 800 organizations in the Basque region of Spain between 1994 and 1998. They explicitly set out to establish causality by extending the analysis of their

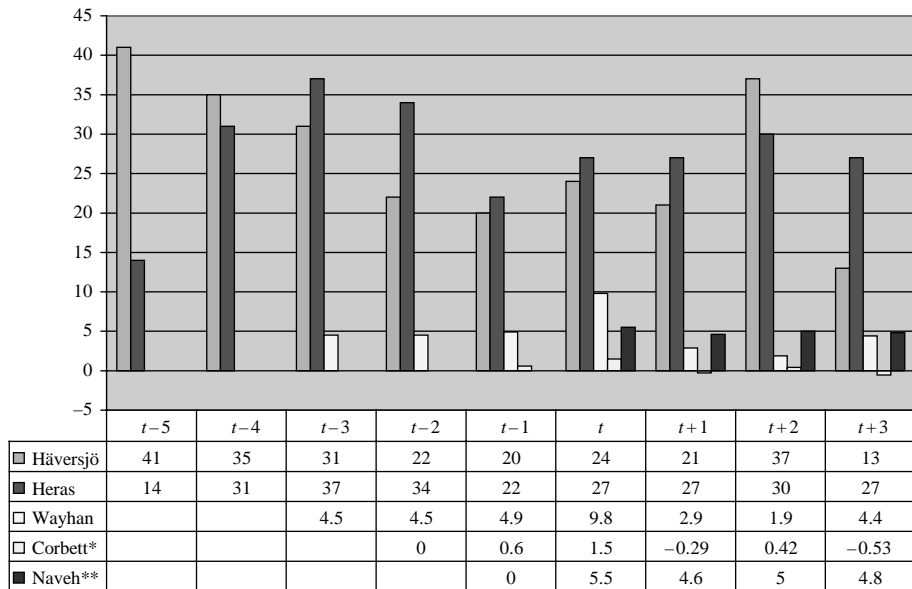


Figure 2. Summary of the abnormal profitability in longitudinal studies of ISO 9001 certified firms

Notes: t is the year of quality certification, $t+1$ is one year after quality certification, etc.; * Corbett ROA standardized on $t-2$ year; **Naveh ROA standardized on $t-1$ year

Source: Full authors citations are given in the reference section

earlier cross-sectional research (Heras *et al.*, 2002a) that indicated improved profitability and sales performance in QCert organizations. Their analysis found that the performance of the 400 certified companies was superior preceding certification compared to the 400 Non-Certified ones, and there was no statistically significant evidence of improved performance after registration. The same was true even when a time lag was allowed for (Heras *et al.*, 2000a, Table 5, p. 784; summarized here in Figure 2). Their control group tests indicate that any differences between ISO Certified and Non-Certified companies were not related to the sector distribution, or differences in size, of their sample firms, so their results indicate that the better performance of Certified than Non-Certified firms is due to a selection-mechanism.

The third article that used a research design that could provide evidence of causality is Wayhans *et al.*' (2002) analysis of the performance of 96 organizations in the USA between 1990 and 1998. Their table of results (Wayhan *et al.*, 2002, p. 225; Table I, summarized here in Figure 2) also shows that their 48 registered organizations had a consistently better return on assets employed, both before and after their registration, compared to a control group of 48 non-registered organizations who were matched by industry and size to the certified companies. As with Häversjö no significant post-registration performance gains can be detected. The empirical material thus indicates selection-mechanism being the reason for the abnormal performance found after registration.

The fourth examined the performance of 544 US firms between 1987 and 1997 (Corbett *et al.*, 2005). In their study to avoid the influence of selection effects a number of control groups were constructed by individual matching and portfolio matching to, "industry-firm size" "industry-firm size-ROA", "industry-ROA", to achieve six control sets (following the methods of Barber and Lyon, 1996). Their findings indicate that differences in abnormal performance in ROA tend to be least when compared with portfolio industry-size matched control (Corbett *et al.*, 2005, Table 7 on p. 1053) and highest when compared to a control of one to one matching by industry and ROA (Corbett *et al.*, 2005, Table 4 on p. 1052). Regardless of the control used differences in abnormal performance show achievement of modest year-by-year gains (0.5-1.5 per cent) post management system certification, few of which reach statistical significance. However, when these gains are aggregated (which increases the power of the tests) all of the control group sets showed that these small gains became statistically significant. Their empirical material is summarized in Figure 2, where their "industry-firm size-ROA" matched control groups are shown because this best eliminates the effect of the selection-mechanism which is the prime objective of their methodology. Their empirical material thus indicates a small treatment-mechanism that can be attributed to QCert when the selection-mechanism's influences are controlled for.

The fifth is Naveh and Marcus (2005) examination of 313 US firms between 1990 and 2000. Like Corbett *et al.* (2005), to eliminate the influence of selection-effects they used Barber and Lyons (1996) methods. Regardless of control group type they found only non-significant yearly ROA gains for all of the five years following registration. However, like Corbett they found that when these gains (which were more substantial than those found by Corbett) were aggregated over the post registration five years these gains became statistically significant. This applied to all of the control groups. Their empirical material is summarized in Figure 2 where their "industry-firm size-ROA" matched control groups are shown since their chosen analysis method aims

to remove the influence of selection-effects. It can be seen that their empirical materials indicate a moderate treatment-mechanism that can be attributed to QCert when the influences of the selection-mechanism are eliminated.

So, what conclusion can be drawn from the five studies' empirical material summarized in Figure 2? First, it can be clearly seen that there is no discernable improvement trend in profitability post-certification for Häversjö, Heras or Wayhan while Corbett's" post-certification performance indicates only marginal changes compared to the steady and worthwhile performance differential seen in Naveh's firms. Second, it is clear that pre-certification profitability of Häversjö, Heras and Wayhans' Certified firms is better in all the years leading up to certification compared to their Non-Certified control groups. This better than average pre-certification is also observed by Corbett *et al.* (2005, pp. 1051 and 1057) and Naveh and Marcus (2005, p. 19, Table 6a). So, it seems that of the five longitudinal studies that could indicate attribution to management system certification only two provide evidence of profitability benefits being gained from the treatment-mechanism. In contrast, all the longitudinal studies provide consistent indicators that a selection-mechanism exists where firms with above average performance prior to their certification have a tendency to self-select to adopt certification.

I concede that I am basing my conclusions on the influence of the selection-mechanism on the results of studies that have used different methods for selecting their control groups. Indeed, Corbett's *et al.* (2005) and Naveh and Marcus (2005) results show that different control group selection criteria do influence results but no great differences that would alter their overall results were found, so I do not believe that differences in control group methods have any substantial influence that limits my overall findings. Although I base my argument on only five longitudinal studies, these all used actual financial results which provide more reliable evidence than self-reported results.

Discussion of findings

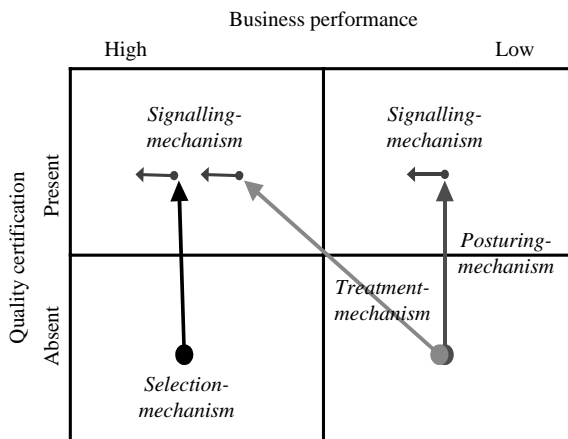
So, what are the possible explanations that might underpin this selection-mechanism? It could be that the systems required by ISO certification are costly to implement and maintain, so more profitable firms, are more likely to be able to afford it. Alternatively, it may be that the certified companies are characterized by having a greater exposure to international trade, and to compete they may have already emulated "best practice" systems of quality management prior to seeking accreditation. A broader explanation is that there is a latent common cause. The common cause could be that high performing firms are more likely to seek new practices/systems that can improve their capabilities, which ultimately create their above average performance. Thus, better performance is not caused by any single system or practice but is the cumulative result of a process of continuous adoption, learning and adaptation of new management practices/systems.

If this broader explanation of common cause is true then it may be that an incorrect inference is being drawn about the effect of the posturing-mechanism that was found in the studies examined earlier (Figure 1: Jones *et al.*, 1997; Brown *et al.*, 1998; Abraham *et al.*, 2000; Yahya and Goh, 2001; Singles *et al.*, 2001; Yeung *et al.*, 2003; Terziowski *et al.*, 2003; Naveh and Marcus, 2005). An alternative plausible explanation is that developmental behaviour is a variable that is a characteristic of firms with higher

performance, rather than an influence that leads to benefits being achieved through certified quality management systems. So, it could be that developmental behaviour is one of the underlying causes of that better than average pre-certification performance observed in these studies.

To appreciate the full implications of the selection-mechanism a re-evaluation of the findings of benefits in the model shown in Figure 1 is needed. What benefits can be safely attributed to the treatment-mechanism rather than the selection-mechanism in the snap-shot studies reviewed earlier in Table I? Clearly, lower waste should be strongly associated with QCert since quality systems should avoid repeated errors. Indeed, the review did find that lower waste has more evidence than any other benefit (five from seven studies). However, the review’s findings indicate that lower costs following on from lower waste in the model are possible but by no means certain (five studies from nine). Better quality is another strong candidate, but this was also not found consistently (four from eight studies). So, the evidence for intermediate causal links is mixed indicating that the better profitability findings in the cross-sectional studies (five from eleven) may be inflated by the influence of the selection-mechanism observed in the earlier analysis of the longitudinal studies. The selection-mechanism explanation of superior performance suggests that the snap-shot studies reviewed earlier that reported performance benefits from the QCert may be attributing to QCert inflated benefits that are in part, or primarily, due to their better performance preceding certification.

The possible influence of the causation mechanisms that have been found are summarised in Figure 3. First, a signalling-mechanism can be observed that has a small influence that augments the influence of all the other causation mechanisms. This is the result of the “badge of quality” that provides potential marketing benefits which may attract some additional business. Second, a treatment-mechanism is indicated by the literature where firms unaffected by the posturing-mechanism achieve benefits from QCert that lead to better business performance. However, firms influenced by the posturing-mechanism (those who do not have “developmental” motives)



Note: Nodes represent starting positions and arrows indicate the mechanisms influence

Figure 3.
Performance attribution
mechanisms

achieve only the small signalling-mechanism benefits. Finally, Figure 3 shows the selection-mechanism where already high performing organizations have a greater propensity to adopt new management systems than lower performing organizations. Some of these firms may achieve additional performance benefits from the treatment-mechanism but these gains are likely to be modest.

Towards a theory of performance attribution

So, how does the influence of the mechanisms change over time? To help this explanation Rogers (2003) diffusion cycle is used. This diffusion cycle starts with a small number of early-adopters who are followed progressively by the majority until the innovation is common and there is little extra growth. Integrating the literature findings suggests a “theory of performance attribution” where it is the behaviour of high performing organizations and their propensity to pursue new management systems adoption earlier than lower performing organizations that contributes to research findings of an association of management system change with high performance in the earlier stages of the adoption of new quality management systems. In other words, the better performance found is due to the early-movers in accreditation being higher performing companies. Later, when low performing organizations emulate, or posture, that they have also changed their management systems, they dilute the effect of the high performing organizations, which leads to later research results indicating that the adoption of the management system is not effective unless firms adopt it for developmental motives.

Looking at these influences in the context of cross-sectional research, I suggest that cause and effect between QCert and business benefits exists in both directions, but in different subsections of organizations within a cross-section of Certified and Non-Certified organizations. The first subsection is higher performing organizations that have a greater propensity than their lower performing rivals to pursue and obtain QCert; notably they are characterized by their performance not altering significantly after QCert (Häversjö, 2000; Heras *et al.*, 2002b; Wayhan *et al.*, 2002). They will tend to be early-movers in adopting QCert since they have a greater propensity to pursue it than their rivals have, so in terms of their proportion in the cross-section of organizations, they will tend to be dominant in the certified cross-section in the earlier stages of certification adoption, in a country, or industrial sector.

The second subsection is the lower performing organizations. Here, performance difference in the certified cross-section will depend on the motives of the organizations for pursuing QCert. Organizations who just want the “badge of quality” (posturing organizations) will enjoy little business benefit (Singles *et al.*, 2001) other than avoiding losing customers who want them to be registered as a prerequisite to doing business. On the other hand, organizations that have developmental motives (non-posturing organizations) that go beyond getting the badge can achieve business benefits (Jones *et al.*, 1997). By definition, high performing organizations will always be a minor proportion compared to average or poor performing organizations, so their impact in any sectional sample will depend on how much they are diluted by other organizations. In particular, their influence will depend on how big a proportion they represent in the Certified cross-section. In addition, but to a much lesser degree, is the influence of the signalling-mechanism from possession of the “badge of quality.” This may attract

some additional business or avoids the loss of business to competitors who already have the badge.

Two examples follow that show how QCert research results may be influenced by these mechanisms in countries or sectors that are starting to pursue QCert versus those where QCert diffusion is widespread.

In industrial sectors, or countries, where adoption of QCert is new, the high performing organizations will tend to be the early-movers in pursuing ISO 9001 accreditation so they will be a large proportion in the certified cross-section compared to lower performing organizations. Therefore, the certified cross-section will appear to provide evidence of improved performance when compared with the non-certified cross-section. However, this improved performance is largely, or partially, an illusion caused by better pre-certification performance. Of course, not all high performing organizations will pursue QCert, but their influence in the non-certified cross-section is small since they are diluted by the many lower performing organizations.

In industrial sectors, or countries, where QCert diffusion is widespread most of the high performing organizations, who see relevance in QCert, will have already gained accreditation and many of the low performing organizations will also have done so. Those low performing organizations with “developmental” motives (non-posturing) achieving benefits while those who are customer driven (posturing) achieving little. Therefore, when the certified and non-certified sections are compared, differences in business performance will be more difficult to detect since the high performing organizations and those who are not posturing and have achieved benefits are diluted by the lack of benefits in those organizations that are posturing. However, when these posturing organizations are controlled for, the picture is different with the high performing organizations and the non-posturing organizations showing business gains compared to the Non-Certified cross-section, but gains are inflated by the presence of the already high performing organizations.

These examples, illustrate that the overall effect is that as QCert becomes the norm the appearance of business benefits in the certified cross-section becomes progressively diluted and so more difficult to detect unless motives for pursuing QCert are considered (Jones *et al.*, 1997; Brown *et al.*, 1998; Abraham *et al.*, 2000; Yahya and Goh, 2001; Singles *et al.*, 2001; Yeung *et al.*, 2003; Terziowski *et al.*, 2003; Naveh and Marcus, 2005).

Conclusions

The influence of four possible performance attribution mechanisms were explored in an analysis of the ISO 9001 Quality Management System empirical literature and the comparative strength of their influence explored. First, a selection-mechanism was found where already high performing organizations have a greater propensity to adopt new management systems. Second, a weak signalling-mechanism was deduced where the “badge of quality” signals quality capability, which may result in attracting some additional business. Third, a posturing-mechanism was found where firms that do not have developmental motives achieve little advantage from accreditation. Finally, a treatment-mechanism was observed where firms that are not influenced by the posturing-mechanism achieve performance improvements.

A theory of performance attribution was proposed using the framework of “the diffusion cycle” where a small number of early-adopters are followed by the majority

as the innovation diffuses into a marketplace (Rogers, 2003). It was explained that in the early stages of QCert diffusion the selection-mechanism will be the dominant influence on research results because already high performing organizations tend to be early-adoptors of QCert and thus are the dominant proportion in the high performing cross section (all the longitudinal studies reviewed begin at the point when QCert accreditation first started in the countries concerned). As the treatment-mechanism has little impact on the results of already high performing organizations its major influence is on ex-lower performing organizations. Therefore, as QCert adoption diffuses to more organizations, lower performing firms, unaffected by the posturing-mechanism, achieve higher performance from the treatment-mechanism but cross sectional research results will be inflated by the presence of the already high performing organizations created by the selection-mechanism. As QCert adoption grows the selection-mechanism becomes less important as the proportion of originally high performing organizations is progressively diluted by the increase in ex-lower performing organizations. Therefore, the influence of the selection-mechanism wanes as the influence of the treatment-mechanism and posturing-mechanism become more dominant. Finally, as adoption becomes more commonplace the posturing-mechanism limits the influence of the treatment-mechanism while the influence of the signalling-mechanism becomes even weaker as adoption become widespread.

Central to the explanation of performance attribution is the influence of the selection-mechanism but is its influence universal? I have shown that better performing companies self-select to adopt quality certification in three very different countries, Denmark, Spain and the USA, which enables me to conclude that the existence of the selection-mechanism is not just a national phenomenon. However, given that over 170 countries with varied cultural and economic regimes have firms registered to ISO 9001 standards (ISO, 2007), I accept that this self-selection behaviour may not be universal.

So what is different in the proposed theory of performance attribution compared to those of institutional and bandwagon theories (DiMaggio and Powell, 1983; Katz and Shapiro, 1985; Abrahamson and Rosenkopf, 1993; Oliver, 1997; Abrahamson and Fairchild, 1999; Straw and Epstein, 2000; Fiol and O'Conner, 2003)? A full explanation is outside of the scope of this exploratory paper but I believe that knowing the influences of the attribution mechanisms during the diffusion cycle illuminates some aspects of these theories. For instance, the part that the selection-mechanism may play in the early stages of the diffusion cycle in providing a (false) signal of adoption benefits that encourages imitation of what may be inefficient administrative innovations.

The size of the influence of the selection-mechanism is the key to the explanation of performance attribution for firms accredited to ISO 9001, but before the paper's findings can be generalised to other best practices confirming evidence from other best practice and performance research is needed. Some supportive evidence is emerging in ISO 14,001 Environmental Management studies (Toffel, 2006; Heras *et al.*, 2008) but these are working papers at present.

Clearly more research is needed and I suggest that instead of research designs that attempt to eliminate the influence of selection bias, a more productive approach would be to design studies so that both treatment and selection causation are measured. Knowing the effect size of selection causation is important in its own right if researchers

are to present findings in a broader theoretical frame where the influence of unknown effects are acknowledged and propositions derived that may explain their likely origins. These propositions would justify research into possible underpinning causes that in turn could lead to the development of broader theory that will enrich our understanding of the complexity of performance attribution.

For researchers the paper demonstrates the potential confusion in the attribution of causation in research designs that assume only a treatment-mechanism. The influence of a selection-mechanism has, I believe, profound implications for the interpretation of causation in the substantial literature that shows QCert is associated with improved business performance. In those studies when a link between business performance improvement and quality management system adoption is found, it is tempting to infer that performance improvement can be attributed to the quality management system change (possibly combined with some intermediate variable(s)). Clearly, the evidence presented here for the presence of a selection-mechanism suggests that counterintuitive explanations can be equally valid.

Notes

1. Most reports are broadly consistent with the indicators of costs that come from a study by the Singapore Productivity and Standards Boards (1999), that suggests that companies need to plan for implementation costs of around \$445 per employee, while maintenance costs will run at approximately \$120 per employee. However, recent research suggest that maintenance cost reduce over time (Casadesús and Karapetrovic, 2005).
2. Variously described by authors' as: Developmental Motives, Internal Motivation, Leadership Motives, Catalyst for Change.

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Further reading

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