

A Service of

ZBW

Leibniz-Informationszentrum Wirtschaft Leibniz Information Centre for Economics

Alanaz, Mohammed H.

Article

The mediating role of primary TQM factors and strategy in the relationship between supportive TQM factors and organisational results: An empirical assessment using the MBNQA model

Cogent Business & Management

Provided in Cooperation with:

Taylor & Francis Group

Suggested Citation: Alanaz, Mohammed H. (2020) : The mediating role of primary TQM factors and strategy in the relationship between supportive TQM factors and organisational results: An empirical assessment using the MBNQA model, Cogent Business & Management, ISSN 2331-1975, Taylor & Francis, Abingdon, Vol. 7, Iss. 1, pp. 1-25, https://doi.org/10.1080/23311975.2020.1771074

This Version is available at: https://hdl.handle.net/10419/244855

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.



WWW.ECONSTOR.EU

https://creativecommons.org/licenses/by/4.0/

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.







Cogent Business & Management

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/oabm20

The mediating role of primary TQM factors and strategy in the relationship between supportive TQM factors and organisational results: An empirical assessment using the MBNQA model

Mohammed H. Alanazi |

To cite this article: Mohammed H. Alanazi | (2020) The mediating role of primary TQM factors and strategy in the relationship between supportive TQM factors and organisational results: An empirical assessment using the MBNQA model, Cogent Business & Management, 7:1, 1771074, DOI: <u>10.1080/23311975.2020.1771074</u>

To link to this article: https://doi.org/10.1080/23311975.2020.1771074

9	© 2020 The Author(s). This open access article is distributed under a Creative Commons Attribution (CC-BY) 4.0 license.		Published online: 04 Jun 2020.
	Submit your article to this journal 🕼	111	Article views: 1414
Q	View related articles 🕜	CrossMark	View Crossmark data 🗷
ආ	Citing articles: 1 View citing articles 🛽 🖓		





Received: 15 November 2019 Accepted: 07 May 2020

*Corresponding author: Mohammed H. Alanazi, Administrative Sciences, King Fahd Security College, Riyadh, Saudi Arabia E-mail: anazim@kfsc.edu.sa;m_alanazey@hotmail.com

Reviewing editor: Balan Sundarakani, University of Wollongong Faculty of Business, United Arab Emirates

Additional information is available at the end of the article

OPERATIONS, INFORMATION & TECHNOLOGY | RESEARCH ARTICLE The mediating role of primary TQM factors and strategy in the relationship between supportive TQM factors and organisational results: An empirical assessment using the MBNQA model

Mohammed H. Alanazi^{1*}

Abstract: The mediating role among total quality management and business excellence model factors, including the role of strategy, has rarely been addressed empirically. This research examines the mediating effects of primary total quality management factors (operations management and measurement, analysis, and knowledge management) and strategy on the relationship between supportive total quality management factors (leadership, workforce, and customers) and organisational results using the Malcolm Baldrige National Quality Award (MBNQA) model as the framework. Based on responses from managers of 217 Saudi firms, the questions and hypotheses suggested in this research are examined using the structural equation modelling technique. The results show that: (a) supportive factors enhance primary factors; (b) strategy mediates the relationship between supportive factors and primary factors; (c) primary factors mediate the relationship between supportive factors and results; and, more importantly, (d) collectively and sequentially, the combination of strategy and primary factors mediates the relationship between

ABOUT THE AUTHOR

Mohammed Alanazi is an Assistant professor of operations management and strategic management at the Department of Administrative Sciences at King Fahd Security College, KSA where he teaches courses at both the graduate and undergraduate levels. His current research focuses on business excellence models and TQM practices (including empirical research on their causal structure), organizational self assessment, and business process management. He holds a PhD in management from University of Hull, UK.

PUBLIC INTEREST STATEMENT

Business conditions usually lead managers to ask the following questions. Where should we start the organizational improvement practices (e.g., total quality management [TQM] practices)? What are the relationships of such practices? What are their relative significance and sequence? This study provides useful answers for such enquiries. This study analyses the way quality management systems work based on relationships and integration among practices (e.g., leadership, operations management, and an organisation's results) using the Malcolm Baldrige National Quality Award (MBNQA) model as the framework.

This study reveals that managers should view their business as a connected, holistic system. Moreover, it shows that there should be a clear progression starting from leadership's commitment and direction, which engages a qualified workforce that understands and effectively participates in managing operations, quality tools, and information through an integrated strategy that leads to the desired results. Understanding this can improve the implementation process and resources management.





© 2020 The Author(s). This open access article is distributed under a Creative Commons Attribution (CC-BY) 4.0 license.

supportive factors and results more strongly than their respective individual mediation effects separately. The findings support the systems perspective provided by the MBNQA model.

Subjects: Operations Management; Quality Management; Research Methods in Management

Keywords: TQM; MBNQA; mediation effects; supportive TQM factors; primary TQM factors; structural equation modelling

1. Introduction

In today's competitive environment, customers have become increasingly aware of the quality of services and products, forcing organisations to adopt initiatives for continual quality improvement. Previous studies have considered many of these initiatives and approaches such as Balanced Scorecard (BSC), Total Preventive Management, Six-Sigma, and Total Quality Management (TQM). Among these, this research focuses on TQM.

Although there are many definitions of TQM, a commonly accepted one states that it is a comprehensive management approach for an organisation to operate through guiding principles, basic concepts, continuous improvement, and organisational change, which, when effectively linked, will lead to desirable organisational results (Kaynak & Hartley, 2005; Oakland, 2014; Spencer, 1994).

To achieve the expected TQM results, its key elements must be developed, implemented, and improved to form a quality management system (QMS) (NIST, 2015). The TQM approach is based on the proper integration and linkage of certain principles with the organisation's strategy, structure, and procedures (Bou-Llusar et al., 2005).

Recognising the integration and interrelationship between TQM elements is essential to realise the objectives and planned results (Calvo-Mora et al., 2015; Tamimi, 1998). Hence, applying a TQM approach requires a systematic framework or model. Based on previous literature, it is possible to distinguish between five types of TQM implementation frameworks:

- Those based on experts and consultants (e.g., Crosby, 1980; Deming, 1982; Juran & Gryna, 1993);
- (2) Standardised models such as the ISO 9000:2000 series (e.g., Kartha, 2004; Rao Tummala & Tang, 1996);
- (3) Models based on the critical factors of TQM (e.g., Dow et al., 1999; Flynn et al., 1994; Saraph et al., 1989);
- (4) Models proposed by academics such as Kanji's Excellence Framework (Kanji & Wallace, 2000); Oakland's Total Organisational Excellence Framework (Oakland, 2001); and the UMIST quality improvement framework (Dale et al., 2007);
- (5) Quality awards and business excellence models (BEMs) such as the Deming Award, the Malcolm Baldrige National Quality Award (MBNQA), and the European Foundation for Quality Management (EFQM) model.

Previous studies have shown that BEMs provide the best reference model for implementing and improving TQM (Kim et al., 2010; Prajogo & Sohal, 2006) and that organisations reap benefits when implementing BEMs (Porter & Tanner, 2004). For example, these models can be used for a comprehensive, systematic, and regular assessment of the organisation's practices and results in comparison to BEM criteria (EFQM, 2013; NIST, 2015). Since BEMs provide a systematic review of an organisation's strengths and weaknesses, they enable development and implementation of strategic plans. Ritchie and Dale (2000) noted that the full benefit of self-assessment is achieved

by linking the assessment results to strategic planning, thus confirming the fundamental TQM assumption of quality management (Dow et al., 1999).

TQM factors and practices can be categorised into three types (Flynn et al., 1995; Oakland, 2011; Rahman & Bullock, 2005):

- (1) Social, soft, or supportive factors (referred to as supportive TQM factors in this research) that focus on behaviour such as leadership, workforce practices, and customer focus.
- (2) Technical, hard, or primary factors (referred to as primary TQM factors in this research) that focus on production methods and processes. Examples include operations management and measurement, analysis, and knowledge management.
- (3) The strategy factor, reflecting the need to integrate TQM objectives, plans, and policies into the organisation's strategic plan (Reiner, 2002).

Studies analysing relationships between BEM factors are limited, focusing mainly on models and tools such as Benchmarking, Balanced Scorecard, International Standards Series (ISO9000), and Six-Sigma (Dahlgaard-Park et al., 2013). Studies on BEMs have focused on descriptive comparisons between models (e.g., Lee & Lee, 2013); effects from the use of BEMs (Bayo-Moriones et al., 2011; Stok et al., 2009); organisations winning excellence awards (Boulter et al., 2013; Escrig & de Menezes, 2015); constraints and challenges of applying BEMs (Gómez-López et al., 2016; Heras-Saizarbitoria et al., 2011); differences in stakeholder perceptions of business excellence adoption (Camison, 1996); and its integration with other tools (Peng et al., 2019).

La Rotta and Rave (2016) stated that there is scant research focused on the causal relations between BEM factors. On the other hand, Gadenne and Sharma (2009), Zeng et al. (2015), Para-González et al. (2015), Sweis et al. (2016), Danyen and Callychurn (2015), and Ho et al. (2001) all indicated there are few clear results on which critical TQM factors have greater impacts on performance and which ones affect results directly, indirectly, or through mediation roles of other factors. Ignoring quality as a strategic issue is the main reason for failure in the implementation of TQMs and BEMs (Gómez-López et al., 2016; Taylor & Wright, 2003). Boulter et al. (2013) and Kim et al. (2010) stated that there is a significant lack of research on the role of the strategic factor in BEMs. Existing research has not analysed the mediating role among BEM factors (e.g., Badri et al., 2006; Prybutok et al., 2011), nor has it been addressed with a focus on the strategy factor or the MBNQA model (e.g., Calvo-Mora et al., 2015).

Taking this into account, the purpose of this study is to analyse the way BEMs work as a QMS based on relationships and integration among its factors. Specifically, this study seeks to further researchers' work aiming at improving our understanding of the interrelationship between TQM factors as a QMS and determining which of these factors is more significant in enhancing results, as well as to help organisations to identify areas of focus for their QMS. A focus will be laid on leadership, workforce, and customers factors (supportive TQM factors); primary TQM factors (as a combined construct comprising operations management and measurement, analysis, and knowledge management); strategy; and results in the context of the MBNQA model. The following questions illustrate the objectives of this research:

- (1) What is the mediating role of strategy in the relationship between leadership, workforce, and customers and primary TQM factors and results?
- (2) What is the mediating role of primary TQM factors in the relationship between leadership, workforce, and customers and results?

In answering these questions, this study aims to fill the gaps in the literature as follows:

(1) Considering the limited findings on the integration mechanism and relationship between TQM and BEMs factors, and more specifically the role of strategy and primary TQM factors,

this study improves the understanding of how to effectively manage and integrate such factors into a QMS;

- (2) Unlike studies on the direct and indirect effects of supportive TQM factors as a combined construct (e.g., Zeng et al., 2015), this study independently examines each factor (i.e. leadership, workforce, and customers) to analyse their direct and indirect roles;
- (3) While past research has focused on the EFQM model (e.g., Calvo-Mora et al., 2015; Suarez et al., 2016), this study focuses on the MBNQA model to analyse the mediation effects among TQM factors and organisational results.

The remainder of this paper is organised as follows. Section 2 provides a literature review and the research hypotheses. Section 3 presents the research methodology and Section 4 outlines the results. Section 5 concludes the paper with a discussion of results, conclusions, and limitations.

2. Literature review and research hypotheses

The MBNQA model presents a framework for analysing the relationships between organisational practices and results (NIST, 2015). The criteria proposed by the model are leadership; workforce; customers (customers focus); strategy; operations management; and measurement, analysis, and knowledge management. Additionally, there is a results criterion that reflects customer satisfaction, financial results, products, market, etc. Overall, these criteria represent the seven critical aspects of organisational management and performance.

The MBNQA model implies that all components are managed as one integrated system (i.e. QMS). Examples of integration are the relationship between practices criteria and results and between strategic planning and leadership and workforce planning as well identifying customers and markets while developing strategy (NIST, 2015).

The model identifies the mechanism through which leadership can direct practices that determine performance (Prybutok et al., 2011; Wilson & Collier, 2000). In particular, it highlights the significant role of strategy in implementing TQM practices (NIST, 2015), as it plays a central role in harmonising and connecting such practices to achieve effective and consistent results (Kumar & Sharma, 2017).

While the MBNQA model does not explicitly refer to the supportive and primary TQM factors, leadership, workforce, and customers criteria are consistent with the supportive TQM factors, and operations management and measurement, analysis and knowledge management correspond to primary TQM factors (Flynn et al., 1995; Ho et al., 2001).

Although studies have examined the relationship between TQM practices and organisational results, the findings have been inconsistent (Dubey & Gunasekaran, 2015; Psomas & Jaca, 2016; Rahman & Bullock, 2005; Sila, 2007). Studies have not provided clear findings on which factors have the most significant effect (primary, supportive, or strategy factors) on results, or which factors directly or indirectly affect results through other factors (Sharma et al., 2009). Furthermore, such studies are limited in the BEMs domain (e.g., Calvo-Mora et al., 2015).

Although the MBNQA model supports the QMS perspective on the interrelation and integration of the model's seven criteria, it does not clearly outline the relationship between process criteria or the relationship between such criteria and results (Curkovic et al., 2000; NIST, 2015). Therefore, a research model (Figure 1) is proposed to identify the relationships between leadership, workforce, and customers factors and primary TQM factors as well as their relationships with organisational results in the MBNQA model.

Figure 1. Research model and summary of the hypotheses.



2.1. The relationship between leadership, workforce, and customers and primary TQM factors

Organisations can achieve desired results with various methods such as benchmarking and defectprevention mechanisms. However, to successfully implement these primary TQM factors, they should focus on customers and workforce participation through empowerment and training. The essence of quality is a workforce that is sensitive to customers' needs and expectations (Ahire et al., 1996; Fotopoulos & Psomas, 2010). Therefore, an organisational leader should focus on customer-oriented strategies and targets. Leadership represents a guiding force for TQM factors through a flexible and creative direction connected with stakeholders (Rahman & Bullock, 2005). Supportive TQM factors (leadership, workforce, and customers) and primary TQM factors are not independent. Therefore, the following hypothesis is proposed:

H1. Leadership, workforce, and customers (supportive TQM factors) are positively related to primary TQM factors.

2.2. The mediation effect of strategy in the relationship between leadership, workforce, and customers and primary TQM factors

Kochan et al. (1995) indicated that quality should be considered as part of a broader strategy in organisational change. In this context, TQM should be considered as a key component of an organisation's strategy for survival and growth (Deming, 1982). In the MBNQA model, the strategy criterion focuses on the development of objectives and action plans; implementing those plans; modifying them when necessary; and measuring progress (NIST, 2015). Thus, TQM practices and targets should be integrated into the strategic plan in a systematic manner (Oakland, 2011).

Moreover, quality practices are considered an intangible strategic resource that cannot be imitated by competitors (Powell, 1995). Through quality implementation and improvement, a competitive advantage can be achieved (Zatzick et al., 2012). TQM can be used in different strategic situations such as a cost leadership strategy that is related to cost advantage (focus on operations) (Zatzick et al., 2012) or a differentiation strategy (focus on customers) (Prajogo & Sohal, 2006).

Reiner (2002) illustrated that strategy, in the context of BEMs, sets a roadmap for reaching desired results by identifying stakeholders, market segments, targets, operations, and required resources. Evans and Lindsay pointed out that "A key role of strategic planning is to align work processes and learning initiatives with an organisation's strategic directions, thereby ensuring that

improvement and learning prepare for and reinforce organisational priorities" (2014, 558). Therefore, the following hypothesis is proposed:

H2. Strategy mediates the relationship between leadership, workforce, and customers and primary TQM factors.

2.3. The mediating effect of primary TQM factors

Academic literature shows the mediating role of primary TQM factors between leadership, workforce, and customers and results (Calvo-Mora et al., 2014; Fotopoulos & Psomas, 2010; Peng & Prybutok, 2015). Prior studies also indicate that leadership, workforce, and focus on customers are positively related to an organisation's results (Abdullah et al., 2008; Badri et al., 2006; He et al., 2011; Peng & Prybutok, 2015; Rahman & Bullock, 2005). These supportive TQM factors are essential prerequisites for effectively and efficiently developing and implementing other TQM practices, as they focus efforts toward continuous improvement (Abdullah et al., 2008). Specifically, leadership plays a critical role in determining values, orientations, and communications and establishing an organisation's focus on actions, including transforming an organisation's structure and culture (NIST, 2015). In addition, research indicates that TQM success is strongly associated with workforce and its related practices such as empowerment, training, and engagement (Ahire et al., 1996; Badri et al., 2006; Oakland, 2011). Without employee commitment and engagement, initiatives would fail (Ahire et al., 1996). On the other hand, focusing on customers is one of the most significant practices, as it is a critical predictor of results (Prybutok et al., 2011; Terziovski et al., 2003).

In this context, the MBNQA model emphasises the importance of engaging customers, including practices such as listening, building relationships, and effectively using customer information—all of which highlight the importance of customer satisfaction (NIST, 2015). Primary TQM factors such as operations management and measurement, analysis, and knowledge management have a significant effect on organisational results. Operations management focuses on designing, managing, improving, and innovating main products, services, and processes to create value for customers (NIST, 2015) and has positive impacts on results (Kaynak, 2003).

Furthermore, using quality information has a direct effect on results, as the purpose of measurement, analysis, and knowledge management is to direct operations and activities toward desired results (NIST, 2015). Therefore, leaders should strive to obtain employees' commitment (Tutuncu & Kucukusta, 2007) in decision-making by integrating workforce management, operations management, and quality information. In short, effective and integrated management of the organisation's resources represented by supportive and primary TQM factors have positive impacts on productivity as well as financial and non-financial results (Kaynak, 2003). Therefore, the following two hypotheses are proposed:

H3. Primary TQM factors mediate the relationship between leadership, workforce, and customers and results.

H4. Strategy and primary TQM factors consecutively mediate the relationship between leadership, workforce, and customers and results.

3. Methodology

3.1. Sample

The sample was provided by the Saudi Ministry of Commerce and Investment and consisted of 941 companies that have implemented TQM programmes in Saudi Arabia. Phone calls to the firms confirmed the accuracy and completeness of the list. A questionnaire was emailed to a random sample of 700 CEOs or quality managers. Of the 228 returned questionnaires, 217 were usable (RR: 31%) which is not uncommon in the Saudi context (e.g., Abosag & Peter, 2014; Al-Faraj & Alidi, 1992)

and in BEM studies (e.g., Bou-Llusar et al., 2009; Moon et al., 2011; Wilson & Collier, 2000). Both response waves were analysed for non-response bias (Armstrong & Overton, 1977). Based on demographic variables, no differences were found between the two waves of data collection. Table 1 shows a summary of the sample demographics, firm sizes, and various sectors and activities (primary, secondary, and tertiary).

3.2. Measures

The literature (Bou-Llusar et al., 2009; Calvo-Mora et al., 2013) has suggested that models based on quality awards (e.g., MBNQA) fit the definition of TQM and could therefore be considered valid frameworks for TQM. In addition, previous academic studies have maintained that BEM/quality award material is an appropriate and comprehensive input for designing a questionnaire and considered as comprehensive (Calvo-Mora et al., 2018, 2005; Bou-Llusar et al., 2005; Santos-Vijande & Alvarez-Gonzalez, 2007). While the MBNQA model does not explicitly refer to supportive and primary TQM factors, leadership, workforce, and customers criteria are consistent with supportive TQM factors, and operations management and measurement, analysis and knowledge management correspond to primary TQM factors (Flynn et al., 1995; Ho et al., 2001). The research model comprises six variables (Figure 1 and Appendix 1). Given that using pre-tested measures from previous empirical research were emphasised wherever possible (Bryman & Bell, 2015; Tata et al., 1999), Peng and Prybutok (2015) research served as the reference to identify the measures of leadership, workforce, customers, primary TQM factors, strategy, and results in the MBNQA context. The questionnaire was finalised based on several iterations that involved observations from four academics and four industry experts, pre-testing, and a pilot study to ensure the items were clearly stated.

To gauge the sub-criteria, items sharing the same sub-criterion were averaged to create composite measures. This is an established procedure (Landis et al., 2000; Little et al., 2002) that has been used in BEM studies (Bou-Llusar et al., 2009; Meyer & Collier, 2001) as well as in other fields (e.g., Zhang & Bartol, 2010; Zhou et al., 2010). In the scale validation process, composite measures are used to weigh more than one item and create score aggregates that were then introduced to confirmatory factor analysis (CFA) as indicator variables (Bagozzi & Edwards, 1998). Hence, each multi-item dimension was averaged to form a composite that served as an indicator variable of the latent construct to test the model.

3.3. Data analysis

Structural equation modelling (SEM) and maximum likelihood estimation were used to test the research model using Amos 25.0 (Arbuckle, 2014). Accordingly, Anderson and Gerbing (1988) comprehensive two-stage analytical strategy was followed. Further, SEM was adopted to test for mediation effects following the procedure recommended by Preacher and Hayes (2008). In this context, Amos was used to assess the whole model at once. This procedure does not depend on

Table 1. Sample c	haracteristics		
		Frequency	Percentage
Company size	Less than 250	75	35
	250 or more	142	65
	Total	217	100
Sector	Extraction of raw materials (primary)	37	177
	Manufacturing (secondary)	109	50
	Services (tertiary)	71	33
	Total	217	100

the assumption of normality for indirect effects, the significance of which was examined using a bias-corrected bootstrapping procedure with 10,000 samples (Preacher & Hayes, 2008).

4. Results

4.1. Measurement model

The measurement model assessment is based on fit indices, convergent validity, and discriminant validity (Hair et al., 2010). A formalised, iterative process was followed to determine which items should be eliminated. Using modification indices and other diagnostics provided by Amos 25.0, item deletion was based on weak loadings, cross-loadings, communalities, error residuals, and theoretical determination (Hair et al., 2010; Prahinski & Benton, 2004). Consequently, 57 out of the 68 proposed items in the measurement scales were retained. Appendix 1 shows the factor loadings and dropped items.

The fit indices fell within an acceptable range for the purified measurement model, as shown in Table 2. It is of note that, whilst the λ^2 test was statistically significant, this test is well-known to be sensitive to sample size and may be found to be significant even when the differences between model-implied and observed covariances are relatively small (Kline, 2010). Thus, multiple indices were used to evaluate model fit, as recommended by the SEM literature (Bollen, 1989; Schumacker & Lomax, 2010).

In terms of convergent validity, all average variance extracted (AVE) values, as presented in Table 3, are higher than the 0.50 cut-off (Fornell & Larcker, 1981; Shook et al., 2004). The factor loading for each indicator was also good (> 0.6) (Byrne, 2010; Hair et al., 2010). Construct reliability was assessed using Cronbach's alpha (Cronbach, 1951) and composite reliability (Fornell & Larcker, 1981). The resulting values are shown in Table 3. All constructs exceed the recommended threshold of 0.7 (Anderson & Gerbing, 1988). Discriminant validity was assessed by testing the square root of the AVE for each construct, which should be higher than its correlations with the other latent constructs (Fornell & Larcker, 1981). Table 3 shows that the square root of the AVE for each latent variable is higher than its correlations with other latent constructs. Discriminant validity was assessed by comparing Cronbach's alpha with the average inter-scale correlation (AVISC). Cronbach's alpha should show values greater than the AVISC for discriminant validity to be confirmed (Bou-Llusar et al., 2009; Bagozzi & Phillips, 1982). For all scales, this was the case and Cronbach's alpha was higher than the respective AVISC.

Table 3 also reports the mean, standard deviation, and correlations of the unidimensional measurement constructs identified in the measurement model validation process. All correlations

Table 2. Goodness-of-f	fit for several specificat	ions of CFA for the mea	surement model
	Goodness-of-fit threshold ª	Model 1	Model 2
		Measurement model	Single-factor model
λ ²		554.896	1250.575
(d.f.)		215	252
λ^2/df	<3	2.581	5.016
RMSEA	≤0.08	0.083 (low: 0.074, high.0.091)	0.135 (low: 0.128, high: 0.143)
SRMR	<0.08	0.072	0.842
CFI	>0.90	0.913	0.726
IFI	>0.90	0.914	0.726

^a(Browne & Cudeck, 1989; Bagozzi & Youjae, 1988; Kline, 2010; Medsker et al., 1994; Mulaik et al., 1989)

Note: RMSEA: root mean square error of approximation; SRMR: standardised root mean square residual; CFI: comparative fit index; IFI: incremental fit index.

Table 3. Desc	riptive statistics	s, correlations	, and converge	int and discrim	inant validity 1	for the measur	ement model			
Constructs	Alpha	ß	AVE	AVISC	1	2	m	4	5	9
1. Strategy	0.892	0.895	0.740	0.639	0.860					
2. Workforce	0.896	006.0	0.600	0.699	0.668	0.775				
3. Leadership	0.840	0.847	0.651	0.710	0.706	0.768	0.807			
4. Customers	606.0	0.908	0.766	0.678	0.576	0.700	0.670	0.875		
5. PTQMP	0.799	0.829	0.622	0.678	0.624	0.656	0.666	0.712	0.789	
6. Results	0.884	0.887	0.612	0.707	0.623	0.704	0.743	0.736	0.733	0.782
Mean					5.682	5.364	5.616	5.662	5.066	5.575
S.D.					0.875	1.050	0.859	1.023	1.026	1.005
Notes: CR = comp reported on the c	oosite reliability, AVE diagonal in italics fo	: = average varia r each variable.	nce extracted, AVI	SC = average inter-	scale correlation,	S.D. = standard de	viation, PTQMP = Pr	imary TQM practic	es. The square roo	ts of the AVE are

the AVE ar
re roots of
. The squai
l practices
imary TQN
TQMP = Pr
eviation, P
tandard d
n, S.D. = s
: correlatic
nter-scale
= average i
d, AVISC =
e extracte
ge varianc ariable.
'E = avera
iability, AV in italics f
nposite rel diagonal
s: CR = corr ted on the
ы Б

were positive and significantly different from zero. This was the expected result, as the constructs are part of an integrated approach to TQM (Flynn & Saladin, 2001).

To examine common method bias, a number of statistical techniques were applied, such as Harman's one-factor test and different CFA specifications for the research model, such as the more comprehensive CFA with a single-factor model (Chang et al., 2010; Podsakoff et al., 2003) as well as indicators measuring strategy and leadership loading on the same factor, whereas all the other indicators loaded onto their intended factors (see for example, Kautonen et al., 2015). The result of an unrotated exploratory factor analysis showed that a single method factor does not explain the majority of the variance. In all the CFA specifications, the fit of the model was worse than that where all the indicators loaded onto their theoretically specified factors. This indicates that common method bias is unlikely to be a threat.

4.2. Structural model and hypotheses testing

Several nested models (Anderson & Gerbing, 1988; Eddleston & Kellermanns, 2007) were developed and nested model comparisons were performed (Byrne, 2010). The fit of the research model was compared with two alternative models, as shown in Table 4. In the first alternative (Model 2 in Table 4), the direct paths from leadership to PTQMP (primary TQM practices), from workforce to PTQMP, and from customers to PTQMP were removed. The χ^2 difference tests show that the research model is not significantly better than Model 2 ($\Delta \chi^2(2) = 2.308$, n.s.). However, Model 2 has an inadequate fit to the data ($\chi^2 = 557.420$, df = 222, $\chi^2/df = 2.970$, p = 0.00, CFI = 00.880, SRMR = 00.058, and RMSEA = 0.096), while the research model provides a more conservative test and is therefore retained for further analysis (Hayes, 2017). In the second alternative (Model 3 in Table 4), the direct paths from leadership to strategy, from workforce to strategy, and from customers to strategy were removed. This model has an adequate fit to the data ($\chi^2 = 561.579$, df = 221, $\chi^2/df = 2.821$, p = 0.00, CFI = 00.908, SRMR = 00.0537, and RMSEA = 0.084) but is not significantly better than the research model ($\Delta \chi^2(2) = 6.467$, p < 0.05). Overall, these results suggest that the research model has the best fit to the data (Model 1 in Table 4).

The structural model (Figure 1) was evaluated based on fit indices, magnitude, and significance of the structural path coefficients in combination with the R² values (Hair et al., 2010). A number of indices were used to determine the fit of data to the model (e.g., χ^2 /df, CFI, RMSEA, and SRMR), as shown in Table 4. These indicate that the overall model demonstrates an adequate fit (χ^2 = 555.112, df = 219, χ^2 /df = 2.535, p = 0.00, CFI = 0.908, SRMR = 0.0511, and RMSEA = 0.084).

Table 5 and Figure 2 show that seven of the direct relationships indicated in Figure 1 are statistically significant. All direct relationships included in the research model are statistically significant except for the direct relationship between customers and strategy. These results support hypothesis H1: ($B_1 = 0.247$, t = 2.642), ($B_2 = 0.191$, t = 2.155), and ($B_3 = 0.435$, t = 5.758).

Furthermore, the endogenous constructs (PTQMP and results) attain R^2 values of 0.840 and 0.770, respectively. This is higher than the substantial level of R^2 (Chin, 1998). However, as shown in Table 5, the strategy construct exhibits a value close to that level (0.539).

Table 6 shows the results for hypotheses H2, H3, and H4 and indicates that the indirect effects of both leadership and workforce on PTQMP (the mediating role of strategy) are statistically significant: (indirect effect (A_1 C) = 0.075, p \leq 0.050) and (indirect effect (A_2 C) = 0.046, p \leq 0.050), respectively. The indirect effect of customers on PTQMP (the mediating role of strategy) is not statistically significant (indirect effect (A_3 C) = 0.017, p > 0.050). These results provide partial support of H2. More specifically, H2 is supported for the indirect effect of leadership and workforce but not supported for the indirect effect of customers.

In addition, the results show a lower direct effect of leadership on PTQMP (Table 6) compared with the greater direct effect of leadership on PTQMP when the mediating role of strategy is not

Table 4. Compa	irison of structur	al equation mo	dels						
Model	x²	Ъţ	λ2/df	CFI	SRMR	RMSEA	Δ x ²	Δdf	Sig.
Model 1: The research model (Figure 1)	555.112 ***	219	2.535	0.908	0.0511	.084			
Model 2: Remove direct paths from leadership to PTQMP, from workforce to PTQMP, and from customers to PTQMP	557.420***	222	2.970	0.880	0.0589	960.0	2.308	2	n.s.
Model 3: Remove direct paths from leadership to strategy, from workforce to strategy and from customers to strategy	561.579***	221	2.821	806.0	0.0537	0.084	6.467	2	*
Notes: df = degree significance. *p < 0.05 ***p ≤ 0.001	of freedom, Δ λ²: diff	erence in chi-squar	e values between m	odels, ∆df: difference	e in number of degre	ses of freedom betw	een models, n.s.: not	: significant at p < 0.	050, sig.: statistical



Alanazi, Cogent Business & Management (2020), 7: 1771074 https://doi.org/10.1080/23311975.2020.1771074

Effect (direct causal effects)		Parameter estimates	S.E.	t-test	R ²
Customers → Strategy	(A ₃)	0.100	0.076	1.142	
Leadership → Strategy	(A ₁)	0.433	0.121	3.913***	
Workforce 🄶 Strategy	(A ₂)	0.264	0.114	2.378*	
Strategy → PTQMP	(C)	0.174	0.069	2.446*	
H1:					
Workforce 🄶 PTQMP	(B ₂)	0.191	0.088	2.155*	
Leadership 🌙 PTQMP	(B ₁)	0.247	0.099	2.642**	
Customers 🄶 PTQMP	(B ₃)	0.435	0.063	5.758***	
PTQMP	(D)	0.877	060.0	10.324***	
Strategy					0.539
PTQMP					0.840
Results					0.770
*p < 0.05; **p ≤ 0.010; ***p ≤ 0.001; standar Note: PTQMP = Primary TQM practices.	dised coefficients.				

oefficier
andardised o
≤ 0.001; st
d***
0.010;
> d**
0.05;
\sim



introduced (Appendix 2). Such results may indicate that strategy partially mediates the relationship between leadership and PTQMP. Similarly, the results show a lower direct effect of workforce on PTQMP (Table 6) compared with the greater direct effect of workforce on PTQMP when the mediating role of strategy is not introduced (Appendix 2). Such results may indicate that strategy partially mediates the relationship between workforce and PTQMP.

The results also indicate that the indirect effects of leadership, workforce, and customers on results (the mediating role of PTQMP) are statistically significant: indirect effect (B_1 D) = 0.243, $p \le 0.010$; indirect effect (B_2 D) = 0.176, $p \le 0.050$; and indirect effect (B_3 D) = 0.336, $p \le 0.001$, respectively (Table 6). These results support H3.

For H4, the results show that the indirect effects of leadership, workforce, and customers on results (the consecutive mediating role of strategy and PTQMP) are statistically significant: indirect effect (A₁ CD) = 0.283, $p \le 0.010$; indirect effect (A₂ CD) = 0.208, $p \le 0.050$; and indirect effect (A₃ CD) = 0.397, $p \le 0.001$, respectively (Table 6). These results support H4.

5. Discussion and conclusions

5.1. Discussion

In general, the results supported the four hypotheses (H1, H2, H3, H4). Hence, the study advances the extant knowledge on how TQM practices can be aligned and integrated to achieve the desired results, especially in a BEM context. In this respect, supportive TQM factors (leadership, workforce, and customers) play a central role within QMS and organisational results are the starting point for initiating and managing TQM practices. They also have a different impact on other QMS components. Furthermore, the study findings explain the pattern in which strategy and primary TQM factors mediate the relationships with the other QMS components, indicating that they play a central mediating role in a sequential and consistent manner (H4) at a system level as a whole, and variably both at the level of the system (QMS) and according to a specific mediator (strategy or primary TQM factors) (H2 and H3). The study's main findings are as follows.

First, the results support H1. The analysis indicates that supportive TQM factors drive the QMS in the organisation, where leadership, workforce, and customer factors directly and positively influence primary TQM factors. This finding is consistent with those of prior research (e.g., Rahman &

I MARE O. TIMILECT ELIECTS PLADOEN	ווו רווב ובאבמו רוו וווסמבו				
Indirect effects		Bootstrap-indirect effect	SE	Lower limit 95% CI	Upper limit 95% CI
H2:					
Leadership → Strategy→PTQMP	(A1 C)	0.075*	0.043	0.015	0.192
Workforce → Strategy→PTQMP	(A ₂ C)	0.046*	0.029	0.005	0.129
Customers → Strategy→PTQMP	(A ₃ C)	0.017	0.024	-0.012	0.089
H3:					
Leadership → PTQMP→Results	(B ₁ D)	0.243**	0.102	0.055	0.460
Workforce → PTQMP→Results	(B ₂ D)	0.176*	0.093	0.006	0.374
Customers → PTQMP→Results	(B ₃ D)	0.336***	0.077	0.193	0.497
H4:					
Leadership → Strategy→PTQMP→Results	(A1 CD)	0.283**	0.086	0.117	0.455
Workforce → Strategy→PTQMP→Results	(A ₂ CD)	0.208*	060.0	0.034	0.387
Customers → Strategy→PTQMP→Results	(A ₃ CD)	0.397***	0.079	0.238	0.551
$p < 0.05; w p \leq 0.010; w p \leq 0.001$					
Notes: Confidence intervals are bias-correct reported in standardised form.	ed based on 10,000 bootstrap	o samples. CI refers to confidence	e interval, and SE to standard	error. Results based on two-tail	ed tests. All path coefficients

ts	
icier	
oeff	
th	
ll pa	
s. A	
test	
led	
o-tai	
two	
l on	
ase(
lts b	
kesu	
or. F	
l err	
dard	
tan	
to	
d SE	
an,	
irval	
inte	
ance	
ofide	
Cor	
rs to	
refe	
Ω.	
ples.	
sam	
đ	
otsti	
ō po	
<u></u> 00,	
n 10	
o pa	
base	
ted	
orrec	
IS-CC	
ș bia	
s are	orm.
rvals	ed fc
inte	Irdise
nce	inda
lide	n stc
S	ed ir
es:	ort

Bullock, 2005), suggesting that effective leadership in the organisation oriented towards customers and an engaging and empowering workforce improve the effectiveness of primary TQM factors.

Second, support for H2 is found whereby the impact of supportive TQM factors (leadership and workforce) on primary TQM factors is enhanced via the mediating role of strategy. This means that developing, implementing, and reviewing strategy play a significant role in improving the effect of supportive TQM factors on primary TQM factors. In addition, information and tools improve over time and become more effective if integrated and connected with strategic planning. Indeed, the MBNQA model emphasises this issue by focusing on linkages: "The linkages among the criteria categories are an essential element of the systems perspective provided by the Baldrige framework. Some examples of these linkages are ... the connection between workforce planning and strategic planning ... the need for customer and market knowledge in establishing your strategy and action plans" (NIST, 2015, iii). In the context of BEMs, few studies have focused on the mediating role of strategy within QMS, although one study that does so was Suarez et al. (2016) using the EFQM model. The findings of the current study concur with these authors' findings. However, this study differs from theirs in two ways. First, it uses the MBNQA model. Second, it analyses the mediating role of strategy by operationalising supportive TQM factors as independent constructs, rather than as a combined construct. In other words, the results of this study show that integration with strategy (via its mediation role) is more pivotal and influential over time for leadership and workforce factors than for the customer factor in terms of the positive impact on primary TQM factors.

Third, support for H3 is found, as it is shown that primary TQM factors play a central role in explaining how supportive TQM factors affect organisational results. Specifically, the effective management of operations and quality tools and information improve the association between supportive TQM factors and organisational results. This finding is in line with the results of previous studies (Ho et al., 2001; Rahman & Bullock, 2005; Suarez et al., 2016). However, this study provides a deeper understanding of how the mediation effect differs according to the various supportive TQM factors. It is found that primary TQM factors play a greater mediating role between customers and results than between leadership and results. The results also indicate that primary TQM factors play a greater mediating role between workforce and results.

Fourth, H4 is supported. Strategy and primary TQM factors play a consistent and sequential mediating role in improving the effect of supportive TQM factors (leadership, workforce, and customers) on results. In other words, the synergic and sequential mediating role of strategy and primary TQM factors facilitate the process through which supportive TQM factors may lead to desired results.

An interesting insight gained from this study is the need for integration among QMS components to succeed. That is, the results illustrate that (1) the mediation role of strategy in the association between customers and primary TQM factors is not supported and (2) both strategy and primary TQM factors play a relatively less significant mediation role in enhancing the indirect effects of workforce. However, sequentially and synergically, strategy and primary TQM factors play a greater mediation role in the association between supportive TQM factors (leadership, workforce, and customers) and results. Such findings show the need to recognise and accomplish integration among QMS components to achieve desired results.

In short, this study provides insights into the positive impact of TQM practices on organisational results as well as on the need for these practices to be conducted in an interrelated and integrated way. Specifically, it shows how the relationships among such practices can be managed as a system in the context of the MBNQA model according to the sequence in Figure 3.

5.2. Managerial implications

The business conditions usually lead managers to ask the following questions: Where should we start organisational improvement practices? What are the relationships of such practices? What are their

Figure 3. Mediating relationship between supportive TQM factors, strategy, primary TQM factors, and results.

supportive TQM factors \rightarrow strategy \rightarrow primary TQM factors \rightarrow results

relative significance and sequence? This study provides useful answers for such enquiries. In this context, the study findings emphasise the importance for managers and practitioners to properly implement TQM practices to achieve desired results. TQM failures are not necessarily caused by the approach itself, as the effective implementation of the TQM approach has a significant role in achieving success (as indicated by the different results of the studied relationships). In this vein, adopting and implementing TQM practices and tools is not the only requirement. Rather, there should be a clear progression starting from leadership's commitment and direction, which engages a qualified workforce that understands and effectively participates in managing operations, quality tools, and information through an integrated strategy that leads to desired results. This finding better equips firms to determine their priorities in investing resources and focus their efforts. In addition, the mediating role of strategy in the success of the integrative relationship among TQM practices indicates the long-term nature of TQM success that managers should take into account.

5.3. Limitations and future research

The cross-sectional nature of this study prevents definitive statements about the causal relationships (Hair et al., 2010; Kline, 2010). Therefore, further research following a longitudinal study design is necessary to further confirm the causality of the suggested relationships. In addition, perceptual data were used to gauge the BEM criteria. It is important to recognise the possibility of same-source bias. This implies that future research is needed that uses multiple sources of information to further test this study's findings.

Funding

The author received no direct funding for this research.

Author details

Mohammed H. Alanazi¹

E-mail: anazim@kfsc.edu.sa;m_alanazey@hotmail.com ¹ Department of Administrative Sciences, King Fahd

Security College, Riyadh, Saudi Arabia.

Disclosure statement

No potential conflict of interest was reported by the author.

Citation information

Cite this article as: The mediating role of primary TQM factors and strategy in the relationship between supportive TQM factors and organisational results: An empirical assessment using the MBNQA model, Mohammed H. Alanazi, *Cogent Business & Management* (2020), 7: 1771074.

References

- Abdullah, M. B., Muhammad, J. U., & Tarí, J. J. (2008). The Influence of Soft Factors on Quality Improvement and Performance: Perceptions from Managers. The TQM Journal, 20(5), 436–452. https://doi.org/10.1108/ 17542730810898412
- Abosag, I., & Peter, N. (2014). Development of Special Forms of B2b Relationships: Examining the Role of Interpersonal Liking in Developing Guanxi and Et-Moone Relationships. *Industrial Marketing Management*, 43(6), 887–896. https://doi.org/http:// dx.doi.10.1016/j.indmarman.2014.05.003
- Ahire, S. L., Golhar, D. Y., & Waller, M. A. (1996). Development and Validation of TQM Implementation

Constructs. Decision Sciences, 27(1), 23–56. https:// doi.org/10.1111/j.1540-5915.1996.tb00842.x

- Al-Faraj, T. N., & Alidi, A. S. (1992). The Practice of Quality Control Techniques in the Saudi Arabian Manufacturing Sectors. International Journal of Quality & Reliability Management, 9(7), 64–68. https:// doi.org/10.1108/02656719210020441
- Anderson, J. C., & Gerbing, D. W. (1988). Structural Equation Modeling in Practice: A Review and Recommended Two-Step Approach. Psychological bulletin, 103(3), 411–423. https://doi.org/10.1037/ 0033-2909.103.3.411
- Arbuckle, J. L. (2014). Amos 23 User's Guide. SPSS. Armstrong, J. S., & Overton, T. S. (1977). Estimating Nonresponse Bias in Mail Surveys. Journal of Marketing Research, 14(4), 396–402. https://doi.org/ 10.1177/002224377701400320
- Badri, A. M., Selim, H., Alshare, K., Grandon, E. E., Younis, H., & Abdulla, M. (2006). The Baldrige Education Criteria for Performance Excellence Framework. International Journal of Quality & Reliability Management, 23(9), 1118–1157. https:// doi.org/10.1108/02656710610704249
- Bagozzi, R. P., & Edwards, J. R. (1998). A General Approach for Representing Constructs in Organizational Research. Organizational Research Methods, 1(1), 45–87. https://doi.org/10.1177/109442819800100104
- Bagozzi, R. P., & Phillips, L. W. (1982). Representing and Testing Organizational Theories: A Holistic Construal. Administrative science quarterly, 27(3), 459–489. https://doi.org/10.2307/2392322
- Bagozzi, R. P., & Youjae, Y. (1988). On the Evaluation of Structural Equation Models. *Journal of the Academy* of Marketing Science, 16(1), 74–94. https://doi.org/10. 1007/BF02723327

- Bayo-Moriones, A., Merino-Díaz-de-Cerio, J., Escamilla-de-León, S. A., & Selvam, R. M. (2011). The Impact of ISO 9000 and EFQM on the Use of Flexible Work Practices. International Journal of Production Economics, 130 (1), 33–42. https://doi.org/10.1016/j.ijpe.2010.10.012
- Bollen, K. A. (1989). Structural Equations with Latent Variables. John Wiley & Sons.
- Bou-Llusar, C. J., Escrig-Tena, A. B., Roca-Puig, V., & Beltrán-Martín, I. (2005). To What Extent Do Enablers Explain Results in the EFQM Excellence Model? International Journal of Quality & Reliability Management, 22(4), 337–353. https://doi.org/10. 1108/02656710510591192
- Bou-Llusar, J. C., Escrig-Tena, A. B., Roca-Puig, V., & Beltrán-Martín, I. (2009). An Empirical Assessment of the EFQM Excellence Model: Evaluation as a TQM Framework Relative to the MBNQA Model. Journal of Operations Management, 27(1), 1–22. https://doi.org/ 10.1016/j.jom.2008.04.001
- Boulter, L., Bendell, T., & Dahlgaard, J. (2013). Total Quality Beyond North America: A Comparative Analysis of the Performance of European Excellence Award Winners. International Journal of Operations & Production Management, 33(2), 197–215. https://doi. org/10.1108/01443571311295635
- Browne, M. W., & Cudeck, R. (1989). Single Sample Cross-Validation Indices for Covariance Structures. *Multivariate behavioral research*, 24(4), 445–455. https://doi.org/10.1207/s15327906mbr2404_4
- Bryman, A., & Bell, E. (2015). Business Research Methods. Oxford University Press.
- Byrne, B. M. (2010). *Structural Equation Modeling with* Amos: Basic Concepts, Applications, and Programming (2nd ed.). Routledge.
- Calvo-Mora, A., Domínguez-CC, M., & Criado, F. (2018). Assessment and Improvement of Organisational Social Impact through the EFQM Excellence Model. *Total Quality Management & Business Excellence*, 29 (11–12), 1259–1278. https://doi.org/10.1080/ 14783363.2016.1253465
- Calvo-Mora, A., Leal, A., & Roldán, J. L. (2005). Relationships between the EFQM Model Criteria: A Study in Spanish Universities. *Total Quality Management & Business Excellence*, 16(6), 741–770. https://doi.org/10.1080/14783360500077708
- Calvo-Mora, A., Picón, A., Ruiz, C., & Cauzo, L. (2013). The Relationships between Soft-Hard TQM Factors and Key Business Results. *International Journal of Operations & Production Management*, 34(1), 115–143. https://doi.org/10.1108/IJOPM-09-2012-0355
- Calvo-Mora, A., Picón-Berjoyo, A., Ruiz-Moreno, C., & Cauzo-Bottala, L. (2015). Contextual and Mediation Analysis between TQM Critical Factors and Organisational Results in the EFQM Excellence Model Framework. International Journal of Production Research, 53(7), 2186–2201. https://doi.org/10.1080/ 00207543.2014.975859
- Calvo-Mora, A., Ruiz-Moreno, C., Picón-Berjoyo, A., & Cauzo-Bottala, L. (2014). Mediation Effect of TQM Technical Factors in Excellence Management Systems. *Journal* of business research, 67(5), 769–774. https://doi.org/ 10.1016/j.jbusres.2013.11.042
- Camison, C. (1996). Total Quality Management in Hospitality: An Application of the EFQM Model. *Tourism Management*, 17(3), 191–201. https://doi. org/10.1016/0261-5177(96)00006-4
- Chang, S.-J., van Witteloostuijn, A., & Eden, L. (2010). From the Editors: Common Method Variance in International Business Research. *Journal of*

International Business Studies, 41(2), 178–184. https://doi.org/10.1057/jibs.2009.88

- Chin, W. W. (1998). Commentary: Issues and Opinion on Structural Equation Modeling. *MIS Quarterly*, 22(1), Vii–Xvi. https://www.jstor.org/stable/249674
- Cronbach, L. J. (1951). Coefficient Alpha and the Internal Structure of Tests. *Psychometrika*, 16(3), 297–334. https://doi.org/10.1007/BF02310555
- Crosby, P. B. (1980). Quality Is Free: The Art of Making Quality Certain. Mentor.
- Curkovic, S., Melnyk, S., Calantone, R., & Handfield, R. (2000). Validating the Malcolm Baldrige National Quality Award Framework through Structural Equation Modelling. International Journal of Production Research, 38(4), 765–791. https://doi.org/ 10.1080/002075400189149
- Dahlgaard-Park, S., Mi, C.-K. C., Jang, J.-Y., & Dahlgaard, J. J. (2013). Diagnosing and Prognosticating the Quality Movement– A Review on the 25 Years Quality Literature (1987–2011). Total Quality Management & Business Excellence, 24(1–2), 1–18. https://doi.org/10.1080/14783363.2012. 756749
- Dale, B. G., Wiele, A. V. D., & Iwaarden, J. V. (2007). Managing Quality (5th ed.). Blackwell Pub.
- Danyen, S., & Callychurn, D. S. (2015). Total Quality Management Success Factors and Their Relationships with Performance Measures in the Food Industry: A Mauritian Case Study. International Journal of Productivity and Quality Management, 16(3), 249–266. https://doi.org/10.1504/IJPQM.2015. 071520
- Deming, W. E. (1982). *Quality, Productivity, and Competitive Position*. Center for Advanced Engineering Study, MIT.
- Dow, D., Samson, D., & Ford, S. (1999). Exploding the Myth: Do All Quality Management Practices Contribute to Superior Quality Performance? Production and Operations Management, 8(1), 1–27. https://doi.org/10.1111/j.1937-5956.1999.tb00058.x
- Dubey, R., & Gunasekaran, A. (2015). Exploring Soft TQM Dimensions and Their Impact on Firm Performance: Some Exploratory Empirical Results. International Journal of Production Research, 53(2), 371–382. https://doi.org/10.1080/00207543.2014.933909
- Eddleston, K. A., & Kellermanns, F. W. (2007). Destructive and Productive Family Relationships: A Stewardship Theory Perspective. *Journal of Business Venturing*, 22 (4), 545–565. https://doi.org/10.1016/j.jbusvent.2006. 06.004
- EFQM. (2013). EFQM Excellence Model. European Foundation for Quality Management.
- Escrig, A. B., & de Menezes, L. M. (2015). What Characterizes Leading Companies within Business Excellence Models? An Analysis of "EFQM Recognized for Excellence" Recipients in Spain. International Journal of Production Economics, 169, 362–375. https://doi.org/10.1016/j.ijpe.2015.08.019
- Evans, J., & Lindsay, W. (2014). Managing for Quality and Performance Excellence. Cengage Learning.
- Flynn, B. B., & Saladin, B. (2001). Further Evidence on the Validity of the Theoretical Models Underlying the Baldrige Criteria. *Journal of Operations Management*, 19(6), 617–652. https://doi.org/10.1016/S0272-6963(01)00072-9
- Flynn, B. B., Schroeder, R. G., & Sakakibara, S. (1994). A Framework for Quality Management Research and an Associated Measurement Instrument. *Journal of Operations management*, 11(4), 339–366. https://doi. org/10.1016/S0272-6963(97)90004-8

- Flynn, B. B., Schroeder, R. G., & Sakakibara, S. (1995). The Impact of Quality Management Practices on Performance and Competitive Advantage. *Decision Sciences*, 26(5), 659–691. https://doi.org/10.1111/j. 1540-5915.1995.tb01445.x
- Fornell, C., & Larcker, D. F. (1981). Evaluating Structural Equation Models with Unobservable Variables and Measurement Error. *Journal of Marketing Research*, 18(1), 39–50. https://doi.org/10.2307/3151312
- Fotopoulos, C. V., & Psomas, E. L. (2010). The Structural Relationships between TQM Factors and Organizational Performance. *The TQM journal*, 22(5), 539–552. https://doi.org/10.1108/ 17542731011072874
- Gadenne, D., & Sharma, B. (2009). An Investigation of the Hard and Soft Quality Management Factors of Australian Smes and Their Association with Firm Performance. International Journal of Quality & Reliability Management, 26(9), 865–880. https://doi. org/10.1108/02656710910995064
- Gómez-López, R., Serrano-Bedia, A. M., & López-Fernández, M. C. (2016). Motivations for Implementing TQM through the EFQM Model in Spain: An Empirical Investigation. Total Quality Management & Business Excellence, 27(11–12), 1224–1245. https://doi.org/10.1080/14783363.2015. 1068688
- Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2010). Multivariate Data Analysis (7th ed.). Pearson Education.
- Hayes, A. F. (2017). Introduction to Mediation, Moderation, and Conditional Process Analysis: A Regression-Based Approach. Guilford Publications.
- He, Z., Hill, J., Wang, P., & Yue, G. (2011). Validation of the Theoretical Model Underlying the Baldrige Criteria: Evidence from China. *Total Quality Management & Business Excellence*, 22(2), 243–263. https://doi.org/ 10.1080/14783363.2010.545562
- Heras-Saizarbitoria, I., Casadesus, M., & Marimon, F. (2011). The Impact of ISO 9001 Standard and the EFQM Model: The View of the Assessors. *Total Quality Management*, 22(2), 197–218. https://doi.org/10. 1080/14783363.2010.532330
- Ho, D. C. K., Duffy, V. G., & Shih, H. M. (2001). Total Quality Management: An Empirical Test for Mediation Effect. International Journal of Production Research, 39(3), 529–548. https://doi.org/10.1080/ 00207540010005709
- Juran, J. M., & Gryna, F. M. (1993). Quality Planning and Analysis (3rd ed.). McGraw-Hill.
- Kanji, G. K., & Wallace, W. (2000). Business Excellence through Customer Satisfaction. *Total Quality Management*, 11(7), 979–998. https://doi.org/10. 1080/09544120050135515
- Kartha, C. P. (2004). A Comparison of ISO 9000: 2000 Quality System Standards, Qs9000, ISO/Ts 16949 and Baldrige Criteria. *The TQM magazine*, *16*(5), 331–340. https://doi.org/10.1108/09544780410551269
- Kautonen, T., Gelderen, M., & Fink, M. (2015). Robustness of the Theory of Planned Behavior in Predicting Entrepreneurial Intentions and Actions. Entrepreneurship Theory and Practice, 39(3), 655–674. https://doi.org/10.1111/etap.12056
- Kaynak, H. (2003). The Relationship between Total Quality Management Practices and Their Effects on Firm Performance. *Journal of Operations Management*, 21(4), 405–435. https://doi.org/10.1016/S0272-6963(03) 00004-4
- Kaynak, H., & Hartley, J. L. (2005). Exploring Quality Management Practices and High Tech Firm Performance. *The Journal of High Technology*

Management Research, 16(2), 255–272. https://doi. org/10.1016/j.hitech.2005.10.002

- Kim, D. Y., Kumar, V., & Murphy, S. A. (2010). European Foundation for Quality Management Business Excellence Model. International Journal of Quality & Reliability Management, 27(6), 684–701. https://doi. org/doi:10.1108/02656711011054551
- Kline, R. B. (2010). Principles and Practice of Structural Equation Modeling (3rd ed.). Guilford Publications.
- Kochan, T. A., Gittell, J. H., & Lautsch, B. A. (1995). Total Quality Management and Human Resource Systems: An International Comparison. International Journal of Human Resource Management, 6(2), 201–222. https://doi.org/10.1080/09585199500000017
- Kumar, V., & Sharma, R. R. K. (2017). An Empirical Investigation of Critical Success Factors Influencing the Successful TQM Implementation for Firms with Different Strategic Orientation. International Journal of Quality & Reliability Management, 34(9), 1530–1550. https://doi.org/10.1108/IJQRM-09-2016-0157
- La Rotta, D., & Rave, J. P. (2016). A Relevant Literary Space on the Use of the European Foundation for Quality Management Model: Current State and Challenges. *Total Quality Management & Business Excellence*, *28*(13–14), 1–22. https://doi.org/10.1080/ 14783363.2016.1150168
- Landis, R. S., Beal, D. J., & Tesluk, P. E. (2000). A Comparison of Approaches to Forming Composite Measures in Structural Equation Models. *Organizational Research Methods*, 3(2), 186–207. https://doi.org/10.1177/109442810032003
- Lee, D., & Lee, D. H. (2013). A Comparative Study of Quality Awards: Evolving Criteria and Research. Service Business, 7(3), 347–362. https://doi.org/10. 1007/s11628-012-0172-8
- Little, T. D., Cunningham, W. A., Shahar, G., & Widaman, K. F. (2002). To Parcel or Not to Parcel: Exploring the Question, Weighing the Merits. *Structural Equation Modeling: A Multidisciplinary Journal*, 9(2), 151–173. https://doi.org/10.1207/ S15328007SEM0902_1
- Medsker, G. J., Williams, L. J., & Holahan, P. J. (1994). A Review of Current Practices for Evaluating Causal Models in Organizational Behavior and Human Resources Management Research. Journal of management, 20(2), 439–464. https://doi.org/10.1177/ 014920639402000207
- Meyer, S. M., & Collier, D. A. (2001). An Empirical Test of the Causal Relationships in the Baldrige Health Care Pilot Criteria. Journal of Operations Management, 19 (4), 403–426. https://doi.org/10.1016/S0272-6963(01) 00053-5
- Moon, J.-Y., Lee, S.-C., Yong-Seung, P., & Suh, Y.-H. (2011). A Study on the Causal Relationships in the Korean National Quality Award Model. *Total Quality Management & Business Excellence*, 22(7), 705–726. https://doi.org/10.1080/14783363.2011.585767
- Mulaik, S. A., James, L. R., Van Alstine, J., Bennett, N., Lind, S., & Dean Stilwell, C. (1989). Evaluation of Goodness-of-Fit Indices for Structural Equation Models. *Psychological bulletin*, 105(3), 430-445. https://doi.org/10.1037/0033-2909.105.3.430
- NIST. (2015). Baldrige Excellence Framework. National Institute of Standards and Technology.
- Oakland, J. S. (2001). Total Organizational Excellence: Achieving World-Class Performance. Butterworth-Heinemann.
- Oakland, J. S. (2011). Leadership and Policy Deployment: The Backbone of TQM. Total Quality Management & Business Excellence, 22(5), 517–534. https://doi.org/ 10.1080/14783363.2011.579407

Oakland, J. S. (2014). Total Quality Management and Operational Excellence:. Text with Cases: Routledge. Para-González, L., Jiménez-Jiménez, D., & Martínez-

Lorente, Á. R. 2015. "The Importance of Intellectual Capital in the EFQM Model of Excellence." European conference on intellectual capital. Spain.

Peng, X., & Prybutok, V. (2015). Relative Effectiveness of the Malcolm Baldrige National Quality Award Categories. International Journal of Production Research, 53(2), 629–647. https://doi.org/10.1080/ 00207543.2014.961207

Peng, X., Prybutok, V., & Xie, H. (2019). Integration of Supply Chain Management and Quality Management within a Quality Focused Organizational Framework. International Journal of Production Research, 58(2), 448-466. https://doi.org/10.1080/00207543.2019. 1593548

Podsakoff, P. M., MacKenzie, S. B., Lee, J.-Y., & Podsakoff, N. P. (2003). Common Method Biases in Behavioral Research: A Critical Review of the Literature and Recommended Remedies. Journal of Applied Psychology, 88(5), 879–903. https://doi.org/ 10.1037/0021-9010.88.5.879

Porter, L., & Tanner, S. (2004). Assessing Business Excellence. Elsevier Butterworth-Heinemann.

Powell, T. C. (1995). Total Quality Management as Competitive Advantage: A Review and Empirical Study. Strategic Management Journal, 16(1), 15–37. https://doi.org/10.1002/smj.4250160105

Prahinski, C., & Benton, W. C. (2004). Supplier Evaluations: Communication Strategies to Improve Supplier Performance. Journal of Operations Management, 22 (1), 39–62. https://doi.org/10.1016/j.jom.2003.12.005

Prajogo, D. I., & Sohal, A. S. (2006). The Relationship between Organization Strategy, Total Quality Management (TQM), and Organization Performance--the Mediating Role of TQM. European journal of operational research, 168(1), 35–50. https:// doi.org/10.1016/j.ejor.2004.03.033

Preacher, K. J., & Hayes, A. F. (2008). Asymptotic and Resampling Strategies for Assessing and Comparing Indirect Effects in Multiple Mediator Models. *Behavior research methods*, 40(3), 879–891. https://doi.org/10. 3758/BRM.40.3.879

Prybutok, V., Zhang, X., & Peak, D. (2011). Assessing the Effectiveness of the Malcolm Baldrige National Quality Award Model with Municipal Government. Socio-economic planning sciences, 45(3), 118–129. https://doi.org/10.1016/j.seps.2010.12.003

Psomas, E. L., & Jaca, C. (2016). The Impact of Total Quality Management on Service Company Performance: Evidence from Spain. International Journal of Quality & Reliability Management, 33(3), 380–398. https://doi. org/10.1108/IJQRM-07-2014-0090

Rahman, S.-U., & Bullock, P. (2005). Soft TQM, Hard TQM, and Organisational Performance Relationships: An Empirical Investigation. Omega, 33(1), 73–83. https:// doi.org/10.1016/j.omega.2004.03.008

Rao Tummala, V. M., & Tang, C. L. (1996). Strategic Quality Management, Malcolm Baldrige and European Quality Awards and ISO 9000 Certification: Core Concepts and Comparative Analysis. International Journal of Quality & Reliability Management, 13(4), 8–38. https://doi.org/10.1108/02656719610114371

Reiner, G. 2002. "Analysis of Critical Factors of Company Success Based on the EFQM Excellence Model." In Proceeding of the 7th world congress for total quality management, 361–366. Verona, Italy.

Ritchie, L., & Dale, B. G. (2000). Self-Assessment Using the Business Excellence Model: A Study of Practice and Process. International Journal of Production Economics, 66(3), 241-254. https://doi.org/10.1016/ S0925-5273(99)00130-9

Santos-Vijande, M. L., & Alvarez-Gonzalez, L. I. (2007). TQM and Firms Performance: An EFQM Excellence Model Research Based Survey. International Journal of Business Science and Applied Management, 2(2), 21–41. http://hdl.handle.net/10419/190585

Saraph, J. V., George Benson, P., & Schroeder, R. G. (1989). An Instrument for Measuring the Critical Factors of Quality Management. *Decision sciences*, 20(4), 810–829. https://doi.org/10.1111/j.1540-5915.1989. tb01421.x

- Schumacker, R. E., & Lomax, R. G. (2010). A Beginner's Guide to Structural Equation Modeling (3rd ed.). Routledge.
- Sharma, R., Yetton, P., & Crawford, J. (2009). Estimating the Effect of Common Method Variance: The Method —Method Pair Technique with an Illustration from TAM Research. MIS Quarterly, 33(3), 473–490. https:// doi.org/10.2307/20650305
- Shook, C. L., Ketchen, D. J., Hult, G. T. M., & Kacmar, K. M. (2004). An Assessment of the Use of Structural Equation Modeling in Strategic Management Research. Strategic Management Journal, 25(4), 397–404. https://doi.org/10.1002/smj.385
- Sila, I. (2007). Examining the Effects of Contextual Factors on TQM and Performance through the Lens of Organizational Theories: An Empirical Study. *Journal* of Operations Management, 25(1), 83–109. https:// doi.org/10.1016/j.jom.2006.02.003
- Spencer, B. A. (1994). Models of Organization and Total Quality Management: A Comparison and Critical Evaluation. Academy of Management Review, 19(3), 446–471. https://doi.org/10.5465/amr.1994. 9412271807
- Stok, M., Zlatka, M. M., & Markic, M. (2009). The Advantage of the EFQM Excellence Model in Business Management and Leadership. International Journal of Entrepreneurship and Small Business, 8(3), 399–410. https://doi.org/10.1504/IJESB.2009.025088
- Suarez, E., Calvo-Mora, A., & Roldán, J. L. (2016). The Role of Strategic Planning in Excellence Management Systems. European journal of operational research, 248(2), 532–542. https://doi.org/10.1016/j.ejor.2015.07.008
- Sweis, R. J., Saleh, R. A., Al-Etayyem, R. H., Qasrawi, B., & Al Mahmoud, A. M. (2016). Total Quality Management Practices and Organisational Performance in Jordanian Courier Services. International Journal of Productivity and Quality Management, 19(2), 258–276. https://doi.org/10.1504/IJPQM.2016. 078889

Tamimi, N. (1998). A Second-Order Factor Analysis of Critical TQM Factors. International Journal of Quality Science, 3(1), 71–79. https://doi.org/10.1108/ 13598539810196886

- Tata, J., Prasad, S., & Thorn, R. (1999). The Influence of Organizational Structure on the Effectiveness of TQM Programs. Journal of Managerial Issues, 11(4), 440–453. https://www.jstor.org/stable/40604284
- Taylor, W. A., & Wright, G. H. (2003). A Longitudinal Study of TQM Implementation: Factors Influencing Success and Failure. Omega, 31(2), 97–111. https://doi.org/10. 1016/S0305-0483(03)00017-3
- Terziovski, M., Power, D., & Sohal, A. S. (2003). The Longitudinal Effects of the ISO 9000 Certification Process on Business Performance. *European journal* of operational research, 146(3), 580–595. https://doi. org/10.1016/S0377-2217(02)00252-7

Tutuncu, O., & Kucukusta, D. (2007). Relationship between Organizational Commitment and EFQM Business Excellence Model: A Study on Turkish Quality Award Winners. Total Quality Management, 18(10), 1083-1096. https://doi.org/10.1080/ 14783360701594709

- Wilson, D. D., & Collier, D. A. (2000). An Empirical Investigation of the Malcolm Baldrige National Quality Award Causal Model. *Decision Sciences*, *31*(2), 361–383. https://doi.org/10.1111/j.1540-5915.2000.tb01627.x
- Zatzick, C. D., Moliterno, T. P., & Fang, T. (2012). Strategic (Mis) Fit: The Implementation of TQM in Manufacturing Organizations. *Strategic Management Journal*, 33(11), 1321–1330. https://doi.org/10.1002/ smj.1988
- Zeng, J., Phan, C. A., & Matsui, Y. (2015). The Impact of Hard and Soft Quality Management on Quality and

Innovation Performance: An Empirical Study. International Journal of Production Economics, 162, 216–226. https://doi.org/10.1016/j.ijpe.2014.07.006

- Zhang, X., & Bartol, K. M. (2010). Linking Empowering Leadership and Employee Creativity: The Influence of Psychological Empowerment, Intrinsic Motivation, and Creative Process Engagement. Academy of Management Journal, 53(1), 107–128. https://doi.org/ 10.5465/amj.2010.48037118
- Zhou, L., Barnes, B. R., & Lu, Y. (2010). Entrepreneurial Proclivity, Capability Upgrading and Performance Advantage of Newness among International New Ventures. Journal of International Business Studies, 41(5), 882–905. https://doi.org/10.1057/jibs.2009.87

Appendix 1. Measurement scales ^{a, b}and factor loadings ^c.

1. Leadership
1.1. Vision, values, and mission 0.851
The organisation achieves high quality performance that applies through all facets of the organisation.
The organisation maintains effective communication channels to deliver the values and expectations of senior leaders to employees.
Management in the organisation sets strategy, goals, and objectives.
Management in the organisation establishes and reinforces an environment that fosters empowerment a innovation.
Management encourages and supports organisational and employee learning.
1.2. Communication and organisational performance—0.627
The organisation regularly evaluates all functions' performance and capabilities.*
The organisation utilises performance reviews to identify opportunities for improvement and innovation.
1.3 Governance and social responsibility—0.871
Management in the organisation cares about the impacts of its products, services, and operations on society.
The organisation actively supports and strengthens the relationships with key communities, such as religio and educational organisations and professional associations.
2. Strategy
2.1. Strategy Development Process—0.856
The organisation establishes a short-term (1–2 years) plan to help achieve goals and objectives.
The organisation establishes a long-term (2–5 years) plan to help achieve goals and objectives.
2.2. Strategic Objectives—0.903
The organisation establishes a strategy/plan to improve customer satisfaction.
The organisation establishes human resource requirements and plans considering employees' capabilitie and needs.
The organisation establishes a strategy/plan to strengthen supplier-partner relationships.
2.3. Strategy Implementation—0.833
The organisation establishes a strategy/plan to address key goals and objectives.
The organisation uses performance measures to track the progress of action plans.
The organisation allocates resources to achieve overall action plans.
3. Customers
3.1. Voice of the Customers—0.879
The organisation measures and analyses customer satisfaction and dissatisfaction.
The organisation compares its customer satisfaction results with its competitors or other benchmarks.
3.2. Product Offerings and Customer Support—0.893
The organisation has an official method to determine current product/service requirements and custome expectations.
The organisation has an official method to determine future product/service requirements and customer expectations.
The organisation has an official method to identify customer groups and market segments.
3.3. Customer Relationships—0.853
The organisation implements effective customer relationship management practices to ensure customer seek assistance.
The organisation continuously improves its customer relationship management practices.*
The organisation determines key customer requirements and delivers them to all employees in the respor chain.*

The organisation resolves customer complaints promptly and effectively.

(Continued)

(Continued)

The organisation officially examines customer complaints to improve its processes.*

4. Primary TQM Practices

4.1. Measurement, Analysis, and Improvement of Organisational Performance-0.853

The organisation offers effective measurement techniques to ensure the following qualities of data and information are achieved (1–5): Reliability Consistency Accessibility

Review*

Timely update

The organisation regularly compares its performance with its competitors or other benchmarks to support its performance, evaluation, and improvement.*

4.2. Knowledge Management, Information, and Information Technology-0.863

The organisation systematically analyses performance data and information collected internally to support its overall quality goals.

The organisation systematically analyses performance data and information collected externally to support its overall quality goals.

4.3. Operations—0.607

The organisation establishes a systematic method to introduce new products/services, including the following items (1-3):

Including customer requirements in the design.

Addressing quality issues early in the design cycle.

Analysing relevant process capabilities.

The organisation monitors the processes producing products/services to identify necessary actions to make corrections.

The organisation continuously improves the processes used to provide its products and services.

The organisation formally assesses the quality of its (6-8):

Products/services

Production/delivery systems

Goods/services supplied by external suppliers/partners

The organisation communicates its quality requirements to all external suppliers of goods/services.*

5. Workforce

5.1. Workforce Capability and Capacity-0.715

The organisation establishes human resource plans derived from its strategic plans to achieve the full potential of its workforce.

5.2. Workforce Climate—0.804

The organisation tries to build a work environment beneficial to the followings items (2–5): Performance excellence* Full involvement Personal growth

Organisational growth*

The organisation supports a work environment that is beneficial to the well-being and growth of all employees.

5.3. Organisational Culture—0.712

The organisation promotes cooperation, individual initiatives, innovation, and flexibility.

5.4. Assessment of Engagement-0.806

The organisation regularly examines employee satisfaction and utilises the results to support quality and innovation.

5.5. Performance Management—0.811

The organisation's compensation, recognition, and related reward practices encourage high performance.

5.6. Learning and Development System—0.758

The organisation establishes formal education and training programmes to meet business and individual needs.

(Continued)

All employees in the organisation receive the necessary training for accomplishing their job responsibilities.

6. Results

6.1. Customer-focused results—0.814

The organisation's current level is superior to its competitors or other benchmarks in terms of the following items (1–14):

Customer satisfaction Customer loyalty and positive referral Customer-perceived value

6.2. Financial and market results—0.701

Financial performance

6.3. Product and process results-0.790

Quality Supplier/partner performance* Productivity

6.4. Workforce-focused results—0.853

Employee well-being and growth Employee satisfaction

6.5. Leadership and governance results-0.754

Regulatory/legal compliance Environmental citizenship Fostering economic development Community support*

Notes:

(a) Each measurement item was written as a perceptual statement paired with a seven-point Likert scale ranging from "Strongly Disagree" to "Strongly Agree".

(b) Items were evaluated then refined with a pre-test through groups of experts and targeted respondents that helped to ensure that they were written to avoid potential response errors.

(c) Factor loadings are standardised.

(*) Dropped items.

Appendix 2. Parameter estimates, standard errors, and t-test results for Model 3

Effect (direct causal effects)	Parameter estimates	S.E.	t-test
Workforce $ ightarrow$ PTQMP	0.232	0.091	2.529*
Leadership $ ightarrow$ PTQMP	0.321	0.0955	3.573***
Customers \rightarrow PTQMP	0.457	0.065	5.875***
PTQMP → Results	0.811	0.090	10.345***

*p < 0.05; **p \leq 0.010; ***p \leq 0.001; standardised coefficients.



© 2020 The Author(s). This open access article is distributed under a Creative Commons Attribution (CC-BY) 4.0 license.

You are free to:

Share — copy and redistribute the material in any medium or format. Adapt — remix, transform, and build upon the material for any purpose, even commercially. The licensor cannot revoke these freedoms as long as you follow the license terms. Under the following terms: Attribution — You must give appropriate credit, provide a link to the license, and indicate if changes were made. You may do so in any reasonable manner, but not in any way that suggests the licensor endorses you or your use. No additional restrictions You may not apply legal terms or technological measures that legally restrict others from doing anything the license permits.

Cogent Business & Management (ISSN: 2331-1975) is published by Cogent OA, part of Taylor & Francis Group. Publishing with Cogent OA ensures:

- Immediate, universal access to your article on publication
- High visibility and discoverability via the Cogent OA website as well as Taylor & Francis Online
- Download and citation statistics for your article
- Rapid online publication
- Input from, and dialog with, expert editors and editorial boards
- Retention of full copyright of your article
- Guaranteed legacy preservation of your article
- Discounts and waivers for authors in developing regions

Submit your manuscript to a Cogent OA journal at www.CogentOA.com