# State of the Art Review

# Innovation and Quality Management – What are the links?

**Stephen Roper**
ERC and Warwick Business School
Stephen.roper@wbs.ac.uk

**SOTA Review No 1: September 2018**

**TQM and ISO 9000 are two of the most widely adopted quality improvement approaches. What does the evidence suggest about the relationship between these quality improvement approaches and firms' innovation outcomes? Internationally, studies of ISO 9000 adoption suggest small positive innovation benefits of 2-13 per cent. International studies of TQM adoption also suggest positive innovation benefits of 4-7 per cent with the strongest benefits arising from the 'soft' elements of TQM related to work practices and cultural change.**

**A lack of both survey and population data mean we have no evidence of the implications of either ISO 9000 or TQM for innovation and firm performance in the UK.**

## Background

Quality improvement and innovation are established strategies as firms seek to create and defend their competitive position. Is the relationship between them complementary or opposing in nature? Some authors have envisaged a complementary relationship, commenting that: 'quality and innovation processes are inter-linked and should not be treated separately. Technical change not enhancing quality is illusive because it does not contribute to a sustained and improved strategic competitive advantage, nor does it increase the value creation potential of available resources through quality creation' (Nowak, 1997, p. 706). Other writers have seen quality improvement processes – which may involve routinisation and standardised business processes – as restricting creativity and innovation.

Two of the most widely adopted quality improvement approaches are TQM and ISO 9000:

- ***TQM*** has been described as a management philosophy that fosters an organisational culture committed to customer satisfaction through continuous improvement. The TQM philosophy essentially comprises three

key elements: customer focus, people involvement and continuous improvement (see Kanji, 2002, and Moura E Sá and Abrunhosa, 2007).

- Quality Certification initiatives such as ***ISO 9000,*** require detailed review and documentation of a firm's production processes, in accordance with the quality system requirements specified by ISO. The ISO 9000 standard is based on eight principles that address the core values and concepts of quality management: customer focus, leadership, involvement of people, process approach, system approach to management, continual improvement and factual approach to decision making (see Kartha, 2004).

What does the evidence suggest about the relationship between these quality improvement approaches and innovation?

## Evidence

There have been relatively few studies of the ISO 9000-innovation relationship. Older studies using panel data and matching approaches identified a positive relationship in French and US businesses (Table 1).

**Table 1: ISO 9000 and innovation outcomes**

| Study | Data | ISO9000 measures | Innovation Measures | Principal empirical results: |
|---|---|---|---|---|
| Benner & Tushman (2002) | 115 US firms, longitudinal analysis in paint and photography | ISO 9000 binary measures | Patent based measures of exploitative innovation | Positive relationships in panel data. Increases no. of exploitative innovations 2-3 per cent |
| Pekovic & Galia (2009) | 1146 French manufacturing firms, 20 plus employees. Matched survey and CIS data | ISO 9000 binary adoption indicator | Nine product and process innovation indicators | Increases product innovation measures 2-13 per cent. Process change by c. 10 per cent. Positive for seven of nine innovation indicators |
| Terziovski & Guerrero (2014) | 220 Australian companies manufacturing and services | Graduated ISO 9000 indicator related to state of adoption | Product innovation performance ; process innovation performance | Negative for product innovation performance; positive for process innovation performance |
| Bourke and Roper (2017) | Survey data 1200 Irish manufacturing firms | Binary adoption variable with date of adoption | Percent of sales from innovative products | Evidence of short-term disruption effect. No longer-term benefits |

The strongest studies adopt two approaches. In a cross-sectional context, the most robust evidence for French businesses uses propensity score matching to correct for any selection effect associated with ISO 9000 adoption and suggests that ISO 9000 may increase product innovation measures by 2-13 per cent. In a dynamic context, evidence for Irish manufacturing firms examines the potential for short-term disruption effects before any longer-term innovation benefits. Both effects prove weak.

ISO 9000 has often been interpreted by management researchers as rule-based and 'mechanistic'. TQM is more complex and includes both rule-based ('mechanistic' or 'hard') and cultural ('organic' or 'soft') practices.

Most analyses related to TQM have considered firms' hard and soft practices using muli-dimensional scales rather than explicitly considering firms' adoption of TQM as a strategic step (Table 2). This sheds light on which elements of TQM may drive innovation but obscures the scale of any effect sizes. Studies of these aspects of TQM have typically been small, sectorally-focussed, and survey-based with little claim to causality or improvement in more recent studies. Typically the evidence suggests the strongest association between the 'soft' elements of TQM – e.g. consumer-orientation, team-working – and innovation outcomes (Table 2).

One more recent analysis adopts a different approach, identifying firms' adoption of TQM as a binary variable and considering the dynamic benefits of adoption. This study suggests that TQM adoption increases innovative sales in Irish manufacturing firms by 4-7 per cent.

## Summary and evidence gaps

International evidence provides consistent evidence on the benefits of TQM adoption for innovation outcomes. The most consistent linkage is between the softer elements of TQM and innovation outcomes. Evidence on the innovation benefits of ISO 9000 is more limited and more equivocal. Here, studies either find a positive or insignificant effect.

Studies of both ISO 9000 and TQM adoption note the difficulty of implementation and therefore the significant lags which can arise before the realisation of any related benefits. One study comments, for example, that 'implementation of the ISO 9000 standard … concerns the whole organisation and involves changes in the fundamental behaviour and applied routine of employees' (see Pekovic and Galia, 2009, p. 831).

To date we have no robust UK evidence on the implications of either ISO 9000 or TQM adoption for innovation, or indeed for other aspects of business performance. In part this is because no population data is available on the adoption of ISO 9000, TQM, or indeed more recent environmental standards such as ISO 14000.

**Table 2: TQM and innovation outcomes**

| Study | Data | TQM measures | Innovation Measures | Principal empirical results: |
|---|---|---|---|---|
| Prajogo and Sohal (2004) | 194 Australian firms in manufacturing and non-manufacturing | Multidimensional scales for soft/hard elements of TQM | Product and process innovation | Soft elements of TQM positively impact innovation. No effect size estimates |
| Hoang et al. (2006) | 204 Vietnamese companies with prior ISO 9000 cert. | Multidimensional scales for soft/hard elements of TQM | Range of measures of number and complexity of innovation | Both hard and soft TQM practices positively influence firm-level innovation |
| Perdomo -Ortiz et al. (2006) | Survey data from 105 equipment manufacturers in Spain | Multidimensional scales for soft/hard elements of TQM | Multi-dimensional scales for Business Innovation Capacity (BIC) | Aspects of TQM are positively associated with different dimensions of BIC. No effect size estimates |
| Moura E Sá and Abrunhos a (2007) | 16 Portuguese footwear companies - | Multidimensional scales for elements of TQM | Extent and adoption of innovation - numeric measures | Weak positive relationships between TQM elements and innovation measures. No effect size estimates |

| | | | | |
|---|---|---|---|---|
| Martínez-Costa & Martínez-Lorente (2008) | Survey data on 415 Spanish manufacturing and services firms | Multidimensional scales for elements of TQM | Multi-dimensional scales for product and process innovation | Positive relationship between TQM elements and product and process innovation |
| Prajogo and Hong (2008) | 120 South Korean manufacturing firms with R&D | Multidimensional scales for elements of TQM | Multi-dimensional scale for product innovation | TQM dimensions positively influence product innovation |
| Abrunhosa and Moura E Sá (2008) | 20 Portuguese footwear manufacturers | Multidimensional scales for elements of TQM | Adoption of technological innovation; Timing of adoption of innovations | Soft elements of TQM positively impact innovation. No effect size estimates |
| Perdomo-Ortiz, González-Benito, et al. (2009) | Survey data from 105 equipment manufacturers in Spain | Multidimensional scales for soft/hard elements of TQM | Assessment of innovation performance relative to main competitors | Some soft TQM practices positively influence innovation. No effect size estimates |
| Hung et al. (2011) | Survey data on 223 Taiwanese high tech firms | Multidimensional scales for elements of TQM | Multi-dimensional scale covering product, process and organisational innovation | A positive relationship between TQM elements and product, process and organisational innovation. No effect size estimates |
| Long et al. (2015) | Survey of 35 Malaysian ISO certified manufacturing SMEs | Multidimensional scales for elements of TQM | Multi-dimensional scale covering product and process innovation | Positive relationships on both innovation scales |
| Atunes et al. (2017) | Survey data on 287 Portugese SMEs | Multidimensional scales for elements of TQM | Multi-dimensional scale covering product and process innovation | Positive process innovation effects. No link to product changes |
| Bourke and Roper (2017) | Survey data 1200 Irish manufacturing firms | Binary adoption variable with date of adoption | Percent of sales from innovative products | Increases innovation outputs 4-7 per cent. No evidence of short-term disruption effect |

## Sources


Abrunhosa, A. and P. Moura E Sá. 2008. Are TQM principles supporting innovation in the Portuguese footwear industry? *Technovation* **28:208-221**.

Antunes, M. G., Quiros, J. T., & Justino, M. D. F. 2017. The relationship between inno and total quality management and the innovation effects on organiza performance. *International Journal of Quality & Reliability Management,* 1474-1492. doi:10.1108/ijqrm-02-2016-0025

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

Bourke, J. and Roper, S. 2017 Innovation, quality management and learning: short-term and longer-term effects, *Research Policy*, 46, 8, 1505-18.

Hoang, D.T.; B. Igel; and T. Laosirihongthong. 2006. The impact of total quality management on innovation. *International Journal of Quality & Reliability Management* **23:1092-1117**.

Hung, R.Y.Y.; B.Y.-H. Lien; B. Yang; C.-M. Wu; and Y.-M. Kuo. 2011. Impact of TQM and organizational learning on innovation performance in the high-tech industry. *International Business Review* **20:213-225**.

Kanji, G.K. 2002. *Measuring Business Excellence. Routeledge*. London, UK: Routledge.

Kartha, C.P. 2004. A comparison of ISO 9000:2000 quality systems standards, QS 9000, ISO/TS 16949 and Baldridge criteria. *TQM Magazine* **16:331-340**.

Long, C. S., Aziz, M. H. A., Kowang, T. O., & Ismail, W. K. W. 2015. Impact of TQM practices on innovation performance among manufacturing companies in Malaysia. *South African Journal of Industrial Engineering, 26*(1), 75-85.

Martínez-Costa, M. and A.R. Martínez-Lorente. 2008. Does quality management foster or hinder innovation? An empirical study of Spanish companies. *Total Quality Management & Business Excellence* **19:209-221**.

Moura E Sá, P. and A. Abrunhosa. 2007. The Role of TQM Practices in Technological Innovation: The Portuguese Footwear Industry Case. *Total Quality Management & Business Excellence* **18:57-66**.

Nowak, A. 1997. Strategic relationship between quality management and product innovation. *The Mid-Atlantic Journal of Business* **33:119-135**.

Pekovic, S. and F. Galia. 2009. From quality to innovation: Evidence from two French Employer Surveys. *Technovation* **29:829-842**.

Perdomo-Ortiz, J.; J. González-Benito; and J. Galende. 2006. Total quality management as a forerunner of business innovation capability. *Technovation* **26:1170-1185**.

Perdomo-Ortiz, J.; J. Gonzalez-Benito; and J. Galende. 2009. The intervening effect of business innovation capability on the relationship between Total Quality Management and technological innovation. *International Journal of Production Economics* **47:5087-5107**.

Prajogo, D.I. and A.S. Sohal. 2004. The multidimensionality of TQM practices in determining quality and innovation performance—an empirical examination. *Technovation* **24:443-453**.

Prajogo, D.I. and S.W. Hong. 2008. The effect of TQM on performance in R&D environments: a perspective from South Korean firms *Technovation* **28:855-863**.

Terziovski, M. and J.-L. Guerrero. 2014. ISO 9000 quality system certification and its impact on product and process innovation performance. *International Journal of Production Economics* **158:197-207**.

## About the author

Stephen Roper is Professor of Enterprise at Warwick Business School (WBS) and Director of the Enterprise Research Centre (www.enterpriseresearch.ac.uk). He has over 30 years' experience of researching issues related to innovation and innovation policy in the UK and internationally and has published widely in both areas. Stephen regularly acts as a consultant for OECD and the World Bank on issues related to small business development and innovation policy. He is currently working with the OECD to conduct an external review of the Austrian innovation system. He can be contacted at: Stephen.Roper@wbs.ac.uk.

Other SOTA Reviews are available on the ERC web site www.enterpriseresearch.ac.uk. The views expressed in this review represent those of the authors and are not necessarily those of the ERC or its funders.