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The relationship between TQM practices and organisational innovation outcomes: Moderating and mediating the role of slack

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**The relationship between TQM practices and organisational innovation outcomes:
Moderating and mediating the role of slack**

Abstract

Purpose

The purpose of this paper is to study the role of slack (both moderating and mediating) to stimulate the relationship between total quality management (TQM) factors and innovation outcomes relative to gaining competitive industry advantages.

Design/methodology/approach

The research methodology includes a multi-item scale questionnaire completed in three waves between 2016 and 2017, and later analysed in 2018. A final response rate of 29.5% was obtained, representing 190 organisations from both manufacturing and service industries in the United Arab Emirates (UAE). Partial least squares structural equation modelling was used to test the multi-collinearity, moderation and mediation analysis.

Findings

Analysis confirmed that factors such as continuous improvement (CI), human resource management (HRM) and information measurement (IM) were positively linked to innovation. However, when slack was introduced as a moderator, innovation outcomes were stimulated through HRM and IM. The results indicate that slack acts as a full mediator for management leadership but only partially mediates supplier quality, IM, CI, HRM and process management.

Research limitations/implications

In terms of geographical coverage, research was limited to the UAE. Organisations striving for excellence through innovation may benefit from the outcomes, as they help in understanding the relationship between TQM and innovation moderated and/or mediated by slack. This could also lead businesses to develop new strategies that harmonise TQM policies with 'rationale' slack policies, thus, promoting innovation.

Originality/value

This study is the first to examine the use of slack to stimulate the relationship between TQM factors and innovation outcomes. Using slack as a mediator can help in understanding *when* TQM might influence innovation, while slack as a moderator could invert the relationship between the two.

Keywords: Mediation analysis, Moderation, Organisational innovation, Organisational slack, Total quality management

Paper type: Research paper

1. Introduction

Developing innovation as a strategy to create competitive advantages has become a necessity in many industries due to globalisation and increasingly complex business environments. Innovation provides unique products and services that foster new opportunities in a rapidly changing world (Carayannis *et al.*, 2015; Coccia, 2017; Crossan and Apaydin, 2010; Feng *et al.*, 2006; Montes *et al.*, 2005; Lasrado, 2019). It has captured the attention of many researchers (see Carboni and Russu, 2018; Coras and Tantau, 2014; Kim *et al.*, 2012; Musiolik *et al.*, 2018), but much remains to be learned about the ways of facilitating innovation outcomes in relation to the various factors that drive organisational growth (Hunter and Cushenbery, 2011; Papa *et al.*, 2018).

Under the same global pressure, most companies adopt different quality systems such as Six Sigma, the International Organization for Standardization's (ISO) 9001 standards and total quality management (TQM) strategies (Muruganatham *et al.*, 2018; Talib *et al.*, 2011a). Yet, the latter option has received gross attention as a comprehensive and structured approach that differentiates an organisation from its competitors (Santos-Vijande and Álvarez-González, 2007). As a philosophy for developing management practices and enhancing firm performance, TQM includes elements such as people involvement, customer focus and continuous improvement (CI) (Bouranta *et al.*, 2017; Sadikoglu and Zehir, 2010).

Results from studying the link between TQM and innovation outcomes constitute an open arena for debate both in the literature and in practice (Abrunhosa and Sa, 2008; Aoun and Hasnan, 2017; Bourke and Roper, 2017; Camisón and Puig-Denia, 2016; Prajogo and Sohal, 2006; Yusr, 2016; Zeng *et al.*, 2017). Indeed, academia provides an interesting insight into the role of TQM for distinct types of innovation, whether regarding different products, services, processes, technologies or administration (Hung *et al.*, 2011; López-Mielgo *et al.*, 2009; Ooi *et al.*, 2012; Silva *et al.*, 2014; Zeng *et al.*, 2015).

Some argue that TQM is positively associated with organisational innovation, while others view this connection in negative terms (Carpenter, 2002; Lenka and Suar, 2008; Sila, 2007). Hence, 'slack' as a concept is used to understand these debates in greater depth and to better underline this paradox (Ng and Wang, 2018). Innovation further requires a certain level of organisational performance and resource slack (Damanpour *et al.*, 2009; Herold *et al.*, 2006); however, it is also associated with trial and error, and demands time and resources to find and

study new solutions (Mol and Birkinshaw, 2009). Meanwhile, TQM aims to reduce slack because its logic contradicts the concept of redundant resources, and focuses more on their effective and efficient use (Honarpour *et al.*, 2012; Yusof and Aspinwall, 2000a, 2000b). Therefore, this study aims to unpack and answer the question of how organisations use slack to stimulate the relationship between TQM factors and innovation outcomes to obtain competitive advantages.

As slack could hold the key to understanding this puzzle, employing it as a mediator between TQM and innovation can help gauge *when* the former might influence the latter. With their connection yet to be tested, this research aims to fulfil gaps in the literature by further proposing slack as a moderator. This could help in understanding the role that interaction plays between TQM and slack on innovation outcomes. In other words, slack could invert the link between TQM and innovation, which has neither received much research attention. In examining this connection at an organisational level, this study proposes that slack can act as both a mediator and a moderator, as doing so might prove useful for organisations developing new strategies—whether to fit existing TQM policies with ‘rationale’ slack policies or to promote innovation.

The remainder of this paper is structured as follows. The literature review in Section 2 highlights TQM, innovation outcomes and organisational slack, and develops the research hypotheses. The research methodology in Section 3 includes a conceptual model and a detailed explanation of the measures and sample. Results are then presented in Section 4, with a thorough description of the empirical analysis included. Finally, Section 5 provides a discussion of the findings, with both the research limitations and suggestions for future studies presented in Section 6.

2. Literature review

2.1 TQM practices

TQM is a comprehensive philosophy that contains of a set of components including critical success factors (CSF), tools, techniques and practices. Together, these help organisations develop an holistic organisational culture committed to delivering high-quality output and earning CI-based customer satisfaction in their operational processes (José Tarí, 2005; Sadikoglu and Zehir, 2010). It is widely recognised in the literature that firms adopting a

quality-oriented strategy have achieved greater overall performance (Akgün *et al.*, 2014; Fuentes-Fuentes *et al.*, 2007).

As Greene (1993) contended, TQM concerns models that simplify and organise the immense variety in quality today. Its main implication is that all individuals including employees, customers and suppliers associated with an organisation contribute to quality management (QM). However, the success of TQM depends on several different CSFs (Ismail Salaheldin, 2009). These have either originated from the National Quality Award models, empirical studies or through the work of quality philosophers. For example, a quality award model can provide a powerful tool through which organisations may improve their performance and enhance their business efficiency by bringing together all of the people, processes, strategies and technologies required to produce outstanding results (Lee *et al.*, 2003).

2.2 Organisational innovation outcomes

The term ‘innovation’ has become a functional expression in modern organisational settings that has helped many firms sustain their competitive advantage (Gunday *et al.*, 2011). Every industry (including asset-light ones such as Amazon, Alibaba, Flipkart and Dubizzle) from the outset has sought innovation in their respective business environments to create value and to sustain the bottom line (Amit and Zott, 2012). However, organisational innovation in the literature is still unclear when it is not technologically based (Camisón and Villar-López, 2014; Damanpour and Aravind, 2012). According to the Oslo Manual (Organisation for Economic Co-operation and Development, 2005, p. 25), innovation is ‘the implementation of products or production and delivery processes with “new or significantly improved” characteristics’. In the services industry, developing such an in-house system transforms innovation into a new service that can be leveraged to a wider range of customers (Mena *et al.*, 2007).

How to measure an organisation’s innovation outcomes is still an open area of debate in the literature. The British Department of Trade and Industry and Conglomerate British Industry produce some of the most well-known scales that measure company innovation based on the number of new or improved products they create within the last three years; this includes percentage of sales from new products, level of investment in systems and technology, and overall administrative innovation. In contrast, soft measures of innovation outcomes include only changes in organisational strategy, structure and marketing (Laforet, 2013).

Overall, referential factors, form, magnitude, type and the dimensional nature of an innovative outcome can better address questions that deal with measuring innovation (Crossan and Apaydin, 2010). One model for organisational innovation developed by Simpson *et al.* (2006) identifies both the positive and negative outcomes of innovation, with operational excellence and market and employee advantages marked as positive, and excess change and market risk viewed negatively. Conversely, Mankin (2007) suggested that innovation performance can be assessed using four measures: (1) amount of funded ideas, (2) return on investment or Project.net present value, (3) innovators in higher positions and/or CEO devotion, and (4) long-term customer adoption.

2.3 Organisational slack

Although slack resources can be used in internal or external research and development (R&D), literature on the relationship between slack and innovation implicitly assumes that firms use slack resources internally to improve their capacity to innovate (Chen and Huang, 2010; Greve, 2003; Nohria and Gulati, 1996, 1997). Notably, Bourgeois (1981, p. 30) defined slack as the:

cushion of actual or potential resources which allows an organization to adapt successfully to internal pressures for adjustment or to external pressures for change in policy, as well as to initiate changes in strategy with respect to the external environment.

Nohria and Gulati (1996) instead propose that too little slack inhibits innovation, as it discourages any form of experimentation where success is uncertain. Equally, excess slack hinders the innovation mechanism because it breeds complacency and a lack of discipline, which increases the possibility that more bad than good projects will be pursued. Taken together, these ideas suggest that a certain level of slack is optimal for innovation in any given situation (Davis and Stout, 1992). Yang *et al.* (2009b) also recommended in their study that a moderate level of slack is optimal for innovation performance, particularly as the consequent benefits of invention cannot be observed short term. Within a Chinese context, Liu *et al.* (2014) further highlighted that this relationship depends on whether slack is absorbed or unabsorbed across selected product-innovation mechanisms.

2.4 Role of TQM in innovation outcomes

In reviewing the existing literature published between 2009 and 2018 on the link between innovation and TQM, most studies empirically examine their relation from different aspects

(Bourke and Roper, 2017). Traditionally, they are compatible; as McAdam *et al.* (1998, p. 141) state, 'quality is doing things better; innovation is doing things differently'. While some argue that quality orientation is not adversely related to the novelty of new products developed by cross-functional product development teams (Sethi and Sethi, 2009), other scholars explore the relationship between TQM, innovation and organisational performance (Martínez-Costa and Martínez-Lorente, 2008; Ooi *et al.*, 2012; Sadikoglu and Zehir, 2010). Generally, the results show that TQM has both a positive and negative influence on innovation outcomes (Silva *et al.*, 2014).

Others differentiate the relationship based on hard and soft QM, with the results showing the latter QM directly affects innovation performance, while the former remains indirect (Perdomo-Ortiz *et al.*, 2009; Prajogo and Sohal, 2004; Zeng *et al.*, 2015). That said, within human resources practices (such as a training and employee suggestions systems), there is evidence that suggests such exercises *do* benefit innovation activities within organisational settings (Sadikoglu and Zehir, 2010; Zeng *et al.*, 2015). In another aspect, most scholars have also studied the relationship within a product-innovation context (Bourke and Roper, 2017; Leavengood *et al.*, 2014; López-Mielgo *et al.*, 2009; Martínez-Costa and Martínez-Lorente, 2008; Silva *et al.*, 2014), while service innovation continues to receive increasing academic attention. Service quality and service innovation are implicitly linked; however, each individual association has not been considered (Parasuraman, 2010).

2.4.1 Positive relationship between TQM and innovation

To date, most scholars have found that TQM practices are appropriate resources through which to foster innovation outcomes (Bourke and Roper, 2017; Hung *et al.*, 2011; Martínez-Costa and Martínez-Lorente, 2008; Prajogo and Hong, 2008; Santos-Vijande and Álvarez-González, 2007; Silva *et al.*, 2014). For example, Miguel and Gutierrez-Broncano (2010) argue that TQM practices play an important role in enhancing business innovation by promoting people involvement in the innovation process to change or implement new ideas. Moreover, TQM practices help organisations deeply understand customer needs and requirements (which both nurture innovation activities), so they may subsequently devise new innovative solutions (Akgün *et al.*, 2014).

Indeed, both concepts are closely tied to CI, which is every organisation's ultimate goal. At the same time, the idea of having an open culture (which has only recently become

popularised) is a core prerequisite of both TQM and innovation. All these similarities clearly indicate that any organisation that can implement the TQM process in its overall functioning is more innovative and creative than the competition (Singh and Smith, 2004).

Upon examining the literature, this paper will ultimately base its TQM CSFs on Hietschold *et al.* (2014) and its CI on Farish *et al.* (2017). To this, the link between these factors relative to organisational innovation, including the centralisation and decentralisation of its various outcomes, will constitute the focus of Sections 2.4.1.1–2.4.1.10.

2.4.1.1 Leadership

From both a scholarly and practitioner's perspective, the leadership factor in TQM indicates the success rate of its implementation (Perles, 2002). That is, in TQM theory leaders arrange to achieve an organisation's vision and objectives (Sadikoglu and Zehir, 2010). Hence, when Das *et al.* (2011) tested the influence of leadership competencies upon implementing TQM principles in Thai manufacturing companies, the results were consistent with the literature regarding the importance of competent leadership from top management (Dubey *et al.*, 2018; Oakland, 2011).

Academia also finds the same leadership factors that enhance organisational innovation outcomes have very high similarity with TQM practices. For example, in Yoshida *et al.* (2014) the effects of leadership in relation to creativity and team innovation were examined and found to positively correlate. Similarly, Makri and Scandura (2010) studied the link between leadership styles and innovation quantity and quality in 77 high-tech organisations, while Vaccaro *et al.* (2012) investigated the contribution of both transformational and transactional leadership behaviour in management innovation moderated by organisation size, reflecting top management roles in organisational innovation. Together, these findings have informed Hypothesis 1:

H1: Management leadership will be positively associated with innovation outcomes.

2.4.1.2 Strategic planning

TQM could be viewed as a strategy to improve and enhance organisational competitiveness, as it engages every department at different levels of management. For example, Yunis *et al.* (2013) conducted a quantitative study on the role of TQM in formulating an organisation

strategy and confirmed that total management is an influential force that breeds competitive advantage. Similarly, in a quantitative sample of Spanish firms, Escrig-Tena *et al.* (2011) noted a positive relationship between adopting QM and strategic flexibility. Overall, it seems scholars have recognised that organisational success is predicated on a comprehensive TQM strategy (Lee *et al.*, 2010; Prajogo and Sohal, 2006; Silva *et al.*, 2014).

In particular, Pisano (2015) discussed the need to develop innovation strategies, both to avoid frequently failing initiatives or periods of difficulty, and to sustain successful ones (such as those employed at Yahoo and Hewlett-Packard). As such, this paper emphasises a clear innovation strategy that accentuates how ‘different parts of an organization can easily wind up pursuing conflicting priorities (Pisano, 2015, p. 46). Additionally, Chereau’s (2015) investigation on strategy-innovation relationships in small- and medium-sized enterprises (SME) outlines the links between strategic and innovation attributes, as well as the effect of hybridising strategic profiles within these connections.

In the same context, examining the relationship between TQM and product innovation shows that strategic planning is positively associated with product-innovation performance (Lee *et al.*, 2010; Satish and Srinivasan, 2010). As such, Hypothesis 2 is as follows:

H2: Strategic planning will be positively associated with innovation outcomes.

2.4.1.3 Supplier quality management

The mutual beneficial exchange between a firm and its suppliers to facilitate the quality of both product and service should not be neglected if one aims to maintain a stable, long-term relationship (Yang *et al.*, 2009a). The literature discusses how a firm can improve its quality performance by adopting supplier QM (SQM); this can reduce cost, improve the process cycle, enhance customer satisfaction and help build long-term relationships (Lo *et al.*, 2006; Sadikoglu and Zehir, 2010). When Talib *et al.* (2011b) compared TQM and supply chain management (SCM) practices from the literature, they found that supplier partnerships are the most common practices found in both TQM and SCM literature. Correspondingly, SQM benefits include:

reduced lead times, increased responsiveness to customers’ orders and enquiries, customer loyalty, increased profitability, reduced opportunity cost from lost sales and effective communication between the organization suppliers as well as customers. (Kitheka *et al.*, 2015, p. 77)

Meanwhile, globalisation drivers force organisations to develop innovation through their supply chain, similar to TQM. To increase an organisation suppliers' innovation, it is important to ensure that suppliers are maximising all opportunities to increase their innovation (Henke and Zhang, 2010). In this regard, Jean *et al.* (2014) demonstrate how multinational suppliers' involvement positively affects supplier innovation in China's automotive sector. Together, these findings inform Hypothesis 3:

H3: Supplier quality management will be positively associated with innovation outcomes.

2.4.1.4 Customer focus

TQM is strongly customer-oriented and positively influences customer satisfaction levels, ultimately leading to greater market share and profit (Kristianto *et al.*, 2012). In the literature, Mehra and Ranganathan (2008) used a meta-analysis to confirm the role of TQM in enhancing customer satisfaction; their findings were later endorsed by Sit *et al.* (2009) in an empirical investigation within a Malaysian context. In a manufacturing context, Kristianto *et al.* (2012) also collected a 'Voice of the Customer' survey to answer how TQM can be implemented to achieve customer satisfaction. Results show that customer satisfaction has increased steadily over three years.

Indeed, most organisations will endeavour to improve their products or services through innovation to gain customer satisfaction (Ooi *et al.*, 2012). Rubera and Kirca (2017) revealed the positive effect of organisational innovation on customer satisfaction when managers trade-off between servicing their customers and investors. In this regard, Danjum and Rasli (2012) also concluded that service innovation does enhance customer satisfaction. Yet, now, it is increasingly clear that customers instead drive innovation. Based on Von (2009), it appears that one's capability to innovate is an evolving phenomenon that continues to drastically improve. As well, Desouza *et al.* (2008) offered a typology for customer involvement in the innovation process, providing a guideline for shifting traditional organisational structures towards customer-driven innovation to achieve continued and sustainable growth.

Earlier, Bon and Mustafa's (2013) review of the literature showed positive correlations between customer-focused TQM and innovation. Hence, the link between the two is based on consumer focus and demand, which constantly encourage organisations to look for new solutions (González-Cruz *et al.*, 2018; Ooi *et al.*, 2012). As such, we propose Hypothesis 4:

H4: Customer focus will be positively associated with innovation outcomes.

2.4.1.5 Information measurement and analysis

Information systems and data analysis represent a key part of the TQM infrastructure (Wright and Taylor, 2003). To constantly improve quality, measuring organisational status before and after improvement activities is key for making accurate evaluations (Jayaram *et al.*, 2010). Demirbag *et al.* (2006) conducted an empirical study on Turkish SMEs, identifying quality data and reporting one of seven CFSs for TQM practice. Likewise, Lakhal *et al.* (2006) confirmed the significance of a database in decision-making by linking the effects of information and analysis on performance measures.

Further, von Krogh *et al.* (2001) found that customer information and data (among other factors) should be integrated to enhance incremental innovation, while in Farish *et al.* (2017) quality information analysis was positively associated with innovation performance. In this sense, ‘information must be the blood which feed the innovative firms’ (Lemos and Porto, 1998, p. 330).

Given the importance of information quality and data analysis in relation to TQM practices, implementation may offer a rich array of tools that organisations could use to enhance their innovation outcomes. Based on these and other supporting arguments, Hypothesis 5 was formed:

H5: Information measurement and analysis will be positively associated with innovation outcomes.

2.4.1.6 Continuous improvement

Most scholars agree that CI is among the most influential dimensions of TQM (see Hung *et al.*, 2011; Prajogo and Sohal, 2001, 2004). That is, for Farish *et al.* (2017), in particular, there exists a positive relationship between CI and innovation performance.

Yet, according to Abrunhosa and Sá (2008), improvement requires an organisational culture that provides a different set of tools, eliminates fear and encourages employees to be innovative. Kohlbacher (2013) highlighted the effect of continued improvement in innovation performance. Using empirical data on an Austrian organisation, his results revealed that

companies would enhance their performance once they apply CI tools and methodologies in practice.

Likewise, Martínez-Costa and Martínez-Lorente (2008) emphasise CI as a primary element in TQM and, hence, confirm that any changes in the process will have a direct effect on an organisation's level of innovation. Earlier, Terziovski (2002) studied the integration between innovation and CI to achieve performance excellence. Their findings likewise suggested that integration would enhance customer satisfaction and productivity more if they were implemented separately. As such, these findings have informed Hypothesis 6:

H6: Continuous improvement will be positively associated with innovation outcomes.

2.4.1.7 Human resource management

Hietschold *et al.* (2014) systematically reviewed the CSFs in implementing TQM from 145 studies. As found, the human resource factor is highly relevant but remains low on the agenda of many practitioners. In the same context, focusing on employee involvement encourages them to suggest novel ideas for new or existing products, services or processes. Additionally, employee empowerment, teamwork, a rewards system and training enable staff to gain knowledge and solve problems more efficiently (Valmohammadi, 2011).

Hence, leadership in TQM motivates and empowers people who are expected to increase innovation for an organisation, especially if its objectives are aligned with having high innovative performance (Manders *et al.*, 2016; Sadikoglu and Zehir, 2010, Prajogo McDermott, 2005). Employee involvement also encourages the sharing of knowledge and experience, both of which are necessary in formulating innovation projects-given that change mainly originates from people's efforts to communicate with each other (Garcia-Morales *et al.*, 2008; Perdomo-Ortiz *et al.*, 2009). One study by Perdomo-Ortiz *et al.* (2009) based on 106 Spanish industrial firms shows a direct relationship between the policies and practices of human resource management (HRM) from the viewpoint of TQM management and performance in innovation. In the same context, a number of other studies (see Harris *et al.*, 2013; Ooi *et al.*, 2012; Urban and Toga, 2017) illustrate that people management positively affects organisational innovation performance. Together, these findings inform Hypothesis 7:

H7: Human resource management will be positively associated with innovation outcomes.

2.4.1.8 Process management

Process management is associated with an organisation's performance indicators (Nair, 2006), and typically concerns a set of methodologies and behavioural practices. These include preventive and proactive approaches to identify key processes and continuously improve quality through documentation and different statistical methods (Sadikoglu and Zehir, 2010; Zhang *et al.*, 2000). Effectiveness and efficiency in managing this process to reduce cost and eliminate waste would extend to innovation development (Benner and Tushman, 2003 and Soltani *et al.*, 2005).

In Taddese and Osada's (2010) work on the process of techno-innovation in TQM, it was observed that management positively influences innovative processes in developing countries to advance proprietary technology. In addition, Long *et al.* (2015) found that TQM practices such as process management positively influence an organisation's innovation capabilities. Meanwhile, Chong and Zhou's (2014) research differentiates service-process innovation from product-process innovation, while Kim *et al.* (2012) categorised these factors as either radical or incremental process innovation. As such, these dynamics in both product and service processes can have a positive effect on innovation outcomes (Ooi *et al.*, 2012), as defined in Hypothesis 8:

H8: Process management will be positively associated with innovation outcomes.

2.4.1.9 Culture and communications

Practising effective communication improves coordination between different groups and departments, while cultural change emphasises the awareness of this quality-based concept (Hietschold *et al.*, 2014). Valmohammadi's (2011) study proves the positive relationship between effective communication and organisational performance, where organisational culture and effective communication reflect and help to understand existing products or processes as well as customer expectations (Kumar *et al.*, 2011). This leads to new innovation methods, and eliminates misunderstanding and confusion about quality goals.

In examining the role of cultural change within the link between TQM practices and innovation, Moreno-Luzon *et al.* (2013) found using a sample of 72 Spanish firms that all the relationships became significant after introducing cultural change as a mediator. Likewise, Sadikoglu and Zehir (2010) demonstrated that employee innovation increases through effective

communication and by sharing information. Dahlander and Frederiksen (2012) added that effective communication also enhances innovation levels through information sharing between diverse people from different backgrounds. Together, these findings informed Hypothesis 9:

H9: Culture and communication will be positively associated with innovation outcomes.

2.4.1.10 Centralising and decentralising innovation

Jones (1996) found that organisations have been developing innovation without a formal department. Alternatively, they depend on people's creativity based on building a culture that welcomes new ideas. Recently, Moosa and Panurach (2008) differentiated centralised and decentralised innovation, suggesting that the former is created by R&D departments, and the latter is created by frontline employees. According to them, 'front-line employees, those closest to the customers and the work of delivering products and services, have fresh ideas and genuine insights' (Moosa and Panurach, 2008, p. 4). Additionally, in Finland, Leiponen and Helfat (2011) examined innovation outcomes should an organisation either have multiple locations or choose to decentralise. Results showed a positive relationship with imitative innovation output that strongly enables organisations to access external knowledge. Hence, Hypotheses 10 and 11 were formed:

H10: A decentralised organisation design/structure will be positively associated with innovation outcomes.

H11: A centralised organisation design/structure will be negatively associated with innovation outcomes.

2.4.2 Role of slack between TQM and innovation

2.4.2.1 Theoretical grounding using resource-based view theory

During the last two decades, the importance of well-known resource-based view (RBV) theory has gained momentum in measuring firm performance (see Hooley *et al.*, 1998). An acclaimed theory, RBV suggests that an organisation's resources are its most significant assets for innovation (Chen and Huang, 2010). In practice, 'slack' as a pivotal resource would help businesses sustain competitive advantage; however, most still struggle to use their slack assets for securing effective and efficient business process outcomes (Paeleman and Vanacker, 2015; Shahin *et al.*, 2013, 2017).

According to Kostopoulo *et al.* (2002), slack based on RBV has not been studied to understand the organisational capability for innovation due to most organisations remaining heterogeneous in terms of the strategic resources they own and control. Given the United Arab Emirates (UAE) is very much in its infancy regarding innovation, RBV theory provides sufficient ground for TQM factors and their subsequent innovation outcomes. However, research suggests a gap in the literature on studies that link TQM factors, slack and innovation outcomes relative to firm performance (Silva *et al.*, 2014). By anchoring our research on RBV theory, this study will highlight this controversial topic concerning these three factors and, thus, introduce new themes for future prepositions.

2.4.2.2 Role of slack

Consistent with our understanding, there is support for organisational slack in improving innovation capabilities within different contexts (Liu *et al.*, 2018; Yang and Chen, 2017). Interestingly, the literature has both theoretically and empirically argued and found that the slack–innovation relationship could be positive, negative or curvilinear under different circumstances (Terry Mousa and Chowdhury, 2014). Recently, scholars have largely focused on an absolute rather than excess level of resources (Kiss *et al.*, 2018), with the profound effect of organisational slack on innovation remaining undeniable (Yang and Chen, 2017). Again, this only further validates that the role of organisational slack as a moderator on innovation (thus, contributing to organisational performance) is dire (Chen *et al.*, 2015; Kiss *et al.*, 2018; Ruiz-Moreno *et al.*, 2008).

Further, observing the link between slack and TQM performance in the literature provides evidence that large organisations have more slack available than their smaller counterparts to implement TQM (Yusof and Aspinwall, 2000a, 2000b). Duh *et al.* (2012) confirmed this finding by adding another condition: an organisation should be less leveraged to have more resources to implement TQM practices. Interestingly, slack resources were also suggested to enhance quality delivery beyond a short-term time frame, and were considered a ‘buffer’ to achieve a specific target (Ng and Wang, 2018). Given that TQM approaches need to change to further support continuous innovation, an investigation on slack itself remains important (Steiber and Alänge, 2013 and Liu, 2017).

In fact, Honarpour *et al.* (2012, p. 27) answered this prompt by asking, ‘how do firms try to reduce slack to improve competitiveness on the one hand and then try to provide slack for innovation on the other?’ Their findings suggest that implementing knowledge management and TQM together

with slack actually improves innovation. In another study conducted by Goldstein and Iossifova (2012) on the healthcare sector, this relationship was stronger in hospitals with high unabsorbed slack.

Moreover, different types of slack influence organisational performance differently (Wiersma, 2017). For example, excess human resources (which are usually viewed as more difficult to redeploy) hamper firm performance, and excess cash resources (which are usually viewed as easy to redeploy) benefit firm performance (Vanacker *et al.*, 2017), deeming certain types of slack positive to innovation. However, not all forms have equal performance implications (Jifri *et al.*, 2016). Hence, neither slack resources nor innovation activities alone explain firm performance (Soetanto and Jack, 2016). Instead, it is the competitive strategies, cost leadership, customer orientation and creative marketing that actually predict better innovation performance. Therefore, these triggers can be employed to deliver adequate implementation of TQM. In sum, most of the studies emphasise the optimum amount of organisational slack for innovation, but none show the role that slack actually plays between TQM and innovation. Therefore, consider Hypothesis 12:

H12: Total quality management will be positively associated with innovation outcomes when moderated by slack.

Meanwhile, TQM focuses on efficiency, which contradicts slack. Interestingly, slack itself is one of the integral antecedents to innovation (Chen and Huang, 2010). It is possible, then, to view the TQM–innovation relationship as one mediated or moderated through organisational slack, evidenced in Lin *et al.* (2016). That said, slack as a mediator has not yet been studied in any of the TQM literature so far, neither considering the TQM measures as independent variables (IV) and innovation outcomes as dependent variables (DV).

Other empirical studies on QM have determined its contribution to business performance, taking into consideration the role of innovation performance as a mediator (Kafetzopoulos *et al.*, 2019), TQM as a mediator in measuring the connection between one's entrepreneurial orientation, as well as overall organisational performance (see Al-Dhaafri *et al.*, 2016). In this sense, slack can positively influence the bond between each TQM element relative to innovation in a mediation role (Lin *et al.*, 2016). Thus, consider Hypothesis 13 to understand the role of slack in arbitrating the relationship between innovation and TQM:

H13: Total quality management will be positively associated with innovation outcomes when it is mediated by slack.

Overall, based on the presented hypotheses, the research proposes a conceptual model provided in Section 3.

3. Research methodology

3.1 The conceptual model

Based on each hypothesis generated from the literature, Figure 1 shows the proposed model outlining the relationship between TQM practices and innovation outcomes, as moderated and/or mediated by slack.

[Figure 1. The conceptual model]

3.2 Construct measurement

To test the hypotheses, multi-item scales were adopted from previous studies to ensure validity and reliability of the constructs. TQM practices were measured, as were innovation outcomes and organisational slack constructs, using a seven-point Likert scale ranging from ‘strongly disagree’ (1) to ‘strongly agree’ (7).

To measure TQM practices, this study based its understanding on slack as CSFs, as defined in a systematic review by Hietschold *et al.* (2014) and supported by other models in the literature (i.e., Farish *et al.*, 2017). The CSFs were derived from an analysis of 145 studies categorised into 11 constructs. Considering the context of industry practice in the UAE as well as expert opinion, rather than developing new instruments this study grouped its CSFs for TQM implementation into nine different constructs: leadership and SQM, customer focus and CI, human resources and communication, and strategic planning and information measurement (IM). Also, to study their individual effects on innovation, this study suggests measurement instruments for each dimension based on a blend of previous models and ones published by Fotopoulos and Psomas (2010), Singh and Smith (2004), and Hoang *et al.* (2006).

Measuring innovation outcomes at an abstract level based on construct scales was reported in early research efforts by Prajogo and Sohal (2004), Johannessen *et al.* (2001), Baird *et al.* (2011), Jitpaiboon *et al.* (2007) and Mankin (2007). Notably, Johannessen *et al.* (2001, p. 26) specified the different types of innovation, that is, as ‘new products; new services; new methods of production; opening new markets; new sources of supply; and new ways of organizing’. Since the UAE is positioned as a hub for many product and service industries in

the Middle East and North African (MENA) region, this study's research focused on innovation from an organisational perspective for both industry types.

Finally, slack resources represent the cushion of potential assets available to enhance innovation. This study measured the level of slack in an organisation by probing its extent (or lack) of surplus human resources, whether it reserved a financial budget, if it could obtain any additional resources upon request and, finally, if additional resources were freely available (Marlin and Geiger, 2015; Nohria and Gulati, 1996, 1997). Thus, both the factors that constitute slack and the related measurement items were obtained.

Once the initial survey questionnaire was designed, it was reviewed by four academics with sound knowledge in conducting empirical studies. After revision, the final version of the questionnaire was tested in a pilot study with 18 managers working in R&D, innovation and quality departments in the UAE. The pilot study helped to eliminate redundant or unclear questions and improve overall readability by industry experts. Thus, content validity of the instrument was performed to confirm that the survey was clear, understandable and that it appropriately reflected the appropriate measures.

3.3 Data collection

The survey was emailed to middle or senior management at select organisations, followed by a call to confirm they had received the correct materials. The questionnaire contained four sections, including an introduction to brief the reader about its objectives and the importance of the study. Each section was divided into sub-questions to assess the organisation relative to the individual section's topic. As noted, each following section presented respondents with a series of statements prompting their reaction along a seven-point Likert scale.

The first part aimed to collect information about respondents' characteristics and scope of business, including the size of their organisation. The second section asked respondents to measure the degree to which their organisation implemented TQM practices, and Section 3 was designed to measure innovation outcomes in the domain of new products and/or services and processes. Finally, Section 4 solicited information about the role of slack in a firm's level of innovation.

The population of this study consisted of both product- and service-based firms in the UAE. The target respondents were identified using non-probability convenient sampling

techniques of population data collected from the Dubai Quality Group, a non-profit organisation and an official entity of the Dubai Economic Department in the UAE. For other emirates in the region, a stratified random sample of LinkedIn contacts was used. This approach ensured all expert individuals of both product and service industries across the entire population of the UAE were covered.

The survey was conducted in three waves between 2016 and 2017. The first began in the second quarter of 2016, then the first quarter of 2017 and finally the fourth quarter of 2017. After removing five incomplete questionnaires, a final response rate of 29.5% was obtained, representing 190 organisations from both manufacturing and service industries in the UAE.

The sample companies were categorised into three groups: government (22%); semi-government (46%), which adopted innovation according to UAE government policy (indeed, 2015 was declared the year of innovation in the region) (UAE Ministry of Cabinet Affairs, 2015); and private (32%), which made efforts towards achieving innovation and business excellence (see Table 1). The government sector mainly included hospitals and municipal authorities, and the semi-government bodies included oil and gas and telecom firms; meanwhile, the private sector was represented by real estate and technology organisations. The final sample indicated about 34% of the firms engaged in product manufacturing, whereas 60% offered services and 6% covered both aspects in the UAE.

[Table 1: Characteristics of the Organisations and Respondents]

4. Data analysis and results

The hypothesised research model consists of both reflective and formative hierarchical modelling. As recommended in Becker *et al.* (2012), a repeated indicator approach was applied to evaluate the model. Its validity, reliability and other testing methods are described in Sections 4.1 and 4.2.

4.1 Construct validity and reliability

When employing a Likert scale, it is necessary to calculate the Cronbach's alpha coefficient for the reliability and consistency of the measure (John and Reve, 1982). Once the structural model was created in SmartPLS (version 3), the measurement variables along with their item indicators (Appendix 1) and quality criteria were generated and are presented in Table 2. To

validate the reflective measurement model, construct validity, convergent validity and discriminant validity were evaluated, as per Hair *et al.* (2014).

[Table 2: Measurement Variable with Item Indicators and Quality Criteria]

A Cronbach's alpha value above 0.70 was considered as the threshold to test for internal consistency (George and Mallery, 2003). Among the nine tested TQM factors, only seven satisfied the threshold, showing reliabilities that ranged from 0.837 to 0.941; meanwhile, the overall Cronbach's alpha for slack was 0.781 and the innovation outcome was 0.816. Two factors among the nine (strategic planning and communication) achieved reliability and Cronbach's alpha values of 0.638 and 0.626, respectively; therefore, these two variables were discarded from the model for further testing, as recommended by Hair *et al.* (2014). The average variance extracted ranged from 61% to 80%, and the overall results revealed that seven TQM measures—together with slack, centralised and decentralised towards innovation outcomes—showed good reliability. The revised model measuring seven TQM factors with the innovation outcome was further tested against all measurement loadings, as shown in Table 3.

[Table 3: Revised Model Constructs with Reliability and Average Variance]

4.2 Formative structural model

To confirm the validity of the reliable constructs, a confirmatory factor analysis was used for testing the developed instrument (Hair, 2010). To further assess its fit, the revised model employed seven latent variables as independent factors, slack as intermediating latent factors, and both centralised and decentralised organisations as DVs, as shown in Figure 2.

[Figure 2. Hypothesis testing of the structural model.]

Various goodness of fit indices (GFI) are available to make comparisons, including the ratio of χ^2 to the df (CMIN/df) test of model fit, the *p*-value, the comparative fit index (CFI), the normal fit index (NFI), the GFI, the root mean square error of approximation (RMSEA) and the root mean square residual (RMR). According to McDonald and Ho (2002), absolute fit indices determine how well a priori models fit the sample data, where the cut-off values ≥ 0.9 are meant to indicate an acceptable fit for CFI, NFI and GFI. The CMIN/df < 5 , RMSEA < 0.08 and RMR < 0.1 are all verified in relation to the threshold coined by Kanyongo and Schreiber (2009). Results relating to the hypotheses of IVs, DVs and slack are shown in Table 4; this

illustrates the significance level of the final model with statistical p - and t -values. The results were also bootstrapped by increasing the sample size up to 1,000 (Figure 3).

[Table 4: Hypothesis Testing Results with p -values and t -statistics]

Model results show that H1, H3, H4 and H7 are not significant when they are independently tested against slack values. Among the hypotheses relating to TQM measures, only H5 (IM–innovation outcomes), H6 (CI–innovation outcomes) and H7 (human resources–innovation outcomes) were found to be significant, as they satisfy both the p -value ($p < 0.05$) and t -value ($t > 1.976$).

[Figure 3. Bootstrapping results of the structural model.]

4.3 Slack as a moderator

Further relationships were tested between the identified TQM measures and innovation outcomes by considering slack as a moderator (see Table 5). The results were determined by applying a two-stage approach recommended by Henseler and Fassott (2010). This means using the formative indicators and their latent scores to measure the moderating outcome. Regression results of slack as a moderator (Table 5) indicate that H5 (p -values = 0.043, t -statistics = 2.029) and H7 (p -values = 0.045, t -statistics = 1.978) are significant and supported, whereas the remaining TQM measures are not, which meets the threshold value of t -value ≥ 1.976 . Therefore, within the UAE the role of slack as a moderator for organisational innovation is not influenced by management leadership, supplier quality, customer focus, CI and process management. Further discussions on how and why innovation is not subject to management leadership within this context are illustrated in Section 5.

[Table 5: Slack as a Moderator]

4.4 Slack as a mediator

According to Baron and Kenny (1986), mediators make a significant contribution when assessed between the predictor variable (the DVs) and the impacting variable (the IVs). In practice, a mediating effect is observed by running the model with and without a mediator. Herein, several independent experiments were run in relation to all IVs of TQM measures and predictor variables of innovation outcomes, along with slack as the mediator. Results of the

two experiments are presented in Figures 4 and 5; however, the full experimental findings of all mediating effects are shown in Table 6.

[Figure 4. Bootstrapping results of slack as mediating effect for management leadership.]

The results in Figure 4 indicate that among all TQM measures, only management leadership is fully mediated by slack, where the direct path t -value is 1.251, which is much less than the acceptable threshold value of 1.976, as per Hair *et al.* (2014). Conversely, for all other TQM measures slack only partially mediates. Evidently, the direct and indirect path coefficients are significant according to the Sobel test of computing the t -statistics and p -values. These findings are further discussed in Section 5.

[Figure 5. Slack acts as a partial mediator for CI.]

[Table 6: Results of Slack as a Mediator for all Independently Tested Path Models]

5. Discussion

As shown, analysis confirmed that factors such as CI, HRM and IM were positively associated with innovation. The main observation arising from this study is that slack has a clear role in influencing how organisations innovate. However, past literature supports the view that TQM principles work to eliminate waste and increase effectiveness to a maximum, contrary to innovation, which otherwise requires resource slack (Honarpour *et al.*, 2012; Yusof and Aspinwall, 2000a, 2000b). The novel findings in this study extend the knowledge of applying TQM principles in modern work environments, where innovation is considered a main pillar for competitive advantage and quality can still influence organisational innovation outcomes managing the slack. To effectively leverage innovation outcomes, slack can, in turn, play a pivotal role. Given its important contribution, organisations have to enforce adequate scenarios for which to account slack leverage. As such, this study amply supports past literature, which claims that slack resources influence innovation clearly and that firms use it internally to improve their capacity to transform (Chen and Huang, 2010; Greve, 2003; Nohria and Gulati, 1996, 1997).

5.1 Effect of slack as a moderator

When slack was introduced as a moderator in our analysis, innovation outcomes were stimulated through HRM and IM. This means that the former factor plays a role in initiating innovation likely because creativity is a basic human ability when people are encouraged by certain incentives (Amabile *et al.*, 1996). Therefore, innovation blossoms through employee-driven ideas that are captured and nurtured by appropriate resource support, until finding fruition (Lasrado, 2018). Moreover, for ideas to freely flow, both one's work environment and job role must be conducive. Here, leaders carry the responsibility to foster appropriate work settings and to design flexible positions that award enough autonomy to employees to pave the way for innovation. According to the study results, a strategic approach to managing HRM will need to play a significant role in influencing innovation outcomes. It is also interesting to observe slack's tie to decentralised innovation—where the inverse (i.e., centralised innovation) shows no such relational significance.

These findings further confirm that for innovation and creativity to flourish, employees need to have enough organisational support, autonomy and flexibility to explore new territory (Shalley *et al.*, 2000). In decentralised work environments where employees have greater opportunity to be adventurous, innovation outcomes are clearer than in centralised systems. Here, job routines and work procedures are typically rigid and less conducive to experimentation (Zhou and George, 2001). In merging observations from these findings, it is clear that organisations must take extra care when designing work structures that are more open to innovation.

IM, which forms a key principle of TQM, is equally important in an organisation when making effective decisions. Indeed, fact-based judgements often form part of world-class or high-performing organisations' modus operandi; hence, this study contributes to understanding that IM can have an effect on innovation outcomes with the support of slack. IM itself is also resource intensive. Thus, when resources undergo strategic management, an organisation's overall journey towards achieving greater innovation generally improves.

Finally, the results indicate that CI is strongly *linked* to innovation outcomes, but they do not share a solid bond. Nonetheless, CI is a starting point for any improvement in an organisation. Making ongoing, constant development helps to not only improve one's products and services, but also rethink the methods through which radical growth can ensue. Housing a

CI approach in an organisation can stimulate innovation outcomes in certain ways. However, if it is further supported by other factors such as HRM and IM, these can together bring even greater improvements that elevate organisations to another level. Indeed, incremental innovations are the result of various CI approaches, which suggests that managers must ensure organisational processes are reviewed on an ongoing basis. The use of a systematic CI framework would be a way forward for organisations to benefit from early potential opportunities.

5.2 Effect of slack as a mediator

As shown in Figure 5, the study results indicate that slack acts as a full mediator for management leadership, but only partially mediates supplier quality, IM, CI, HRM and process management. Further, it is clear that the role of slack is fully dependent on the support of the leadership present in an organisation. Leaders have a responsibility to mobilise the resources necessary for any innovative action; it is only when support is given through proper resourcing that slack can begin to succeed. These findings are consistent with Lin *et al.* (2016), which measured corporate innovation through a mediated moderation approach. Conversely, all other TQM principles that underpin quality initiatives to improve organisational excellence are too influenced by slack. This means that such management variables will affect innovation when subject to slack. Particularly, HRM and performance measures—which are key elements that grant access to all forms of innovation—must be supported by adequate resources to ensure creativity flourishes. Given each element's contribution, slack compliments leadership, which is responsible for directing and mobilising the resources within an organisation.

Interestingly, the results show low mediation for customer focus, as any decisions on resource allocation (i.e., slack) are mainly done internally by those in control. However, customers can signify their needs based on which leaders may consider the introduction of slack—hence, it still partially mediates innovation outcomes.

6. Conclusion

The objective of this paper was to present the role of slack (both moderating and/or mediating) to stimulate the relationship between TQM factors and innovation outcomes for the purposes of competitive advantage. Findings suggest that slack has both a moderating and a mediating effect on innovation outcomes, and stimulates both mechanisms between TQM factors and innovation outcomes—particularly given that TQM emphasises efficiency (thus, implying

reduced resources). Likewise, it is important for managers to consider the role that slack can play in spurring innovation. They can choose to embrace human resource factors to increase innovation outcomes, but must acknowledge that such capital can only be strategically deployed if leadership proactively embraces a sustained outcome. This research also confirmed that leaders remain the key decision-makers in the allocation of organisational slack, in that it reduces the contraction between itself and TQM when stimulating innovation.

That said, the results are not without any limitations. Given the study chiefly represents organisations in the UAE, the findings cannot be widely generalised. Nonetheless, testing this initial framework in a different setting, such as a different sector or different country, might bring new insights.

While most studies on the relationship between slack and innovation were carried out in developed countries, little attention has been paid to emerging economies and almost no research has been reported on the MENA region. This paper offers one early attempt to understand the effect of slack as a moderator and/or mediator on innovation outcomes in a relatively unique part of the world. Overall, it discovered that using slack as a mediator can help in understanding *when* TQM might influence innovation, and likewise proposes that, when moderating, slack could inverse the relationship between each factor.

Finally, given the important role of slack on innovation outcomes, future research can investigate if its mediation and/or moderation are likely to have the same influence on different industry sectors, including whether the types of innovation vary across the scale. As this study further proposes that HRM has significant influence, it is also essential to examine the role of each factor in different industry contexts. Overall, this paper has provided a broad basis on which to consider slack in future innovation-based research attempts (see Section 7).

6.1 Managerial implications

Leaders can greatly influence organisational innovation with the support of slack. In this sense, strategic planning should greatly consider its facilitation, with managers likewise urged to make necessary budgetary decisions involving resources that must become useful in an organisation's innovation journey. A register to maintain slack of required resources in terms of physical assets and human resources (among other factors) would require initiation through an organised process. Naturally, this has implications on certain organisational processes such as human capital development, sourcing and procurement, and financial planning. Therefore,

TQM adoption should mean integrating the facilitation and assessment of slack in functions relating to leadership, strategic planning, human resources, IM and SCM.

7. Limitations and future studies

This study concerned organisations that have adopted a TQM approach using different models including ISO, the National Quality Award models or the European Foundation for Quality Management (EFQM) models. Given that each engaging factor on their respective frameworks differs, it is tough to generalise the results obtained in this study. Hence, variation constitutes a key limitation of the research, but equally awards interesting avenues for future studies to explore. Additional research can be carried out to differentiate the effects on specific quality systems such as ISO or EFQM.

Further, the study sample was composed of various business structures (private, semi-private and government), meaning it is possible that any noted differences could have altered the results. Indeed, the quality system employed should have also been a control variable. Hence, future studies can focus on both aspects by maintaining the kind of QM system applied as a control variable, with the effects on different types of organisations concurrently studied.

As TQM provides a set of practices that are highly philosophical in nature, it is important to differentiate the organisations under review according to the model being used. The present study had assumed that said organisations possessed some form of TQM implementation, either in following the National Quality Award or ISO systems. In this sense, another interesting avenue for future research may be to include the relationship of slack in relation to company size, and whether its application reacts the same or differently for SMEs and large-scale organisations.

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Appendix 1

Factor 1: Management leadership

1. Our top management identify quality goals for employee to achieve.
2. Our top management encourages change and implements a culture of trust, involvement and commitment in moving toward best practise.
3. Our top management creates a work environment that helps me do my job.
4. Our top management shares information.
5. Our top management encourage learning quality-related concepts and skills.
6. Our top management discusses many quality-related issues in top management meetings.
7. Our top management are consistently rewarded for good suggestions and quality improvement.

Factor 2: Strategic planning

1. Our management sets objectives for managers and employees.
2. Our management involves the employees in the setting of its objectives and plans.
3. Results are evaluated by comparing them to planned results, in order to make improvements.

Factor 3: Supplier quality management

1. Our company strives to establish long-term relationships with suppliers.
2. Our suppliers are actively involved in our product design/redesign process.
3. Our suppliers are evaluated according to quality
4. Our company has a thorough supplier rating system.

Factor 4: Customer focus

1. Our company knows our external customers' current and future requirements.
2. These customer requirements are effectively understood throughout the workforce.
3. In designing new products and services our company uses the requirements of domestic customers.
4. Our company has an effective process for resolving external customers' complaints.
5. Our company conducts a customer satisfaction survey every year.

Factor 5: Information measurement and analysis

1. Our company measure the quality of our product /service.
2. Our company use the information in making decision.
3. Our company presents the important information to employees.
4. Our company collects and analyses data related to its activities.
5. Our company information is used to improve its key processes, products and services.
6. Our company has data about the competition used to identify areas of improvement.

Factor 6: Continuous improvement

1. My company treats audit findings as an opportunity to improve our process.
2. I treat my audit findings as an opportunity to improve our process.
3. My company is always looking at ways to improve the processes
4. Our supervisors support my efforts to improve processes
5. My company will not stop investigation until we reach the root cause of the problem.

Factor 7: Human resources management

1. Our company has a transparent and effective appraisal system for recognising and rewarding employees for their efforts.
2. Our company stresses teamwork and team spirit.
3. Our management motivates employees and fully develops their potential.
4. Our company provides a safe and healthy work environment.
5. Our company provides a participative environment for employees.
6. Our company measures employee satisfaction.

Factor 8: Process management

1. Our company takes immediately corrective actions when a quality problem is identified.
2. Our company improves systematically key processes to achieve better quality and performance.
3. Our company controls processes using different tools.
4. Our company regularly monitors improvement to the processes.

Factor 9: Culture and communication

1. Our company attaches importance to communicate to solve problems.
2. All employees are ready and willing to be trained and educated with new concept on quality.
3. Our company develops a company-wide culture of quality.
4. Our company encouraged to communicate and meet colleagues for formal/informal discussions.

Innovation outcomes

1. Our company Introducing new product /service
2. Introducing new methods for production process
3. Our company opening new market
4. Our company processes are continuously updated

Centralised innovation

1. In our company, new ideas and improvements are originated in our R&D department.
2. Our company have innovation unit that focuses on new ideas.
3. New projects are initiated by innovation unit
4. Our company encouraged us to collaborate innovation unit.

Decentralised innovation

1. I make suggestion to my process improvements within my unit.
2. New ideas are implemented.
3. Improvements to processes are very often.
4. Employees are authorized to try new things out and bring creativity.

Organisational slack

1. Our company have surplus human resources.
2. Our company have reserved financial budget.
3. We can get any additional resources required upon request.
4. Any additional resources are freely available.

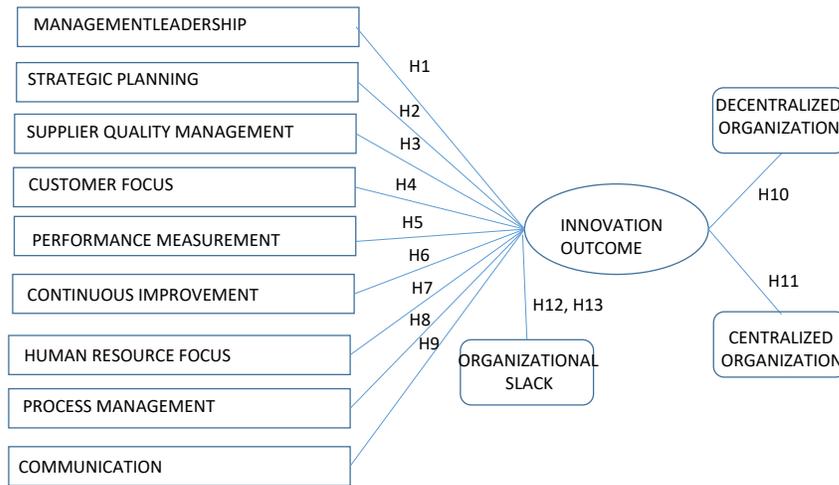


Figure 1: The Conceptual model

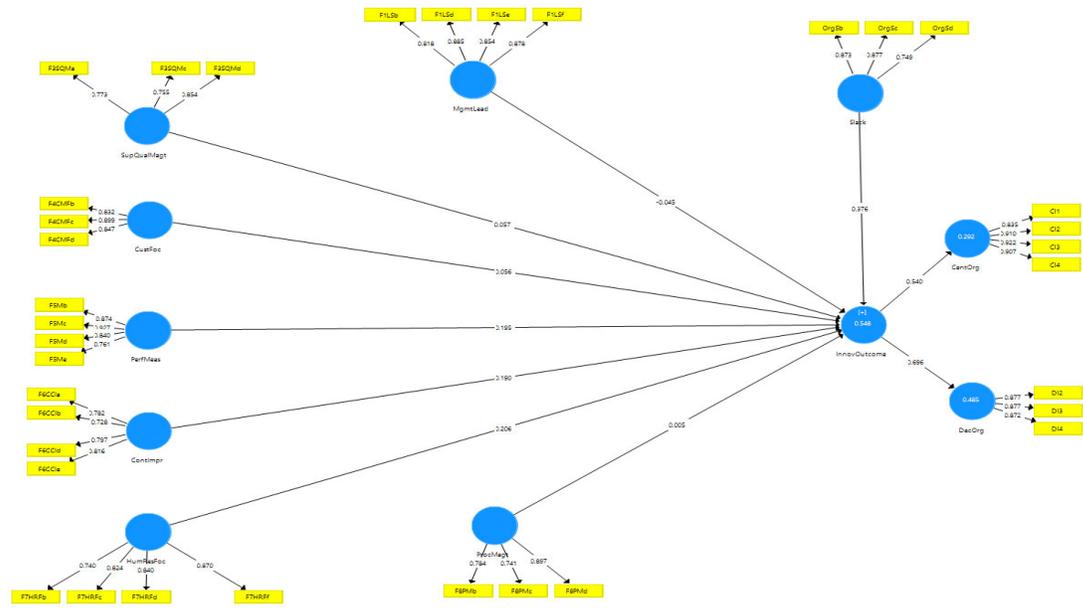


Figure 2 Hypothesis testing of Structural model

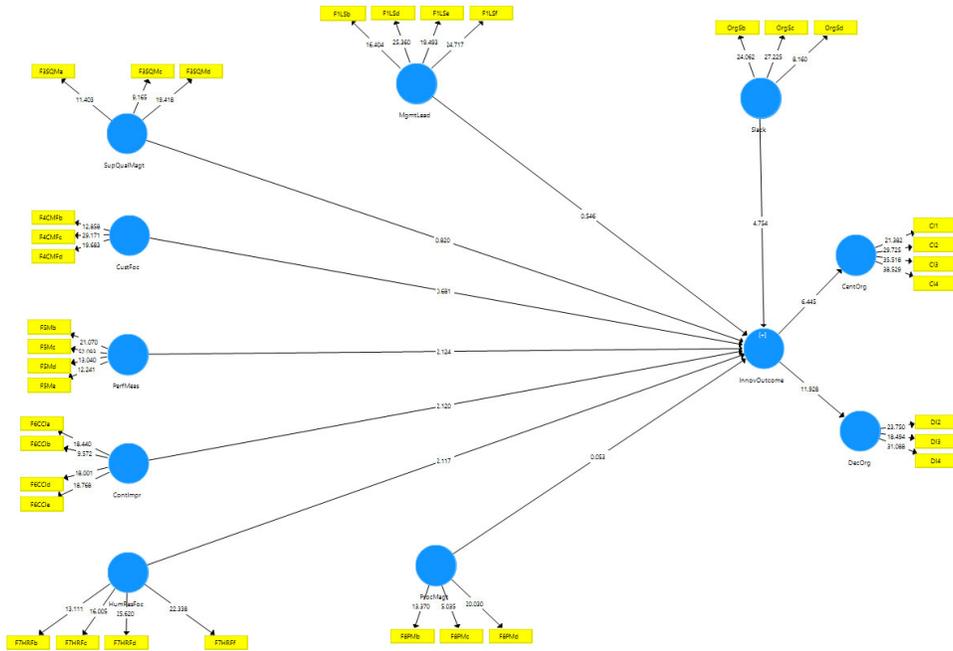


Figure 3 Bootstrapping results of structural model

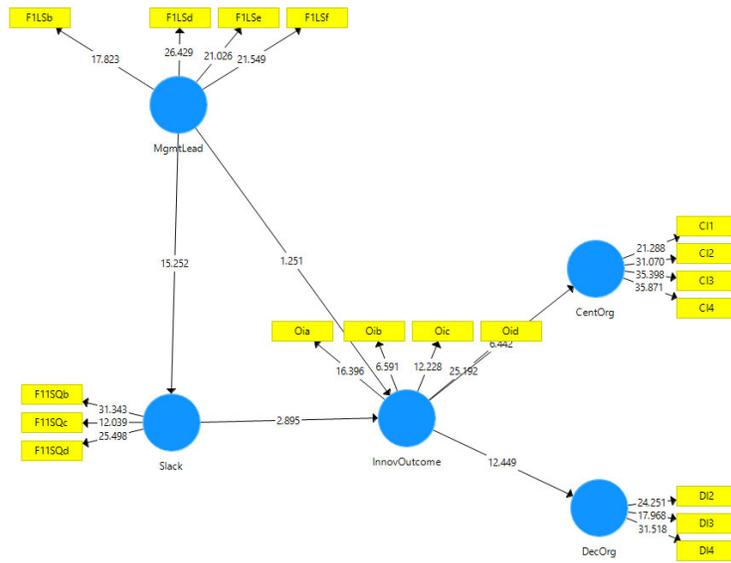


Figure 4: Bootstrapping results of slack as mediating effect for Management Leadership

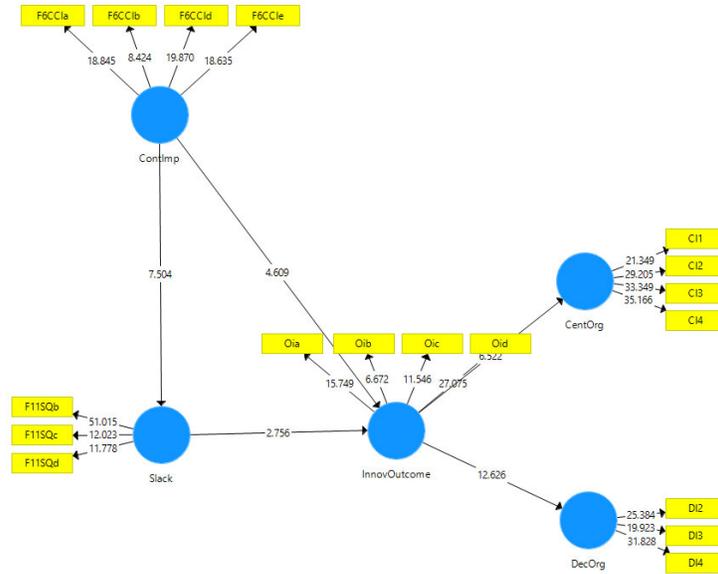


Figure 5: Slack acts as a partial mediator for continuous improvement

Table 1: Characteristics of the organizations and respondents

Criteria	Description	Percentage
Gender		
	Male Participants	61%
	Female participants	39%
Organization size		
	No. of Employees<500	26%
	No. of Employees>500-5000	56%
	No. of Employees>5000	12%
	Unknown	7%
Sectors		
	Government	22%
	Semi-government	46%
	Private	32%
Industry Providers		
	Manufacturing	34%
	Services	60%
	Both	6%

Table 2: Measurement variable with Item indicators and their quality criteria

Variable	Indicator	Loadings	Composite Reliability	AVE	Rho_A	Cronbach's Alpha
CentOrg	Innovation originated only in R&D department.	0.835	0.941	0.799	0.92	0.916
	The company have innovation unit	0.910				
	New projects are initiated by innovation unit	0.922				
	The company encouraged to collaborate with innovation unit.	0.907				
DecOrg	New ideas are implemented.	0.877	0.908	0.766	0.848	0.848
	Improvements to processes are very often.	0.877				
	Employees are authorized to try new things out and bring creativity.	0.872				
Commn	Employees are willing to be trained/ educated with new concept on quality.	0.750	0.645 [#]	0.523	0.605	0.638
	Develops a company-wide culture of quality.	0.612				
	Communicate and meet colleagues for formal/informal discussions.	0.667				
MgmtLead	Encourages change and implements a culture of trust, involvement and commitment	0.810	0.919	0.739	0.885	0.882
	Creates a work environment that helps me do my job.	0.837				
	Shares information.	0.847				
	Encourage learning quality-related concepts and skills.	0.850				
	Discusses many quality-related issues in top management meetings.	0.860				

	Top management rewarded for good suggestions and quality improvement.	0.768				
StrPlan	Sets objectives for managers and employees.	0.787	0.623 [#]	0.499	0.617	0.626
	Involves the employees in the setting of its objectives and plans.	0.594				
	Results are evaluated by comparing them to planned results, in order to make improvements.	0.573				
SupQualMagt	Establish long-term relationships with suppliers.	0.786	0.837	0.632	0.761	0.718
	Suppliers are actively involved inr product design/redesign process.	0.817				
	Our suppliers are evaluated according to quality	0.752				
	Company has a thorough supplier rating system.	0.825				
CustFoc	Company knows the external customers' current and future requirements	0.701	0.895	0.739	0.834	0.824
	Customer requirements are effectively understood throughout the workforce.	0.836				
	Company uses the requirements of domestic customers.	0.811				
	Company has an effective process for resolving external customers' complaints.	0.774				
	Company conducts a customer satisfaction survey every year.	0.767				
InfMeas	Company measure the quality of our product /service.	0.729	0.914	0.727	0.898	0.875
	Company use the information in making decision.	0.860				
	Company presents the important information to employees.	0.906				
	Company collects and analyses data related to its activities.	0.797				
	Company information is used to improve its key processes, products and services.	0.767				
	Company has data about the competition used to identify areas of improvement.	0.777				
ContImpr	Company treats audit findings as an opportunity to improve our process.	0.782	0.862	0.611	0.79	0.787
	I treat my audit findings as an opportunity to improve our process.	0.728				
	Company is always looking at ways to improve the processes.	0.797				
	Supervisors support the efforts to improve processes.	0.816				
HumResFoc	Company has a transparent and effective appraisal system.	0.703	0.891	0.672	0.842	0.837
	Company stresses teamwork and team spirit.	0.741				
	Management motivates employees and fully develops their potential.	0.824				
	Company provides a participative environment for employees.	0.794				
	Company measures employee satisfaction.	0.847				
ProcMagt	Company improves systematically key processes to achieve better quality and performance.	0.784	0.85	0.656	0.75	0.736
	Company controls processes using different tools.	0.741				
	Company regularly monitors improvement to the processes.	0.897				

InnovOutcome	Company Introducing new product /service	0.802	0.879	0.644	0.819	0.816
	Introducing new methods for production process	0.804				
	Our company opening new market	0.757				
	Our company processes are continuously updated	0.845				
Slack	Company have reserved financial budget.	0.873	0.873	0.697	0.794	0.781
	We can get any additional resources required upon request.	0.877				
	Any additional resources are freely available.	0.749				

Italicised are dropped variable due to meeting below than the threshold of 0.7

Table 3: Finalised constructs with Reliability and Average Variance

	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
CentOrg	0.916	0.92	0.941	0.799
ContImpr	0.787	0.79	0.862	0.611
CustFoc	0.824	0.834	0.895	0.739
DecOrg	0.848	0.848	0.908	0.766
HumResFoc	0.837	0.842	0.891	0.672
InnovOutcome	0.816	0.819	0.879	0.644
MgmtLead	0.882	0.885	0.919	0.739
PerfMeas	0.875	0.898	0.914	0.727
ProcMagt	0.736	0.75	0.85	0.656
Slack	0.781	0.794	0.873	0.697
SupQualMagt	0.718	0.761	0.837	0.632

Table 4. Hypothesis testing results with P value and T statistics

		Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (O/STDEV)	P Values	Significance
Management leadership -- innovation outcomes	H1	-0.045	-0.048	0.083	0.546	0.585	Nonsignificant
Supplier quality management-- Innovation outcomes	H3	0.057	0.057	0.07	0.82	0.412	Nonsignificant
Customer focus-- Innovation outcomes	H4	0.056	0.058	0.082	0.681	0.496	Nonsignificant
Information measurement-- Innovation outcomes	H5	0.195	0.187	0.092	2.124	0.034	Significant
Continuous improvement-- Innovation outcomes	H6	0.19	0.193	0.089	2.12	0.034	Significant
Human resource-- Innovation outcomes	H7	0.206	0.197	0.097	2.117	0.035	Significant
Process management- -Innovation outcomes	H8	0.005	0.026	0.095	0.053	0.958	Nonsignificant
Decentralized organization-- Innovation outcomes	H10	0.696	0.698	0.058	11.928	0	Significant
Centralized organization-- Innovation outcomes	H11	0.54	0.553	0.084	6.445	0	Significant
Slack -- Innovation outcomes	H12	0.376	0.379	0.079	4.754	0	Significant

Table 5: Slack as moderator

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (O/STDEV)	P Values
Management leadership -- innovation outcomes	-0.04	-0.054	0.091	0.44	0.66
Supplier quality management-- Innovation outcomes	0.059	0.061	0.075	0.793	0.428
Customer focus-- Innovation outcomes	0.067	0.054	0.08	0.831	0.406
Information measurement-- Innovation outcomes	0.212	0.194	0.104	2.029	0.043
Continuous improvement-- Innovation outcomes	0.127	0.124	0.116	1.091	0.276
Human resource-- Innovation outcomes	0.168	0.156	0.098	1.978	0.045
Process management- -Innovation outcomes	0.015	0.047	0.092	0.157	0.875
Decentralized organization-- Innovation outcomes	0.696	0.697	0.062	11.271	0
Centralized organization-- Innovation outcomes	0.54	0.547	0.084	6.456	0
Slack -- Innovation outcomes	0.335	0.326	0.093	3.599	0

Table 6: Results of slack as a mediator for all independently tested path models

Path	Direct Path co-efficient		Indirect Effect		Mediator Outcome
	t - value	Beta Co-eff	t - value 1	t - value 2	
Management leadership >slack>innovation outcomes	1.251	0.162	15.252	2.895	Full Mediator
Supplier quality management> slack >Innovation outcomes	3.651	0.262	3.743	4.848	Partial Mediator
Customer focus->slack > Innovation outcomes	3.329	0.283	2.316	5.535	Partial Mediator
Information measurement->Slack >Innovation outcomes	3.059	0.317	10.278	2.861	Partial Mediator
Continuous improvement>slack >Innovation outcomes	4.609	0.392	7.504	2.756	Partial Mediator
Human resource->slack >Innovation outcomes	3.514	0.390	11.591	2.458	Partial Mediator
Process management->slack >Innovation outcomes	2.353	0.247	9.125	3.874	Partial Mediator