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# Management Technologies - Are they worth it? A normative study of ISO 9001 and Project Management

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## Abstract

This research inquires into the value of two common 'management technologies', namely ISO 9001 and project management. To avoid certain methodological problems, we study the value of these micro-level practices by inductively analysing macro-level data, specifically the intensity of project management and ISO 9001 certification (termed project management score and ISO 9001 score) in different countries against national measures of wealth and innovation. There is no correlation between ISO 9001 score and innovation, while high ISO 9001 scores are correlated with *decreasing* levels of wealth. The project management score is positively correlated with wealth and with innovation, though very high project management scores are negatively correlated with innovation. The study includes a cluster analysis which finds that, with one exception, countries tend to adopt either project management or ISO 9001 but not both. The analysis indicates that project management is more likely to be associated with high innovation and high wealth than ISO 9001.

**Keywords:** innovation, ISO 9001, project management, quality management.

## Management Technologies - Are they worth it? A normative study of ISO 9001 and Project Management

### INTRODUCTION

A Management Technology (MT) is an institutionalized set of practices and techniques designed and implemented to achieve explicit managerial objectives. Examples of such technologies include ISO 9001, ISO 14000, project management, JIT, MRP, and Six Sigma. These technologies have been extensively studied within the management literature over the last few decades, not least because they are so widely implemented, and because their benefits have been so loudly promoted and contested. Common streams of research are evident in each of the MT literatures: (i) the MT's effect on financial performance, (ii) the MT's effect on innovation, and (iii) the diffusion and evolution of the MT. While most research focuses on just one of these questions and on just one MT, this study inquires into all three questions and considers two MTs, namely ISO 9001 and project management.

In an insightful *Journal of Management* article, Edwin Locke (2007) asserts that the hypothetico-deductive method, which he sees as almost hegemonic in management research, "actually retards the progress of science" (p. 868), partly because it "makes for quick and often short-lived theories" (p. 872). Instead, he proposes an inductive approach to theory building. Locke advocates that a paper following the inductive approach should (a) not start with a theory but would merely summarise what is known about the phenomenon in question; (b) not include hypotheses; "instead the author could simply pose questions" (p. 887); (c) focus, in the discussion section, on tying together the new findings with what was previously known; and (d) not highlight implications of the study — "if anything, journal editors should actively discourage premature theorizing" (p. 887). This study accepts much of Locke's arguments and the paper is structured accordingly. It begins by briefly describing the two MTs before outlining the predominant explanations and conceptual architecture around each of the research questions. This is followed by a section on research design which sets out

and justifies the particular research method adopted. The paper then discusses data collection. This is followed by a section where the data is used to inquire into the three central research questions. The study's contribution is then discussed, before concluding by outlining future research.

## TWO MTs: ISO 9001 AND PROJECT MANAGEMENT

### ISO 9001: A Formal Quality Management Technology

ISO 9000 is a family of standards for quality management systems, maintained by ISO, the International Organization for Standardization. The primary standard within this family is ISO 9001:2000. The requirements of ISO 9001 include having and following a documented set of procedures for all key processes in the business to facilitate monitoring, control and continuous improvement.

ISO 9000:1987 was the original quality management standard, and was based on the earlier UK Standard BS 5750. A new standard was published in 1994 and then the 2000 version combined three standards into one, called 9001. Up to the end of December 2007, almost 1 million ISO 9001:2000 certificates had been issued across 175 countries (The ISO Survey — 2007).

ISO 9001:2000 will be abbreviated in this paper by the acronym QM (for Quality Management).

### Project Management

In this paper, project management (PM) is understood as a diverse but well-recognized set of management practices and techniques used to plan, organize and manage resources to achieve specific project objectives. This basket of techniques includes the critical path method, Gantt charts, earned value analysis, variance analysis, risk management techniques, scope management, work breakdown structure, project evaluation techniques, etc. These techniques

have become standardized and institutionalized through the two main project management associations, the Project Management Institute (PMI), founded in 1969 in the United States, and the International Project Management Association (IPMA) founded in Europe in 1967, as well as through other standardizing bodies such as the Office of Government Commerce (an independent office of the UK Treasury) which maintains the PRINCE2 method of managing projects. In 1981, PMI began to document and standardize generally accepted project management practices, which led to the publication, in 1996, of "A Guide to the Project Management Body of Knowledge (PMBOK)" (PMI Standards Committee & Project Management Institute, 1996). The IPMA followed a similar route, publishing in 1999 the IPMA Competence Baseline (ICB), which identified and described 46 technical, behavioural and contextual competencies of professional project management (the 2006 version of ICB is available at http://www.ipma.ch/Documents/ICB_V._3.0.pdf).

By the end of 2008, IPMA and PMI had issued 86,545 and 262,821 certificates respectively, across 52 countries.

QM and PM are similar but different in important respects. They are similar in that both are formal, structured, prescriptive attempts to manage and control an organization's operations. Both are rooted in an engineering/production model of the world that valorises a systematic, standardised, objective, and rational approach to getting things done. They are both institutionalised in being underpinned by professional bodies, consultancy groups, and various educational programmes. Both have their strong advocates who, at the extreme, employ an almost religious, proselytising rhetoric. Similarly, detractors use almost identical arguments against the two MTs, namely that the rational, scientific, instrumental approach suffocates creativity and innovation and that this diminishes business performance. The important differences between QM and PM are as follows. First, QM certifies organizations or business units while PM certifies individuals. Second, QM has been around much longer

than PM, and is much more extensively implemented. Third, while QM and PM may both be considered "process management activities" (Benner and Tushman 2002), PM provides a template for carrying out almost any project, while QM describes and helps regulate how a particular production process will be done. In addition, PM is a looser system in that no audit is required, and a business's customers rarely, if ever, impose PM certification as a requirement.

## RESEARCH QUESTIONS AND CONCEPTUAL FRAMES

This research inquires into three distinct but related research questions. Is there a relationship between each MT and financial performance? Is there a relationship between each MT and innovation performance? And how and why do these MTs diffuse? There is much to be gained from inquiring into all three questions and both MTs, not least because the three questions are inter-related. Innovation performance is probably linked to financial performance, and the perceived benefits of an MT (in terms of innovation and financial performance) are presumably factors that influence its diffusion. In addition, studying two MTs helps adjudicate on the merits of any analysis, since any proposed explanation should be able to account for substantive differences in the relationships and diffusion patterns. Indeed, this emphasis on comparison is central to grounded theory, which is probably the best-known form of induction in management research (Glaser & Strauss, 1968).

We will now consider the literature and theoretical perspectives that frame each of the three questions.

### MTs and Financial Performance

Given that MTs are so passionately advocated, it is no surprise that various studies have inquired into their actual and perceived benefits. Garvin (1984) presented an early and influential model of the benefits of total quality management (TQM), arguing that improved

product quality enhances market reputation and experience-based learning, and that this leads to increased market share (and/or higher prices) and consequently higher profits. At the same time, TQM reduces manufacturing, warranty, service and rework costs, which further increases profits. Others are less sanguine, arguing that (a) quality may improve operational but not business performance; (b) quality's focus on control is to the long-term detriment of the business; (c) prior research confuses actual and perceived benefits; and (d) any benefits are short-lived and should not be confused with sustainable competitive advantage. The argument has gone on for years. Sampaio, Saraiva & Rodrigues (2009) reviewed some 24 studies into the impact of ISO 9001 certification on financial performance and concluded that

> Despite all the studies carried out in this area, conclusions reached so far have yet a contradictory nature. Some authors conclude that there is a positive relationship between ISO 9001 certification and companies' financial improvement… while others do not find evidence to support such a relationship (Sampaio et al 2009: 50).

The 24 studies fall into two neat camps of 12. In addition, Sampaio et al were critical of the reliance on survey methodologies in previous research, which consequently "express conclusions that are mainly derived from opinions and perceptions about the subject" (p. 38). Wayhan, Kirche & Khumawala (2002) made a similar point, highlighting the bias inherent in self-reported data "due to the fact that the respondents often have a vested interest in the eventual success of the ISO 9000 initiative" (p. 229).

In contrast to QM, there is very little systematic research assessing the impact of PM on business performance. In their extensive review, Thomas & Mullaly (2007) state that:

> Although the holy grail of demonstrable project management value is often discussed in consulting and practitioner literature, the actual value resulting from investments in project management has been hard to define, let alone measure. Few rigorous studies

> have been undertaken and those that exist struggle to provide indisputable and strong evidence (p. 74).

They proceed to outline a research project – sponsored by PMI – that seeks to fill this gap, and they subsequently published the results of this research in book form (Thomas & Mullaly, 2008). A central issue that they address is how value should be measured, and they caution against measuring it using Return on Investment or Balanced Scorecard metrics. And while they also caution against "self-report survey data, limited case studies or studies of the value of independent elements of project management" (p. 77), their research makes much use of self-report survey data and (albeit a larger than usual number of) case studies.

**MTs and Innovation**

Abernathy (1978) first suggested that a firm's focus on productivity might inhibit its flexibility and ability to innovate. This criticism endures and is routinely leveraged against formal quality management systems, which are seen to focus excessively on control to the detriment of learning and innovation (Adler et al., 2009; Boiral, 2003; Cole & Matsumiya, 2007; Sitkin & Sutcliffe, 1994). Thus, it is somewhat surprising that Sampaio et al (2009), in their review of 92 articles on ISO 9001, did not find one article examining the relationship between ISO 9001 and innovation performance. The relationship is perhaps implicitly considered in one of their research streams, namely studies into the link between *ISO 9000* (not ISO 9001) and TQM, because TQM is traditionally perceived to be more about continuous improvement (innovation) while ISO 9000 is about achieving certification and running a business process properly. The findings of this stream were inconclusive. Nowadays, this distinction is perhaps less compelling because continuous improvement is integral to ISO 9001: 2000 (Franceschini, Galetto & Cecconi, 2006). Indeed as Cole & Matsumiya (2007) report, over 25% of the 82 presentations at the 2007 Annual Conference of the American Society of Quality had some version of innovation in their title.

An important body of work not included by Sampaio et al (2009) is Benner and Tushman's research into the impact of "process management" activities on technological innovation (Benner & Tushman, 2002; 2003; Benner & Veloso, 2008). While they list TQM, Six Sigma and ISO 9000 as examples of process management, their research focused solely on ISO 9000 certification. Importantly, they draw on March's (1991) argument that innovation consists of *exploitation* of existing knowledge and *exploration* in search of new knowledge, a distinction they operationalise though filtering patent data. In summary, they found that:

> process management helps firms build on prior practices and knowledge and facilitates exploitative innovations… [but] increased process management activities in a firm were also associated with significant decreases in its most exploratory forms of innovation (Benner & Tushman, 2002: 700).

Cole and Matsumiya's (2007) article on the relationship between quality and innovation is also not included in Sampaio et al's review. Drawing on a number of case studies of Japanese high-tech firms, and on Benner and Tushman's ideas, they argue that "while a firm's pursuit of quality is often quite compatible with incremental innovation, its relationship with radical or disruptive innovation is a good deal more problematic" (p. 77).

Moving to the relationship between PM and innovation, one finds that the literature is equally sparse, which is somewhat surprising because PM purports to provide a structured way to manage change, and change is practically a synonym for innovation. The threads of a literature may be traced back to the 1960s when an early feature of the PM approach, namely the matrix organizational structure, was advocated as more conducive to new product development than the archetypical model of bureaucratic organization (Galbraith, 1973; Thompson, 1967). Further research highlighted some deficiencies in the matrix pattern and, in time, many practitioners and gurus argued for a fully projectised approach. For instance,

Tom Peters routinely exhorted businesses to "Instill a 'project orientation' everywhere", as in his 1990 article titled *Get Innovative or Get Dead*:

> Virtually every person in the company should spend a fair amount of his or her day on project teams with people from other functions: *The essence of perpetual quality improvement, service improvement, speeding up this and that, and rapid product development is getting people from multiple, warring tribes working together on output-oriented activities that generally go unmanaged in our tradition, 'vertical,' 'functional stovepipe' organization.* All managers in the sleek, new-look 'projectized' organization become first and foremost cross functional project creators (Peters, 1990: 23, original emphasis).

Keegan and Turner (2002) took a more downbeat stance when they addressed the specific question of whether or not "project-based firms provide a context supportive of innovation" (p. 2002). In their review of the literature they noted that "the traditional innovation literature largely ignores project management …[while] the project management literature… largely ignores innovation" (p. 368). Echoing Peters and others, they state that "Projects are portrayed in the literature as a fast, flat, flexible approach to managing change (and innovation) in organizations. We anticipate therefore that project-based firms provide a context supportive of innovation" (p. 368-9). But they wonder if this is actually the case. Drawing on interviews with practitioners, they conclude that while project-based firms use PM to manage innovation projects as a way of facilitating innovation, they are concerned that these practices may actually be stifling innovation. In explaining this, they point to the paradigm's engineering tradition and the institutionalization of PM knowledge, which both emphasize the control of work to specific time, cost and quality constraints. While the argument sounds compelling – and parallels the criticism of ISO 9001 – it is largely speculation and opinion.

Aggeri and Segrestin (2007) take a somewhat similar tack, arguing that while PM is an appropriate way to manage *product development* – which is focused around existing knowledge and predefined targets, processes and deadlines – it is misplaced when applied to *radical innovation*, where the focus is on outperforming dominant designs, exploring new alternatives and constructing new knowledge (echoing March's (1991) distinction between exploitation and exploration). However, this is little more than speculation since they studied only a single case.

March's (1991) distinction between exploitation and exploration runs through much of the research, although there is much conceptual muddiness around the terms. In particular, it is not clear whether the two concepts are competing phenomena — i.e. exploration and exploitation are two ends of a continuum — or are they better understood as orthogonal variables (Katila & Ahuja, 2002). Gupta et al (2006: 697) conclude that "we do not believe that a universal argument can be made in favor of either continuity or orthogonality". Instead, the conversation has shifted attention onto the need to achieve balance between the two modes of innovation and the mechanisms that organisations use to effect this. One such mechanism is the concept of the 'ambidextrous organisation' consisting of "multiple tightly coupled subunits that are themselves loosely coupled with each other. Within subunits the tasks, cultures, individuals and organizational arrangements are consistent, but across sub-units tasks and cultures are inconsistent and loosely coupled" (Benner & Tushman, 2003: 247).

**MT Diffusion**

The third question is about how and why these technologies diffuse. Again one can leverage different and competing theories to explain the phenomenon (Ketokivi & Schroeder, 2004). The strategic management argument sees each new implementation of an MT as the consequence of a deliberate management strategy (Dean & Snell, 1996). Central to this

conceptual frame is the decision-making agent of the organisation: the rational manager. In contrast, contingency theory moves the manager to the background and instead posits that these technologies reflect structural contingencies imposed upon the organization by its business and task environment (Burns & Stalker, 1961; Lawrence & Lorsch, 1967; Rungtusanatham, Forza, Koka, Salvador & Nie, 2005; Sila, 2007). In place of managerial agency, this theory privileges environmental constructs such as complexity, flexibility, size, uncertainty, etc. Neo-institutional theory offers a third perspective, seeing the diffusion of MTs as the manifestation of, *inter alia*, mimicry and coercive pressures (DiMaggio & Powell, 1983; Guler, Guillen & Macpherson, 2002). A shared assumption across these competing theories is the idea of intended but bounded economic rationality. We can also drop that assumption and then the best explanation for the diffusion of MTs is perhaps that it is fashion at work (or work as fashion, maybe) (Abrahamson, 1996; Kieser, 1997).

Whichever theory one favours, an overarching assumption is that MTs diffuse according to an S-curve pattern as proposed by Rogers (1962/1995) in his seminal work on technology diffusion (Albuquerque, Bronnenberg & Corbett, 2007; Franceschini et al., 2006; Guler et al., 2002; Saraiva & Duarte, 2003; Teece, 1980). The analysis by Franceshini, Galetto & Cecconi (2006) indicates that ISO 9001 has reached saturation level (the top of the S curve) in a number of countries, although this level corresponds to only a small fraction of the total number of companies in each country.

## METHODOLOGY: AN INDUCTIVE, QUANTITATIVE STUDY

Most management research follows the hypothetico-deductive approach and therefore some comments on the inductive nature of this study are in order. Not only is inductive reasoning less popular, but it is also almost exclusively associated with the analysis of *qualitative* data, to the point where 'qualitative inquiry' and 'quantitative inquiry' have emerged as synonyms for inductive and hypothetico-deductive research respectively. This development is

unfortunate, since qualitative data may be analysed deductively (Hyde, 2000) and quantitative data may be analysed inductively. The following 2x2 matrix usefully maps out four different research approaches (recognising that both data and method may be mixed):

| | Qualitative Data | Quantitative Data |
|---|---|---|
| Inductive method | 1 | 2 |
| Deductive method | 3 | 4 |

This research project is situated in quadrant 2. Unlike deductive research, which deduces hypotheses from the literature and then tests these in the field, inductive research seeks to explain interesting patterns in the data, akin to the way a detective pieces together a plausible and evidence-based story to explain a crime (Winks, 1969).

The study is normative in that it is inquiring into the link between management practices (QM and PM) and performance measures (financial and innovation performance). (There is also a normative dimension underpinning the diffusion of MTs.) But normative research is problematic in management studies for various reasons. First, while two organizations may ostensibly use the same MT, the technology may be used quite differently in different situations. In addition, contingent factors such as the industrial setting and local environment are likely to be important. So what appears to work very well in one setting may demonstrably fail in another. Second, researchers and practitioners are likely to impute causality when perhaps there is only correlation or coincidence at play. In particular, one should be skeptical of surveys of practitioners because of the various problems with self-reports (Podsakoff & Organ, 1986). As attribution theory has shown, individuals are likely to provide different explanations for their own actions as against the actions of others (and the perceived success or failure of same). Third, if research uncovers the 'truth' that technology A leads to, say, increased market share, and this 'fact' is made available to businesses, then all

competitors in a specific industry should implement the technology, which should mean that *no* competitive advantage can be gained, thus negating the earlier 'truth'. Fourth, implementing any new MT has a vital political dimension, where there are winners and losers. If a technology is worth its salt it must require that the organization change profoundly, and, as the new sweeps out the old, prior values, practices and positions are cast aside in a maelstrom of careering bandwagons. In these political manoeuvrings, academic research is likely to be leveraged for instrumental ends – by both academics and practitioners (see Benner & Tushman (2002)).

But even if these MTs are no more than fads (Abrahamson, 1996) they are worth studying because they are so pervasive, so potentially upsetting to organizations, and because of the claims and beliefs on which they rest. In many ways, they are interesting solely because they bring to light deeper aspects of ourselves, our motivations, fears and desires.

This study seeks to address the above methodological points by framing the research project in a specific way. First, it uses *nations,* rather than organizations or businesses, as the comparative unit of analysis. This at least partly deals with the attribution and self-reporting issues. Second, it focuses on just two outcomes, wealth and innovation performance. Third, it considers two MTs, namely PM and QM, and their relationship with both wealth and innovation performance. These two were chosen because they are similar but also different ways that organizations use to regulate and routinise their operations. Both are popular "process management activities" (Benner and Tushman 2002), or, in the terminology used in this paper, 'MTs'. Most importantly, one can infer relative levels of implementation of these technologies in different countries across the world, which is not the case for, say, Six Sigma. In addition, the 'standardization' of QM preceded the standardization of PM by at least ten years (an ISO for PM is currently under development), which adds a potentially interesting

temporal dimension to the study. And comparison and interpretation is facilitated by collecting data on two MTs and two different outcomes.

While strong correlations cannot be expected between variables built on aggregating disparate sets of micro data that abbreviate complex, multi-dimensional phenomena, the approach nonetheless provides an interesting and novel perspective on the relationship between important concepts. Such an approach has also been used by Esser (2007) to examine the link between country level indicators on innovation and governance.

## DATA COLLECTION

This section describes how I operationalised the four primary variables: PM intensity, QM intensity, financial performance, and innovation performance.

Data was collected on the four variables across 52 countries, although data was available on all four variables for just 30 countries.

### PM Intensity

PM intensity is a measure of how intensively PM is practiced in a particular country. If formal PM methods are widely implemented in a country then this is likely to be reflected in a high number of PM certificates issued in that country. Thus, the weighted number of PM *certificates* per capita is an indicator of the intensity of PM practice. IPMA Level A, B, C and D certificates were rated 4, 3, 2, and 1 respectively. PMI has recently also moved to a four tiered certification structure, but some 98 percent of its certificates have been awarded at one level only, known as PMP (Project Management Professional) which I weighted as 1.5 points. I decided on these weightings having consulted with professionals from both certifying bodies. I obtained IPMA data for all years up to 2008 and PMP data for 2008 and 2004. Together, PMI and IPMA have certified in excess of 400,000 PM practitioners.

I was unable to obtain country-specific data on PRINCE2 certification, and this is one limitation of the research. A further limitation is the variance that necessarily occurs in the certification adjudication process. Notwithstanding these issues, the level of certification per capita gives a *prima facia* measure of how extensively PM methodologies are used in each country. This is called the *PM score*. The assumption is that the higher the PM score, the more PM is practiced in a country.

The PM dataset covers 52 countries, and Figure 1 shows the PM score for the top 30 countries. Iceland (which has a small population) and Austria have exceptionally high scores. Closer analysis shows that this is due to a higher number of unweighted certificates per annum *and* a much higher proportion of B and C certificates than other countries.

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Insert Figure 1 here

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This measure of PM intensity may be compared with earlier work done by Roland Gareis (2002) on the level of PM practiced across selected European countries (the so-called Project Oriented Society (POS) study). In this study, separate and independent assessors evaluated the level of PM practice in ten European countries using an agreed assessment framework. The comparison indicated that there was broad consistency between the two, quite different, methods of assessing the level of PM practice, although Austria's high PM score was not replicated in the POS study.

**QM Intensity**

Similar to the PM scoring, the *QM score* measures the number of certificates awarded per capita in each country. The International Standards Organization provided information on the number of certificates awarded annually by country.[i] The most recent publication was

produced in 2008, with data up to 2007. Country data is currently available from 1993 to 2007. Figure 2 shows the scores for the top 30 countries and includes the country ranking in 2001.

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Insert Figure 2 here

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It is clear that the rankings have changed significantly between 2001 and 2007.

**Innovation Performance**

The measure of innovation performance used throughout this paper is the European Innovation Scorecard. This is a well-known and well-regarded instrument that compares the innovation performance of 37 states, including the 27 EU member states, the US, Canada, Japan and Australia. The project is funded by the European Commission. To date, seven editions of the scorecard have been published, most recently in February 2008 (available at http://www.proinno-europe.eu/metrics). Countries are assigned an overall innovation score through aggregating 25 innovation indicators, including measures such as the number of new science and engineering graduates per 1000 population, public R&D expenditure as a percent of GDP, percent of SMEs innovating in-house, percent employment in high-tech services, and number of patents per million population. The scorecard produces a rich source of comparative data. A number of anomalies and idiosyncrasies have been identified in the index (see Schibany & Streicher (2008) and Hollanders & van Cruysen (2008) for recent reviews of the index), but it is still the most important innovation benchmark available. In the latest survey, the list is book-ended by Sweden and Switzerland at the top and Turkey and Romania at the bottom.

The Global Summary Innovation Index is another measure of national innovation performance (Hollanders & Arundel, 2006). It is similar to the EIS but has fewer indicators and provides data on the innovation performance of seven additional countries. I decided to use the EIS rather than the GSII because PM certification is very low in the additional countries covered by the GSII and because the correlation coefficient between 2005 EIS and 2006 GIS performance is close to 1 (Hollanders & Arundel, 2006: 23). (Both the EIS and GSII data may be obtained from the Pro-Inno web-site (http://www.proinno-europe.eu).

**Wealth**

The measure of wealth used in this research was GDP per capita (obtained from the International Monetary Fund database at www.imf.org)

To partly take account of different demographics across countries, I also analyzed the data using per head of labour force rather than per capita data. In essence, the results did not differ substantially. However, the labour force data had more anomalies, which may be due to different ways that labour force is counted across countries. For this reason, all the analysis is based on per capita data.

## FINDINGS AND ANALYSIS

**QM, PM and Financial Performance**

This part of the research focuses on the relationship between the two MTs and wealth. To allow for time lag effects, and because PM data was available for 2004 and 2008, I conducted two correlation analyses, one with 2004 scores for QM and PM, but 2008 data for wealth, and one with 2007 scores for QM, and 2008 scores for PM and wealth.

An initial analysis using the 2004 data showed that the relationship between the QM score and wealth was non-linear (the linearity assumption was found to be invalid). Since a curvature was apparent in the initial scatterplot, a quadratic was then fitted to the data and

residual diagnostics (standardized residual, Cook's distance, centred leverage value, standardized DfFits, standardized DfBetas) were investigated to eliminate outliers and influential cases. This analysis indicated that Norway, Switzerland, Italy and Iceland should be removed.[ii] When this was done, the resulting $R^2$ quadratic was 49.5 percent, as shown in Figure 3. The 2008 data produced much lower correlation levels ($R^2$ quadratic was only 26 percent).

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Insert Figure 3 here

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With the PM data, the 2004 and 2008 data were not substantively different, and indeed there were slightly higher correlations with the 2008 data. In this case, the relationship between PM score and wealth follows a linear relationship, after three outliers are removed using the same statistical techniques described earlier (see figure 4). The three outliers were Norway, which has very high GDP per capita, and Austria and Iceland, which have exceptionally high PM scores. The $R^2$ linear measure is 60 percent, which indicates a very strong correlation, given that only one variable (PM intensity) is accounting for 60 percent of the variance in the national wealth data.[iii]

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Insert Figure 4 here

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**QM, PM and Innovation Performance**

The analysis – see figure 5 – indicates no relationship between the QM score and innovation; the data shows a random pattern, even when apparent outliers are eliminated. The $R^2$ linear and $R^2$ quadratic are effectively zero for 2004 and 2007 data.

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Insert Figure 5 here

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In contrast to the absence of a relationship between the QM and innovation, there is quite a strong relationship between PM and innovation. A quadratic model of the relationship between these two variables (30 countries) was plotted with 2004 and 2008 data on the two variables (30 countries). (A linear relationship did not fit this dataset because the homogeneity of variance assumption was found to be invalid, while a visible curvature in the plot of standardized residuals against predicted values indicated that a quadratic model would be more appropriate.) The residual diagnostics and measures of leverage and influence indicated that Austria and Iceland (both of which have exceptionally high PM scores) should be removed from the dataset. The 2008 data had a higher $R^2$ than the 2004 data (66.4 percent versus 51 percent). The resulting quadratic for the 2008 data is plotted in figure 6.

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Insert Figure 6 here

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The $R^2$ in figure 7 computes as 66.4 percent, which is a very high correlation given that the innovation score is aggregated from 25 different indicators. The analysis shows that increasing levels of PM are correlated with increasing levels of innovation – up to a point (about 600 PM weighted certificates per million population).

**MT Diffusion**

Inductive research seeks to develop theory that will explain both differences and similarities. A first step, therefore, is to identify similarities and differences. To this end, I used cluster analysis to classify the countries into groups, based on the four variables included in the analysis using the data that yielded the highest correlations in the previous analysis (i.e. 2008 data for PM and 2004 data for QM). In this research, the classification was made on the basis

of hierarchical agglomerative cluster analysis, which seeks to identify distinct groupings of observations that are homogenous within a group and heterogeneous across a group. Clusters were linked using Ward's method, which uses an analysis of variance approach to evaluate the distance (here squared Euclidian distance) between clusters. All variables were standardized with a mean of 0 and standard deviation of 1 using Z-scores to reduce the influence of different measures, units and scales. The cluster solution was determined by investigating the size of the jump in the distance measures when two clusters were merged.

The cluster analysis reduces the dataset of 30 countries into 6 clusters, as depicted in Table 1. The rightmost column in Table 1 is an indicator of the relative importance given to PM compared to QM (i.e. it divides the PM score by the QM score).

**(1) Switzerland.** Switzerland rates high on all four measurements. Switzerland has an exceptionally high level of ISO 9001 certification, which might be explained by the fact that the International Standards Organization is based in Geneva. Uniquely, it also has a high PM score.

**(2) The PM Enthusiasts.** This group consists of just Austria and Iceland, both of which have exceptionally high PM scores. Both countries are quite wealthy and have a moderate to high innovation score. The earlier analysis identified these two countries as outliers due to their high PM scores, and this is why they form a distinct cluster in the cluster analysis. The other mean values indicate that Austria and Iceland might otherwise be properly located in the High PM/Low QM cluster.

**(3) The High PM / Low QM Cluster.** These countries are, in the main, wealthy innovators, with low-to-moderate QM and high PM scores. Norway is something of an anomaly; but for its oil-based wealth, it might be more properly located in the High QM/ Low PM cluster.

**(4) The High QM / Low PM Cluster.** This cluster is less wealthy than cluster 3, and has much higher levels of QM and much lower PM scores.

**(5) The QM Enthusiasts.** These countries are, on average, not wealthy, have relatively low innovation scores, and very low PM scores. However, they have very high QM scores, which makes the PM/QM ratio very low indeed.

**(6) The Poor Relations.** These countries rate low on all four variables.

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Insert Table 1 here

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Two questions arising from the cluster analysis are 'what explains the differences between the clusters?' and 'are these differences relatively enduring?'

A powerful aspect of the inductive approach is that it builds theory by focusing attention on anomalies and substantive differences in the data. Finding one black swan does not show that induction is invalid, but rather adds to what we know about the concept of swan (Locke 2007: 886). In our study, both the correlation and cluster analysis have identified some anomalies; black swans, if you wish, that need explaining. Why, for instance, are Austria and Italy so enthusiastic about PM and QM respectively? To answer such questions would require a number of case studies that would go beyond the scope of this paper, but, as an initial step, figure 7 plots Italy and Austria's wealth and PM and QM scores from 1990 to 2008. This shows that Italy's QM score lagged behind Austria up to 1999, but that at that point Austria seemed to 'lose interest' in QM and, perhaps coincidentally, began to enthusiastically embrace PM. The graph also indicates that the different paths taken by Austria and Italy post 1999 have had little apparent effect on the relative wealth of both countries.

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Insert Figure 7 about here

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## THEORETICAL CONTRIBUTION

In line with Locke's (2007) argument that a valid theory needs to be gradually built from an accumulating body of evidence, this section will primarily discuss the findings in the context of prior research and explanations.

### MTs and Financial Performance

Given the diversity of the extant literature, there will certainly be no last word on the relationship between the two MTs and financial performance. Figure 4 shows a linear correlation between PM and wealth, but a linear relationship between any MT and wealth is to be expected because wealthier countries will tend to be more industrialised and will consequently have more of these technologies than poorer countries. In other words, the correlation in figure 4 should not be taken as an indicator of causation. The same point applies to the left hand side of the curve in figure 3.

What is more interesting is why the shapes of the graphs in figures 3 and 4 are so different, given that similar criticisms exist about both MTs. Specifically, what explains the right hand side of the curve in figure 3, where increasing levels of QM are correlated with *decreasing* wealth? Specifically, why do some relatively poor countries have high QM scores? In this case, causation *is* plausible since high levels of QM – a QM fetish if you will – may decrease wealth, most likely through excessive formalization of organizational processes. But if this is so, then why is it not the case with PM (figure 4)?

Alternatively, the high levels of certification in relatively poor countries may also be interpreted as evidence that contingent factors affect the diffusion rate of an MT (Guler et al., 2002), but that a high level of adoption of an MT may not be correlated with increased

wealth. However, this raises other questions, which we will discuss in the section on diffusion.

The inverted U-shape in figure 3 does help explain and reflect the hotly contested views on the value of quality management systems. Supporters and detractors may be viewing different microcosms of the curve, with supporters on the left and detractors on the right, although they may both be confusing correlation with causation. Overall, there is little evidence that QM is associated with increased financial performance with some evidence that high levels of QM are associated with poor financial performance. In contrast, the analysis indicates that countries that are enthusiastic adopters of PM are richer than those that enthusiastically adopt QM.

**MTs and Innovation**

The absence of any relationship between QM and innovation (figure 5) is somewhat surprising, because one would expect the wealthier countries to be more innovative *and* have higher QM scores. Indeed the wealthier countries are more innovative (there is an $R^2$ linear of 69 percent between innovation and GDP per capita once Norway is excluded) leading one to expect some correlation between the QM score and innovation. The fact that there isn't seems to support those who say that QM fosters standardization, painting-by-numbers, and stifles creativity and innovation (though this would imply that there should be negative correlation). Another possible interpretation is that QM has a positive relationship with exploitation but a negative relationship with exploration (as Benner and Tushman's research would suggest) and that one nullifies the other. However, this thesis appears implausible, although it cannot be tested because the EIS dataset does not decompose innovation into these elements.

While one should be careful not to infer causation from correlation, the absence of a QM-innovation relationship is in stark contrast to the PM-innovation relationship (figure 6). It is also interesting that very high levels of PM are correlated with *decreasing* level of innovation performance. Again, the exploitation/exploration distinction provides one possible interpretation: formal PM approaches may facilitate the former and perhaps hinder the latter (interestingly, Gupta et al (2006: 697) hypothesise that there should be an inverted U curve if exploitation and exploration are on a continuum). But again since the innovation index does not differentiate between the two forms of innovation, this explanation is speculative. Alternatively, the quadratic's right side may merely reflect high levels of adoption of PM in particular countries, which we will discuss below.

Overall, the research shows that countries that adopt PM tend to be richer and more innovative than those that adopt QM.

**Diffusion: Market Isomorphism through translation**

The data indicates that MTs do not necessarily diffuse according to an S-curve pattern, that MT adoption rates may regress (UK QM score dropped 1589 in 2003 to 676 in 2006), that diffusion rates in two countries may match one another and then suddenly and radically diverge (see figure 7), and that neighbouring countries may have radically different MT diffusion rates (see Table 1). What is perhaps most striking about the data is the *heterogeneity* in the diffusion patterns. It is also significant that, excluding the 'poor relations', countries other than Switzerland seem to adopt an either/or strategy to PM versus QM – i.e. they adopt one or the other but not both — suggesting that these technologies are competing with one another.

In a seminal and defining contribution to institutional theory, DiMaggio and Powell (1983) identified three modes of isomorphism — coercive, normative and mimetic — through which

organisations become more similar to one another. Subsequent work has built on this framework and neo-institutional theory now provides a dominant theoretical frame for understanding the diffusion of MTs (Delmas, 2002; Guillén; Guler et al., 2002; Ketokivi & Schroeder, 2004). However, this study suggests that this an inadequate conceptual carapace for understanding diffusion, since there is little evidence that the data can be usefully explained by appealing to the coercive behaviour of states or large multinational corporations (coercive isomorphism), professionalization (normative isomorphism) or mimetic isomorphism arising from uncertainty.

This study points to a fourth process — *markets isomorphism* — that is distinct from the three processes described by DiMaggio and Powell. Markets isomorphism focuses attention on the ways that markets themselves cause isomorphism through, paradoxically, the manufacture of distinctions in the market. This requires explanation. When organisations compete in a market, a primary task for each organisation is to create and understand the distinctions and comparisons that the *customers* make. In a market, the modelling process is more complex that DiMaggio and Powell's subject-object dyad. There is, at a minimum, (a) a subject (organisation) [S], (b) the customer [C] who is making distinctions and decisions; and (c) the object (organisations) [O] against which the customer compares and contrasts the subject (organisation). In a market, there is an incentive for organisations to differentiate themselves, *from the customer's perspective*, from competitors (i.e. there is a heterogeneity impetus). There is also an impetus to be similar to other organisations (a homogeneity impetus) again in the eyes of the customer. Customers compare and contrast many organisations, and engage in quite sophisticated forms of theorizing and model-building in the process. Each subject organisation knows this, and they also know that competing (object) organisations know it as well, which adds a reflective, game-playing dimension to the model. For instance, a subject organisation [S] may decide to implement an MT because it thinks that this will *distinguish* S,

in the eyes of a customer [C], from a competing organisation [$O_1$]. However, S may also believe that the MT will make it, in the eyes of the customer (or indeed another customer), *similar* to another organisation [$O_2$], which is perhaps in a different industry. If S believes that C is positively disposed to $O_2$, then S may adopt the MT to be at once different from $O_1$ and similar to $O_2$. In other words, *isomorphism may occur as organisations become similar through trying to be different*. In this way, distinction creates difference, but also is implicated in the creation of sameness.

Extant research into the diffusion of QM puts much purchase on the coercive actions of states and dominant businesses in the supply chain (Corbett, 2006; Guler et al., 2002; Ketokivi & Schroeder, 2004).[iv] However, this explanation is less compelling when applied to PM because organisations are rarely if ever forced into adopting this MT. Instead, a high PM score in one country relative to another probably reflects the relative energy and activity of local consultants, gurus and the certifying bodies, who *persuade* rather than coerce organisations to adopt PM. In particular, the relative activity of each national certifying body seems especially important since their ambit is typically limited to national boundaries. The concept of markets isomorphism captures this idea of ideas being marketed. MTs, or at least aspects of them, are bought and sold *in a market,* which focuses attention on those that benefit from the sale/implementation of the MT and on the forces and dynamics in each MT market.

Thus, there is much scope to explain MT diffusion through more detailed analysis of MT markets. For instance, the evidence in this study is that PM and QM are competing with one another, working either directly or indirectly to block or displace the other from the market. Thus, instead of the rather deterministic models that have tended to dominate the diffusion literature heretofore (Albuquerque et al., 2007; Corbett & Kirsch, 2001; Marimon, Heras & Casadesus, 2009; Teece, 1980), this study centres attention on the 'idea entrepreneurs' (Abrahamson & Fairchild, 1999) and trend-makers within each MT market. Diffusion, then,

is better theorised as market isomorphism through *translation*, the latter term being a direct nod to the sociology of translation (Callon, 1986) and specifically to Latour's critique of the diffusion metaphor (Latour, 1986, 1987). For Latour, diffusion is an inappropriate metaphor because it suggests that an innovation has an inherent force driving its spread: '[T]he spread in time and space of anything — claims, orders, artefacts, goods — is in the hands of people; each of these people may act in different ways" (Latour, 1986: 267). Translation is an ongoing, material and meaningful process whereby claims are progressively transformed as proponents seek to enrol other actors, who may accept, reject or modify the claims based on their own interests. This is precisely what happens in a market. Innovations become embedded (or punctualised in Latour and Callon's language) once there is a perceived fit between the proponent's claims and the interests of the targeted audience. And in this embedding, there are always displacements since translation is never wholly faithful.

While translation is pervasive, some actors translate more than others. Wolfe (1975) makes this clear in his acerbic study of fashion in the art world, where a small clique or *cénacles* can set a trend that, in turn, is taken up by the bohemia world, the art world, and ultimately *tout le monde*. In recognition of this, I have coined the term *trendslator* to identify the certifying bodies, local associations, and other consultants who play a key role in advocating, educating and promoting an MT. The term emphasises these agent's role in manufacturing a trend, and it also explicitly recognises that translation — as understood within the sociology of translation — is fundamental to the diffusion and trend-making process (Czarniawska-Joerges & Sevón, 2005).

## FUTURE RESEARCH

In line with Locke's (2007) view that inductive research is a slow, incremental process, where studies build on one another, future research might profitably focus on the anomalies and outliers identified in the data analysis. For instance, detailed case studies might explain why

some countries have adopted QM so enthusiastically but still have relatively low levels of innovation and wealth. A more comprehensive comparative study might also shed more light on why, for instance, Austria and Italy are so enthusiastic about PM and QM respectively. Or why is Switzerland unique in having both a high PM and high QM score?

Theoretically, the research favours a translation perspective on the evolution and diffusion of MT. More detailed case studies might study the ways in which this standardisation is effected *and* subverted, and study in detail the practice of trendslators.

An important finding from this study is that the diffusion (or translation) of one MT appears to affect the diffusion of other MTs. This merits further inquiry into the co-existence (or not) of and competition between MTs, and the relationship with wealth and innovation. Indeed some recent research has appeared along these lines (Albuquerque et al., 2007; Delmas & Montiel, 2008; Marimon et al., 2009).

## CONCLUSION

This study adds to a number of literatures by contrasting the diffusion of PM and QM and the relationship of each with wealth and innovation. Overall, the analysis provides little succour to advocates of QM. There is no correlation between national QM scores and innovation performance, and high QM scores are negatively correlated with wealth. In contrast, PM fares better. There is a linear relationship between PM and wealth, and innovative countries are much more likely to use PM than those that are less innovative. While one is cautious about inferring causality, the strength of the relationships and the contrast with QM suggest that PM has a demonstrable effect on innovation performance and wealth.

The research design section of the paper described how business research and practice can reflexively conspire with one another to undermine research findings. The two MTs perhaps provide an interesting instance of this phenomenon at work. The reason why QM comes out

poorly in the study may be because the original benefits – perceived and actual – led to the diffusion of that MT, but a point has now been reached where it is more trouble than it is worth. Similar to the 'misfiring' that sometimes occurs in evolution – e.g. birds feeding other bird's chicks – MTs that have proved successful in the past may flourish even though they may, over time, be counter-productive. Compared to QM, PM has only recently been standardised and there is little published evidence of its benefits. Thus, it is perhaps only just reaching the 'misfiring' stage (as evidenced by the truncated quadratic of figure 6). Should this study be conducted again in, say, ten years time, then the results for PM might well be similar to the current results for QM.

The study suggests that the currently popular distinction between exploitation and exploration does not provide a strong basis for interpreting the data. In particular, the analysis indicates that Benner and Turner's (2002) findings, which are based on ISO 9000 data, should not be extended to all process MTs, and certainly not to PM. All MTs are not the same, and indeed they can – and perhaps should – coexist (Sethi & Sethi, 2009).

The cluster analysis groups the countries into six (or perhaps five) clusters. With the exception of Switzerland, countries appear to have taken to either PM or QM but not both. The analysis indicates that PM and QM are competing with one another, suggesting that organisations eschew ambidexterity in favour of focus (Simsek, 2009). The cluster analysis provides strong evidence that PM is more likely to be associated with high innovation and high GDP per capita than QM. This provides a basis for conceptualising a distinct form of isomorphism — markets isomorphism — wherein key agents, labelled trendslators, play a central role.

Finally, the research provides evidence that, while the effect of extraneous variables cannot be discounted, micro-level practices may be related to national measures of wealth and innovation. This suggests that national competitive advantage models – such as Porter's

(1991) diamond – might be extended to incorporate micro-level practices. While one can overstate their significance, such practices are routinely seen as important, as when, for example, JIT, TQM and SPC were commonly identified as vital aspects of the Japanese economic miracle of the 1970s and 1980s.

## REFERENCES


Abernathy, W. J. 1978. *The productivity dilemma : roadblock to innovation in the automobile industry*. Baltimore: Johns Hopkins University Press.

Abrahamson, E. 1996. Management fashion. *Academy of Management Review, 21(1)*: 254-285.

Abrahamson, E., & Fairchild, G. 1999. Management fashion: Lifecycles, triggers, and collective learning processes. *Administrative Science Quarterly, 44(4)*: 708-740.

Adler, P. S., Benner, M., Brunner, D. J., MacDuffie, J. P., Osono, E., Staats, B. R., Takeuchi, H., Tushman, M. L., & Winter, S. G. 2009. Perspectives on the Productivity Dilemma. *Journal of Operations Management, 27(2)*: 99-113.

Aggeri, F., & Segrestin, B. 2007. Innovation and project development: an impossible equation? Lessons from an innovative automobile project development. *R & D Management, 37(1)*: 25.

Albuquerque, P., Bronnenberg, B. J., & Corbett, C. J. 2007. A spatiotemporal analysis of the global diffusion of ISO 9000 and ISO 14000 certification. *Management Science, 53(3)*: 451-468.

Benner, M. J., & Tushman, M. 2002. Process Management and Technological Innovation: A Longitudinal Study of the Photography and Paint Industries. *Administrative Science Quarterly, 47(4)*: 676-706.

Benner, M. J., & Tushman, M. L. 2003. Exploitation, Exploration, and Process Management: The Productivity Dilemma Revisited. *Academy of Management Review, 28(2)*: 238-256.

Benner, M. J., & Veloso, F. M. 2008. ISO 9000 practices and financial performance: A technology coherence perspective. *Journal of Operations Management, 26(5)*: 611-629.

Boiral, O. 2003. ISO 9000: Outside the Iron Cage. *Organization Science, 14(6)*: 720-737.

Burns, T., & Stalker, G. M. 1961. *The Management of Innovation*. London: Travistock.

Callon, M. 1986. Some Elements of a Sociology of Translation: Domestication of the Scallops and the Fishermen of St Brieuc Bay. In J. Law (Ed.), *Power, Action and Belief: A New Sociology of Knowledge?*: 196-233. London: Routledge and Kegan Paul.

Cole, R. E., & Matsumiya, T. 2007. Too Much of a Good Thing? Quality as an impediment to Innovation. *California Management Review, 50(1)*: 77-93.

Corbett, C. J. 2006. Global Diffusion of ISO 9000 Certification Through Supply Chains. *Manufacturing & Service Operations Management, 8(4)*: 330-350.

Corbett, C. J., & Kirsch, D. A. 2001. International Diffusion of ISO 14000 Certification. *Production and Operations Management, 10(3)*: 327-342.

Czarniawska-Joerges, B., & Sevón, G. 2005. *Global ideas : how ideas, objects and practices travel in a global economy*. Malmö, Sweden: Liber & Copenhagen Business School Press.

Dean, J. W., & Snell, S. A. 1996. The strategic use of integrated manufacturing: An empirical examination. *Strategic Management Journal (1986-1998), 17(6)*: 459.

Delmas, M., & Montiel, I. 2008. The Diffusion of Voluntary International Management Standards: Responsible Care, ISO 9000, and ISO 14001 in the Chemical Industry. *Policy Studies Journal, 36(1)*: 65-93.

Delmas, M. A. 2002. The diffusion of environmental management standards in Europe and in the United States: An institutional perspective. *Policy Sciences, 35(1)*: 91-119.

DiMaggio, P., & Powell, W. 1983. The Iron Cage Revisited : Institutional Isomorphism and Collective Rationality in Organisational Fields. *American Sociological Review, 43(2)*: 147-160.

Esser, F. C. 2007. The link between innovation performance and governance. Luxembourg: European Commission Joint Research Centre: Institute for the Protection and Security of the Citizen.

Franceschini, F., Galetto, M., & Cecconi, P. 2006. A worldwide analysis of ISO 9000 standard diffusion: Considerations and future development. *Benchmarking, 13(4)*: 523-541.

Galbraith, J. R. 1973. *Designing Complex Organizations*. Reading, Mass.: Addison-Wesley.

Gareis, R. 2002. Assessing and Benchmarking Project-oriented Societies: Results of the Benchmarking of Austria, Ireland, Latvia and Norway as POS. PROJEKTMANAGEMENT GROUP, University of Economics and Business Administration, Vienna.

Garvin, D. A. 1984. What does product quality really mean? *Sloan Management Review, 26(1)*: 25-43.

Glaser, B., & Strauss, A. 1968. *The Discovery of Grounded Theory*. London: Weidenfeld and Nicolson.

Guillén, M. F. 1994. *Models of management : work, authority, and organization in a comparative perspective*. Chicago: University of Chicago Press.

Guler, I., Guillen, M. F., & Macpherson, J. M. 2002. Global Competition, Institutions, and the Diffusion of Organizational Practices: The International Spread of ISO 9000 Quality Certificates. *Administrative Science Quarterly, 47(2)*: 207-232.

Hollanders, H., & Arundel, A. 2006. 2006 "Global Innovation Scoreboard" (GIS) Report. European Trend Chart on Innovation. http://trendchart.cordis.lu/scoreboards/scoreboard2006/pdf/eis_2006_global_innovation_report.pdf.

Hollanders, H., & van Cruysen, A. 2008. Rethinking the European Innovation Scorecard: A revised methodology for 2008-2010. Mastricht: MERIT.

Hyde, K. F. 2000. Recognising deductive processes in qualitative research. *Qualitative Market Research, 3(2)*: 82.

Katila, R., & Ahuja, G. 2002. Something old, something new: A longitudinal study of search behavior and new product introduction. *Academy of Management Journal, 45(6)*: 1183-1194.

Keegan, A., & Turner, J. R. 2002. The management of innovation in project-based firms. *Long Range Planning, 35(4)*: 367.

Ketokivi, M. A., & Schroeder, R. G. 2004. Strategic, structural contingency and institutional explanations in the adoption of innovative manufacturing practices. *Journal of Operations Management, 22(1)*: 63-89.

Kieser, A. 1997. Rhetoric and myth in management fashion. *Organization, 4(1)*: 49-74.

Latour, B. 1986. The Powers of Association. In J. Law (Ed.), *Power, Action and Belief*: 264-280. London: Routledge and Kegan Paul.

Latour, B. 1987. *Science in Action. How to follow Scientists and Engineers through Society*. Cambridge: Harvard University Press.

Lawrence, P. R., & Lorsch, J. W. 1967. *Organization and Environment*. Cambridge, MA: Harvard Graduate School of Business Administration.

Locke, E., A. 2007. The Case for Inductive Theory Building. *Journal of Management, 33(6)*: 867.

March, J. G. 1991. Exploration and Exploitation in Organizational Learning. *Organization Science, 2(1)*: 71.

Marimon, F., Heras, I., & Casadesus, M. 2009. ISO 9000 and ISO 14000 standards: A projection model for the decline phase. *Total Quality Management & Business Excellence, 20(1)*: 1-21.

Peters, T. 1990. Get Innovative or Get Dead (Part 1). *California Management Review, 33(1)*: 9.

PMI Standards Committee, & Project Management Institute. 1996. *A Guide to the project management body of knowledge (PMBOK)*. Upper Darby, PA: Project Management Institute.

Podsakoff, P. M., & Organ, D. W. 1986. Self-Reports in Organizational Research: Problems and Prospects. *Journal of Management, 12(4)*: 531.

Porter, M. E. 1991. *The Competitive Advantage of Nations*. New York: The Free Press.

Rogers, E. M. 1962/1995. *Diffusion of innovations* (4 ed.). New York: The Free Press.

Rungtusanatham, M., Forza, C., Koka, B. R., Salvador, F., & Nie, W. 2005. TQM across multiple countries: Convergence Hypothesis versus National Specificity arguments. *Journal of Operations Management, 23(1)*: 43-63.

Sampaio, P., Saraiva, P., & Rodrigues, A. G. 2009. ISO 9001 certification research: questions, answers and approaches. *International Journal of Quality & Reliability Management, 26(1)*: 38-58.

Saraiva, P. M., & Duarte, B. 2003. ISO 9000: some statistical results for a worldwide phenomenon. *Total Quality Management & Business Excellence, 14(10)*: 1169-1178.

Schibany, A., & Streicher, G. 2008. The European Innovation Scoreboard: drowning by numbers? *Science & Public Policy (SPP), 35(10)*: 717-732.

Sethi, R., & Sethi, A. 2009. Can Quality-Oriented Firms Develop Innovative New Products? *Journal of Product Innovation Management, 26(2)*: 206-221.

Sila, I. 2007. Examining the effects of contextual factors on TQM and performance through the lens of organizational theories: An empirical study. *Journal of Operations Management, 25(1)*: 83-109.

Simsek, Z. 2009. Organizational Ambidexterity: Towards a Multilevel Understanding. *Journal of Management Studies, 46(4)*: 597-624.

Sitkin, S. B., & Sutcliffe, K. M. 1994. Distinguishing control from learning in Total Quality Management: A contingency perspective. *Academy of Management Review, 19(3)*: 537-564.

Teece, D. J. 1980. The diffusion of an administrative innovation. *Management Science, 26(5)*: 464-470.

Thomas, J., & Mullaly, M. 2007. Understanding the Value of Project Management: First Steps on an International Investigation in Search of Value. *Project Management Journal, 38(3)*: 74-89.

Thomas, J., & Mullaly, M. 2008. *Researching the Value of Project Management*. Newtown Square, PA: PMI.

Thompson, J. D. 1967. *Organisations in Action*. New York: McGraw-Hill.

Wayhan, V. B., Kirche, E. T., & Khumawala, B. M. 2002. ISO 9000 certification: The financial performance implications. *Total Quality Management, 13(2)*: 217-231.

Winks, R. W. 1969. *The historian as detective; essays on evidence* (1st ed.). New York,: Harper & Row.

Wolfe, T. 1975. *The painted word*. New York: Farrar, Straus and Giroux.

# TABLES AND FIGURES

## FIGURE 1

### PM score for top 30 countries

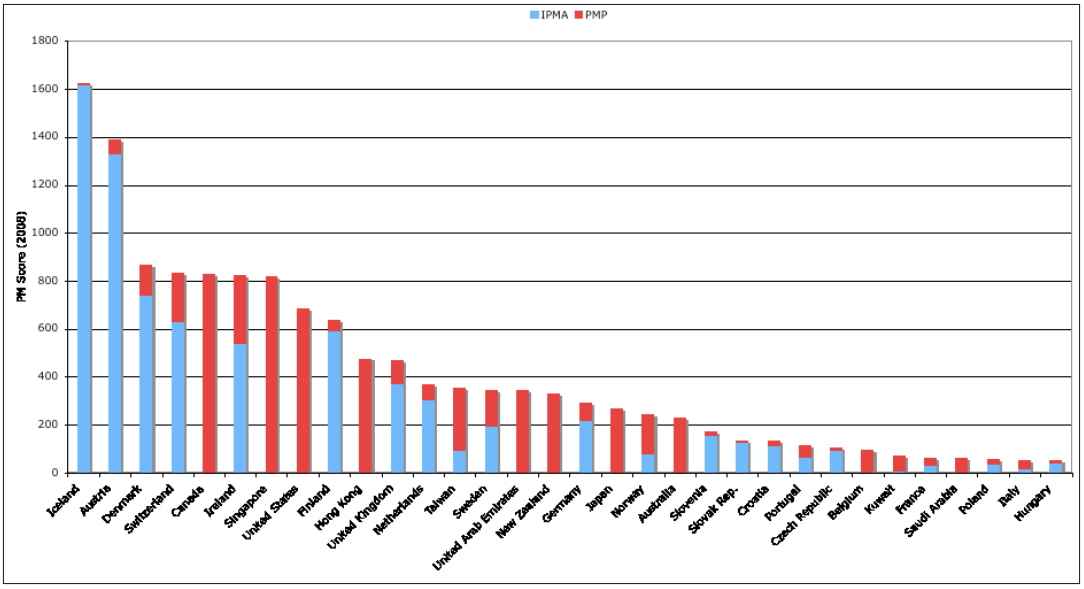

**FIGURE 2**

**QM score (top 30 countries, including 2001 ranking).**

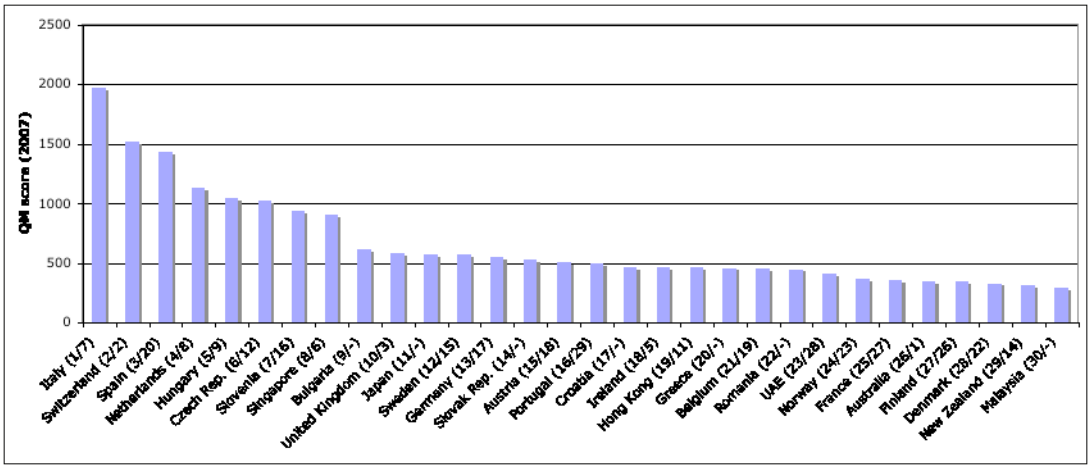

**FIGURE 3**

**QM score versus National Wealth**

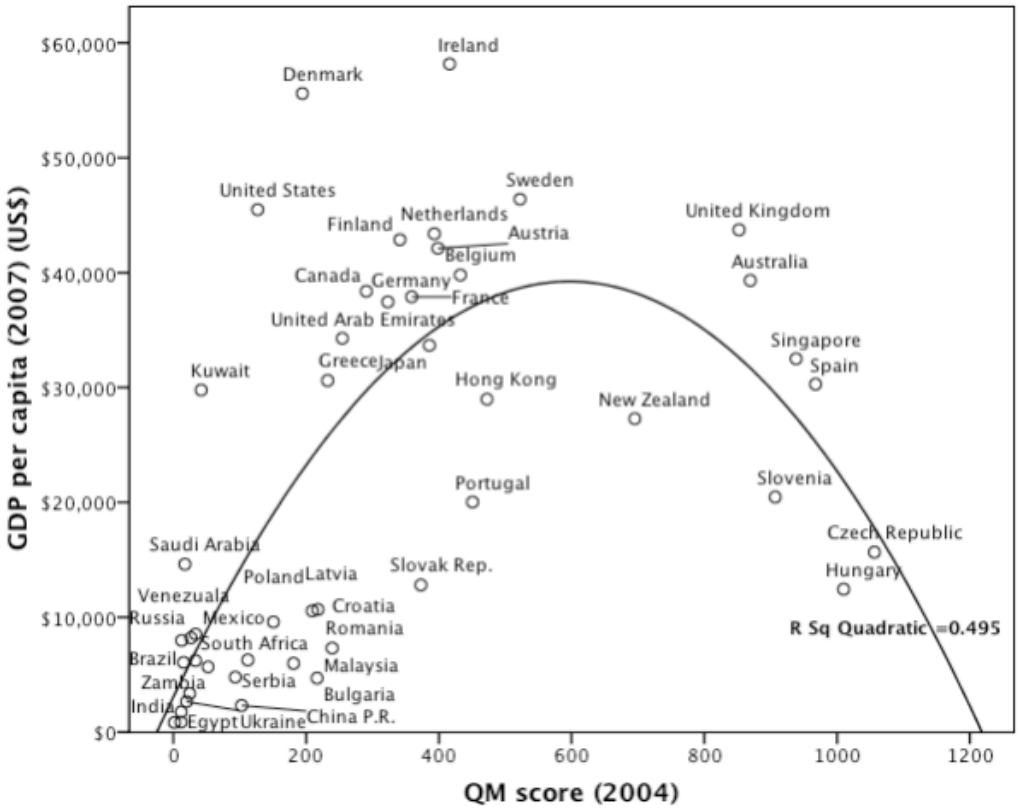

**FIGURE 4**

**PM score v National Wealth.**

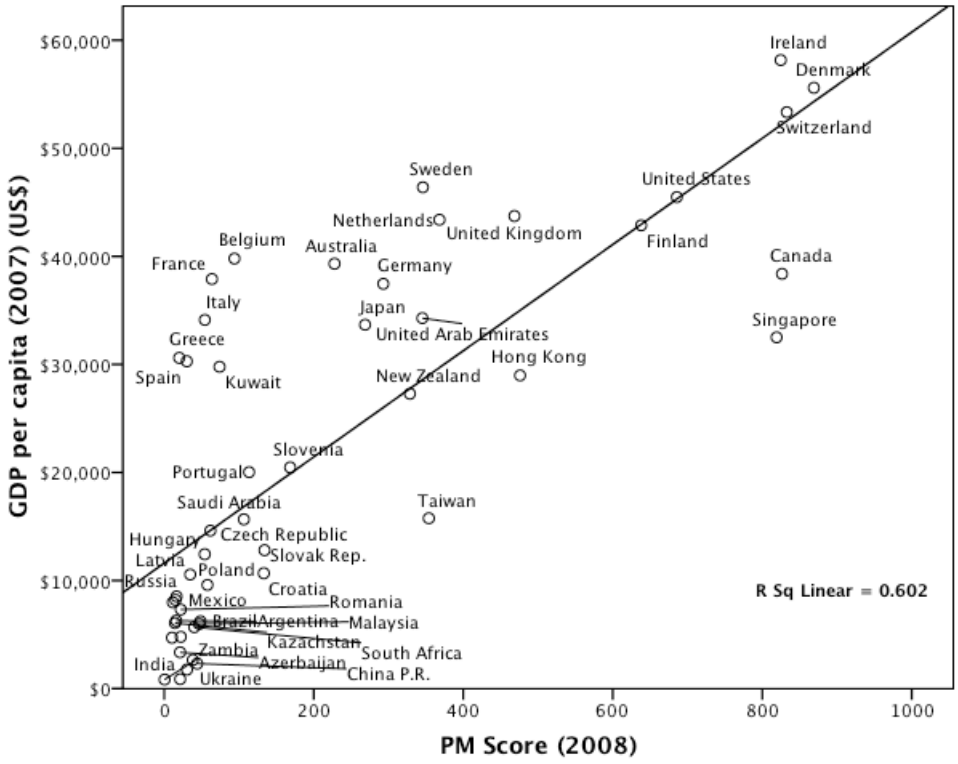

**FIGURE 5**

**QM score v Innovation Index**

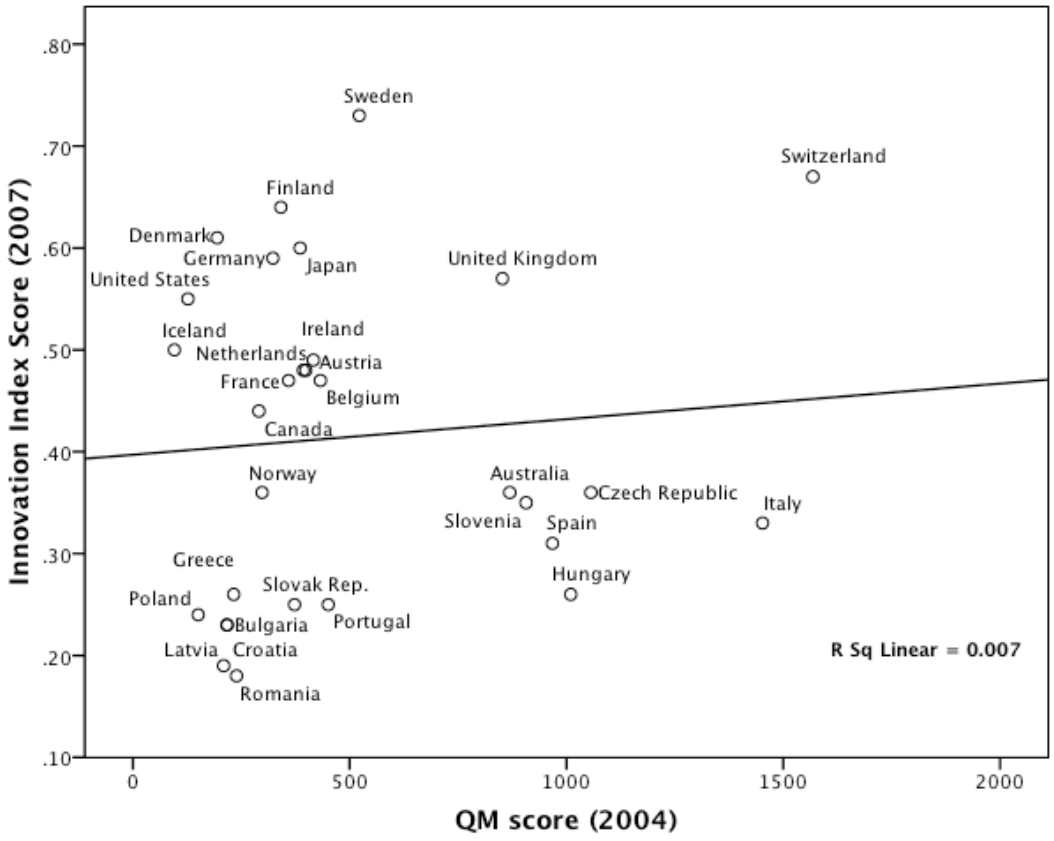

**FIGURE 6**

**PM Score v Innovation**