

PAPER • OPEN ACCESS

Mediator Effect of TPM between TQM and Business Performance in Malaysia Automotive Industry

To cite this article: M F Ahmad *et al* 2015 *IOP Conf. Ser.: Mater. Sci. Eng.* **83** 012015

View the [article online](#) for updates and enhancements.

Related content

- [Mediator effect of statistical process control between Total Quality Management \(TQM\) and business performance in Malaysian Automotive Industry](#)
M F Ahmad, R Z Rasi, N Zakuan *et al.*
- [Modern technologies and business performance in creative industries: a framework of analysis](#)
A Bujor and S Avsilcai
- [Meta-analysis of the relationship between TQM and Business Performance](#)
Ahmad M F, Zakuan N, Jusoh A *et al.*



ECS **240th ECS Meeting**
Oct 10-14, 2021, Orlando, Florida

Register early and save up to 20% on registration costs

Early registration deadline Sep 13

REGISTER NOW

Mediator Effect of TPM between TQM and Business Performance in Malaysia Automotive Industry

Ahmad, M.F^{1,a}, Zakuan, N^{2,b}, Raja Zuraidah RM Rasi^{1,c} and MNN Hisyamudin^{3,d}

1 Department of Production and Operation, Faculty of Technology Management and Business, Universiti Tun Hussein Onn Malaysia (UTHM), Parit Raja, Batu Pahat, Johor, Malaysia

2 Department of Management, Faculty of Management, Universiti Teknologi Malaysia (UTM), Skudai, Johor, Malaysia

3 Department of Materials & Design Engineering, Faculty of Mechanical Engineering Universiti Tun Hussein Onn Malaysia (UTHM), Parit Raja, Batu Pahat, Johor, Malaysia

E-mail: ^amohdfauzi@uthm.edu.my, ^bnorhayatimz@utm.my, ^crzuraida@uthm.edu.my, ^dnhisham@uthm.edu.my

Abstract. Total Quality Management (TQM) is vital management tool in ensuring a company can success in the continuously growing competition in the global market. In order to survive in the global market with intense competition amongst regions and enterprises, the adoption of tools and techniques are essential in improving business performance. However, only few previous studies have examined the mediators and moderators between TQM and business performance. This present research proposed a TQM performance model with mediator effect of TPM with structural equation modelling, which is a more comprehensive model for developing countries, specifically for Malaysia. A questionnaire was prepared and sent to 1500 companies from automotive industry and the related vendors in Malaysia, giving a 21.3 per cent rate. The result concludes that TPM is partial mediation between and TQM and Business Performance with indirect effect (IE) is 0.25 which can be categorised as high mediator effect.

1.0 Introduction

The concept of total quality management (TQM) has been developed as a result of intense global competition [1][2]. Firms that manage the international trade in global competition have put emphasis on TQM philosophy, procedures, tools and techniques[3][4][5]. Juran [6] defines TQM as philosophy aimed at achieving business excellence through the application of tools and technique, as well as the management of soft aspects, such as human motivation in work. Furthermore, Demirbag et.al [7] defines TQM as a management philosophy aims to contribute continuous improvement in the organization with the participation of all employees to achieve customer satisfaction by producing better, cheaper, faster and safer than competitors. However, the study of mediators is neglected and is referred to less frequently in literature review [8][9]. The fundamental systems-interactive paradigm of organisational analysis features the continual stages of input, throughput (processing), and output, which demonstrate the concept of openness and closeness. Processing is the process of changing from



one “look” to another, or one culture to another [10]. In this study, the author defines input as TQM; processing as application tools and techniques namely TPM; and output as business performance as shown in Figure 1. Thus, one of the objectives of this study is to empirically analyse the impact of TPM between TQM and business performance.

2.0 Literature Review

The purpose of TPM is to minimise breakdown and to maximise equipment availability of production systems at minimal cost [12]. TPM can be defined as an improvement programme that establishes a comprehensive productive-maintenance system throughout the entire life of the equipment with the participation of all employees through voluntary team-based activities [15]. However, only few previous studies have examined the mediators and moderators between TQM and business performance [16]. The inconsistent results between TQM and BP are because the mediators and moderators have been overlooked in research designs [17]. This present research proposed a TQM performance model with mediator effect of TPM with structural equation modelling, which is a more comprehensive model for developing countries, specifically for Malaysia.

Research Hypothesis

Relationship among TQM, TPM, and Business Performance

H1: Relationship between TQM and Business Performance

Most previous studies indicate a significant relationship between TQM practices and business performance [18]; [19]. In contrast, other studies show that TQM does not improve business performance [20]; [7]. Other findings show partial correlation between TQM practices and business performance [7]. Accordingly, the author proposes that:

H1: TQM practices are positively significant and have direct effects on business performance.

TPM is significantly supported by TQM for improving business performance [21]. Teeravarapug et al., [22] suggest that TQM and TPM should be implemented before lean production. Two sets of factors are critical for the effectiveness of TQM and TPM: (1) universally significant factors for all three approaches such as leadership, process management, and strategic planning; and (2) approach-specific factors such as equipment management and focus on customer satisfaction [23]. Thus, TQM practices are positively correlated with TPM.

H2a: TQM practices are positively significance and direct effect on TPM.

Ahuja and Khamba [24] note the critical success factors of TPM, such as top management leadership and involvement, maintenance practices, as well as holistic TPM initiatives, enhance business performance in Indian industry. Konecny and Thun [21] indicate that TQM and TPM supported by human resource practices significantly improve business performance. Ahmad et al., [1] and Nakajima [12] indicate that TPM practices have impact on business performance. Therefore, TPM practices are positively correlated with business performance. Accordingly, the author proposes that:

H2b: TPM practices are positively significance and direct effect on business performance.

There are lack of empirical evidences of TPM as mediator between TQM and business performance in previous work [16]. TQM provides soft and hard aspects such knowledge, skill, continuous improvement and work environment and culture to support adoption of TPM implementation [24],[25]. Meanwhile, TPM has positively impacts on business performance [6], [27]. Thus, TQM will be helpful for effective and efficient in TPM adoption, in turn increasing business performance. ***H2: TPM is a mediator between TQM and business performance.***

2.0 Methodology

A total of 1500 questionnaires were mailed to these companies. A total 327 questionnaires were returned which represented about 21.8% response rate. The number of returned questionnaires that were found to be usable in this study was 319, which represented about 21.3% response rate.

3.0 Result

SEM

TPM as the mediator variable was included into the model, as shown in Figure 1. Table 1 shows that the relationship between TQM and BP was reduced when TPM was included in the model, but the relationship was still significant with *rc* from 0.81 (*CR*=13.177, *p*<0.01) to 0.55 (*CR*=7.449, *p*<0.01) based on SEM result. The result also showed that TQM had a significant and direct effect on TPM with *rc*=0.80 (*CR*=14.346, *p*<0.01). In addition, TPM had a significant and direct effect on BP with *rc*=0.31 (*CR*=4.334, *p*<0.01). The goodness-of-fit indices for the structural model ($\chi^2/df=2.220$, *GFI*=0.920, *AGFI*=0.902, *TLI*=0.937, *CFI*=0.952, and *RMSEA*=0.044) were well within the generally accepted limits, indicating a good fit to the data. Thus, it can be concluded that TPM partially mediated the relationship between TQM and BP. Standard indirect effect (*IE*) of TQM to BP was 0.250, which can be categorised as high effect of mediation [27].

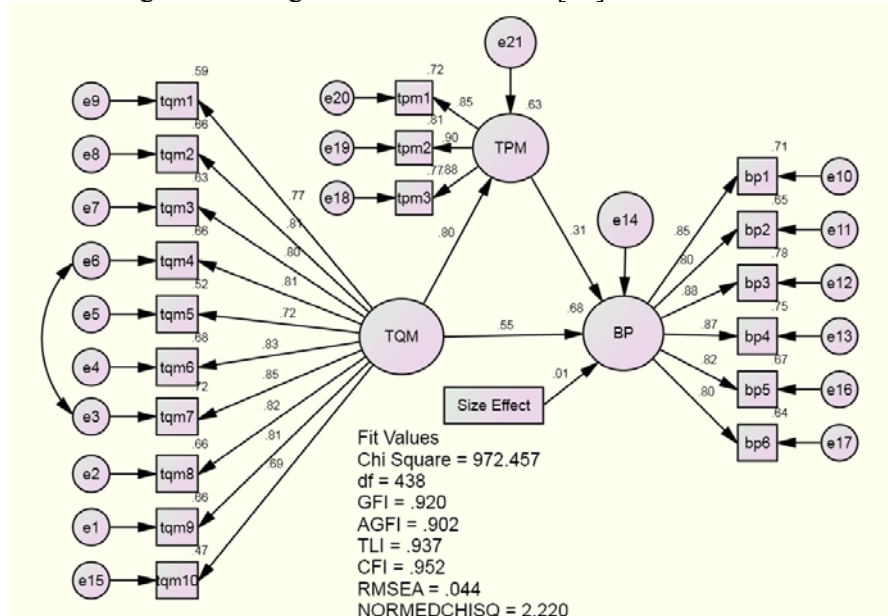


Figure 1 Mediator testing for TPM between TQM and BP

Table 1: Mediator testing for TPM between TQM and BP

No.	Hypotheses	Links in the model	Standardised Estimate (<i>rc</i>)	CR	p-value	Result	Remark
1.	H1	TQM → BP	0.81	13.177**	0.000	Supported	Without TPM
2.	H1	TQM → BP	0.55	7.449**	0.000	Supported	With TPM
	H2a	TQM → TPM	0.80	14.346**	0.000	Supported	With TPM
	H2b	TPM → BP	0.31	4.334**	0.000	Supported	With TPM

Note: **p*<0.05; ***p*<0.01 (one-tailed test)

4.0 Discussion

It was expected that TPM was a mediator between TQM and business performance. This finding is supported by Seth & Tripathi [23] and Konecny & Thun [21]. Konecny & Thun [21] prove that TPM is a mediator between TQM and business performance in order to improve quality, flexibility, cost, and time in the context of manufacturing industry in Germany. The results of this present study were also in agreement with Nakajima [12] who states that the objectives of TPM are zero breakdown and zero defects to improve productivity and quality, to reduce inventory and delivery cycle time, and to improve safety and employee morale.

5.0 Conclusion

The result concludes that TPM is partial correlation between and TQM and BP with indirect effect (IE) is 0.25 which can be categorised as high moderator effect based on SEM result as shown Table 1. It has proved that the impact of TPM as mediator based on system theory and the importance of TPM in TQM implementation.

Acknowledgement

This research was supported by Malaysian Ministry of Higher Education (MOHE) under Exploratory Research Grant Scheme (ERGS) to the Office of Research, Innovation, Commercialization and Consultancy (ORRIC) at the Universiti Tun Hussein Onn Malaysia (vot:E044).

References:

- [1] M.F Ahmad, N. Zakuan, A. Jusoh, and J. Takala, "Relationship of TQM and Business Performance with Mediators of SPC, Lean Production and TPM," *Procedia - Social and Behavioral Sciences*, vol. 65, no. 2012, pp. 186-191, Dec. 2012.
- [2] M.F.B Ahmad and S. Yusof, "Comparative study of TQM practices between Japanese and non-Japanese electrical and electronics companies in Malaysia: Survey results," *Total Quality Management & Business Excellence*, vol. 21, no. 1, pp. 11-20, Jan. 2010.
- [3] M.F.B Ahmad, S. Yusof, and N. Yusof, "Comparative study of quality practices between Japanese and non-Japanese base electrical and electronic companies in Malaysia: A Survey," *Jurnal teknologi*, vol. 47, no. A, pp. 75-89, 2008.
- [4] M. F. Ahmad, N. Zakuan, A. Jusoh, and J. Takala, "Relationship of TQM and Business Performance with Mediators of SPC, Lean Production and TPM," *Procedia - Social and Behavioral Sciences*, vol. 65, no. 2012, pp. 186-191, Dec. 2012.
- [5] M. F. Ahmad, N. Zakuan, a. Jusoh, S. M. Yusof, and J. Takala, "Moderating Effect of Asean Free Trade Agreement between Total Quality Management and Business Performance," *Procedia - Social and Behavioral Sciences*, vol. 129, pp. 244-249, May 2014.
- [6] J. M. Juran, *Juran's Quality Handbook*. Singapore: McGRAW-HILL, 1998.
- [7] M. Demirbag, E. Tatoglu, M. Tekinkus, and S. Zaim, "An analysis of the relationship between TQM implementation and organizational performance: Evidence from Turkish SMEs," *Journal of Manufacturing Technology Management*, vol. 17, no. 6, pp. 829-847, 2006.
- [8] M.F. Ahmad, M. Arif, N. Zakuan, S. Rahman, T. Abdullah, and Fadzil, "The Effect of Demographics on Customer Satisfaction amongst Malaysia Hajj Pilgrims: Survey Result," *Applied Mechanics and Materials*, vol. 660, pp. 1000-1004, 2014.
- [9] M. F. Ahmad, N. Zakuan, A. Jusoh, and J. Takala, "Review of Relationship between TQM and Business Performance," *Applied Mechanics and Materials*, vol. 315, no. 2013, pp. 166-170, Apr. 2013.
- [10] W. B. Rouse, "A theory of enterprise transformation," *Systems Engineering*, vol. 8, no. 4, pp. 279-295, 2005.

- [11] L. Hans, "Measuring maintenance performance- in search for a maintenance productivity index," *Int. J. Production Economics*, vol. 63, no. 8, p. 47, 2000.
- [12] S. Nakajima, *Introduction to Total Productive Maintenance (TPM)*. Cambridge: Productivity Press, 1988.
- [13] A. B. Abdallah, "The Influence of 'Soft' and 'Hard' Total Quality Management (TQM) Practices on Total Productive Maintenance (TPM) in Jordanian Manufacturing Companies," *International Journal of Business and Management*, vol. 8, no. 21, pp. 1-13, Oct. 2013.
- [14] A. B. Abdallah and Y. Matsui, "JIT and TPM: Their relationship and impact on JIT and competitive performances," *TPM*, vol. 1, no. 9, pp. 1-18, 2007.
- [15] B. Dal, P. Tugwell, and R. Greatbanks, "Overall equipment effectiveness as a measure for operational improvement.," *Journal of Operations and Production Management*, vol. 20, no. 12, pp. 1488-1502, 2000.
- [16] E. Sadikoglu and C. Zehir, "Investigating the effects of innovation and employee performance on the relationship between total quality management practices and firm performance: An empirical study of Turkish firms," *International Journal of Production Economics*, vol. 127, no. 1, pp. 13-26, Sep. 2010.
- [17] R. M. Baron and D. A. Kenny, "The Moderator-Mediator Variable Distinction in Social Psychological Research: Conceptual, Strategic, and Statistical Considerations," *Social Psychology*, vol. 51, no. 6, pp. 1173-1182, 1986.
- [18] M. Jun, S. Cai, and H. Shin, "TQM practice in maquiladora: Antecedents of employee satisfaction and loyalty," *Journal of Operations Management*, vol. 24, no. 6, pp. 791-812, Dec. 2006.
- [19] J. C. Bou and I. Beltrán, "Total Quality Management, human resource strategy and firm performance: an empirical study," *Total Quality Management*, vol. 16, no. 1, pp. 37-41, 2005.
- [20] P. Corredor and S. Goñi, "TQM and performance: Is the relationship so obvious?," *Journal of Business Research*, vol. 64, no. 8, pp. 830-838, Aug. 2011.
- [21] P. A. Konecny and J. H. Thun, "Do it separately or simultaneously—An empirical analysis of a conjoint implementation of TQM and TPM on plant performance," *International Journal of Production Economics*, vol. 133, no. 2, pp. 496-507, Oct. 2011.
- [22] J. Teeravaraprug, K. Kitiwanwong, and N. SaeTong, "Relationship model and supporting activities of JIT, TQM and TPM," *Songklanakarin Journal of Science and Technology*, vol. 33, no. 1, pp. 101-106, 2011.
- [23] D. Seth and D. Tripathi, "Relationship between TQM and TPM implementation factors and business performance of manufacturing industry in Indian context," *International Journal of Quality & Reliability Management*, vol. 22, no. 3, pp. 256-277, 2005.
- [24] I. P. S. Ahuja and J. S. Khamba, "An evaluation of TPM initiatives in Indian industry for enhanced manufacturing performance," *International Journal of Quality & Reliability Management*, vol. 25, no. 2, pp. 147-172, 2008.
- [25] S. A. Brah and W. K. Chong, "Relationship between total productive maintenance and performance," *Journal of Production Research*, vol. 42, no. 12, pp. 2383-2401, 2004.
- [26] I. P. S. Ahuja and J. S. Khamba, "An evaluation of TPM initiatives in Indian industry for enhanced manufacturing performance," *International Journal of Quality & Reliability Management*, vol. 25, no. 2, pp. 147-172, 2008.
- [27] J. Cohen, "Statistical Power Analysis for the Behavioral Sciences." NJ: Lawrence Erlbaum, Hillside, 1988.
- [28] D. Seth and D. Tripathi, "Total Quality Management & Business A critical study of TQM and TPM approaches on business performance of Indian manufacturing industry A Critical Study of TQM and TPM Approaches on Business Performance of Indian Manufacturing Industry," *Total Quality Management*, vol. 17, no. 7, pp. 37-41, 2006.