



# The integration of TQM and technology/R&D management in determining quality and innovation performance

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## Abstract

This paper presents an empirical study which examines the co-alignment between Total Quality Management (TQM) and technology/research and development (R&D) management in predicting organizational performance in terms of quality and innovation. This study improves our understanding of the relationship between TQM and innovation based on the following two major issues. First, this study contributes to the understanding of the co-alignment between TQM and technology management along with R&D management by bridging the gap between the two areas which are often addressed in a separate fashion. Second, this study also examines the impact of the integration between TQM and technology/R&D on quality and innovation performance which have been considered as the primary sources of a competitive advantage. The empirical data was drawn from 194 Australian organizations and analyzed using the Structural Equation Modeling (SEM) technique. The findings indicate that TQM shows a strong predictive power against quality performance but no significant relationship against innovation performance. On the other hand, technology and R&D management shows a significant relationship with quality performance but at a lower level than that of TQM, and shows much stronger relationship with innovation performance. In addition, there is strong and positive correlation between TQM and technology/R&D management. The major implication of this study is that technology/R&D management is an appropriate resource to be used in harmony with TQM to enhance organizational performance, particularly innovation.

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## 1. Introduction

In their seminal work, Benner and Tushman [1] highlighted the idea of balancing the firm's dynamic capabilities between exploitation and exploration as suggested by strategy and organization theorists. They referred to exploitation capabilities as those aimed at maximizing

existing resources to achieve efficiency and productivity, whilst exploration capabilities are associated with innovative capacities and developing new skills and resources. They argued that the ability of a firm to integrate and capitalize both capabilities simultaneously will determine its competitiveness and sustainability of its performance over time. The study presented in this paper built on the above premise by examining the integration of Total Quality Management (TQM) practices and technology and research and development (R&D) management in determining performance in terms of quality and innovation.

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(A.S. Sohal).

We believe that the study contributes to research in several ways. First, this study is important when viewed in relation to today's highly competitive environment where the pressures for organizations to meet multiple, often inconsistent, contextual demands have escalated [1]. As Bolwijn and Kumpe [2] argued, the competitive environment today requires organizations to pursue more complex dimensions of performance, most notably quality and innovation. Quality has been heralded as the source of competitive advantage during the 1980s and 1990s, particularly when Western companies began to see the loss of their market share to their Japanese competitors. This loss has been attributed mainly to the inferior quality compared to their Japanese counterparts. Similarly, innovation has long been recognized as one of the major sources of competitive advantage, and research evidence has shown a large number of business companies which have benefited from it in terms of increasing profits and market share [3]. In this paper, innovation is defined as "something that is new or improved and done by the enterprise to create significantly added value either directly for the company or indirectly for its customers" [4, p. 3]. Literature on innovation has also pointed the importance to define innovation more clearly by distinguishing between radical and incremental innovations [5,6]. The importance of this issue comes from the interplay between variations in organizational characteristics and the types of innovation, meaning that the degree of radicalness of the innovation will dictate the management schemes and resources needed by the organizations, as exemplified in the past studies [7–9]. The cumulative dimensions of competitive strategies have driven organizations to employ a variety of resources, including those who were previously considered as antagonistic in their nature [10].

Secondly, the study on the integration between TQM and technology/R&D management is important in bridging the areas of quality management and innovation management. Over the last two decades, TQM has emerged as one of the most popular and durable modern management concepts, and despite its numerous critics, TQM has a profound and unparalleled impact on modern business history [11,12]. Empirical studies have evidenced that majority of the organizations that implement TQM have viewed its benefit in various ways, from product quality performance to financial performance. The cumulative evidence from these empirical studies seems to lead into a conclusion that TQM is an effective resource that can be employed to pursue other types of competitive performance than quality, including innovation. We, however, believe that the validity of the postulate in regards to innovation needs to be tested given that the origins of TQM are rooted in the concept of (quality) control which, in some ways, could be seen as contrary to the 'spirit' of innovation, as highlighted by Prajogo and Sohal [13]. Such controversial arguments warrant an empirical examination to test the im-

port of TQM on innovation, and if these arguments are true, we can postulate that organizations need to integrate TQM with other resources in order to pursue high innovation performance.

From an innovation point of view, the examination of the impact of TQM on innovation performance is important in contributing to the development of managerial practices which can be used as a resource for determining innovation performance. Apart from several models which have been developed so far [14–17], Tidd et al. [18] pointed to the lack of modeling such a set of 'good practices' which can guide managers in nurturing innovation. They further articulated their concerns as follows [18, p. 305]:

Innovative organization implies more than organizational structures; it is an integrated set of components which work together to create and reinforce the kind of environment which enables innovation to flourish. Studies of innovative organizations have been extensive although many can be criticized for taking a narrow view, or for placing too much emphasis on a single prescription like 'team working' or 'loose structures'.

This study therefore contributes to this area by examining the suitability of TQM as a set of established management principles and practices would be suitable for filling this gap.

Thirdly, this study adds to the literature by investigating the integration of TQM and technology/R&D management which has not been addressed in these previous studies. A number of past studies on TQM have examined the compatibility of TQM with other management practices in determining organizational performance. This includes just-in-time (JIT) [19,20], operations management practices [21], business process reengineering (BPR) [22,23], design for manufacturing (DFM) [24] and management systems, practices and behavior in the World Class Manufacturing (WCM) context [25]. The integration between TQM and technology/R&D management is also important in relation to the argument pointed out in the second point that organizations may have to complement TQM with other resources in order to achieve a high innovation performance.

The remainder of this paper is structured as follows. Section 2 presents a review of the literature examining the relationship between TQM, technology management, and R&D management, and the possibility of integration among these as organizational resources. In particular, the three rationales of the study which led to the development of the three research questions are discussed in detail. Section 3 presents the research framework of the study, followed by Section 4 which describes the empirical research design and the development of the research instrument. Section 5 presents the quantitative analyses, particularly the structural equation modeling (SEM) of the research framework, followed by Section 6 where the research findings are discussed. The paper ends with the major conclusions and implications drawn from the study.

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