The relationship between TQM and innovation in service organizations: Quantitative findings

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Abstract— this study investigates the relationship between TQM and innovation in service organizations. The data were collected from 209 service organizations operating in Malaysia. Confirmatory Factor Analysis and Structural Equation Modeling were used in the analysis. Results of hypotheses testing showed positive relationships between TQM and innovations. This study added the perspective of service organizations to the debate on the relationship between TQM and innovation. Managers of service organizations can use the results to link TQM implementation with innovation.

Keywords— TQM; innovation; service; TQM in service; innovation in services; Malaysia

I. INTRODUCTION

The relationship between TQM and innovation in service organizations is important. TQM plays positive roles in the performance and competitiveness of service organizations [1-4]. Innovation has the same important role in service organizations [5-8]. Thus, the link between TQM and innovation has significant influence on service organizations outcomes, specially on level of customers satisfaction and degree of service quality [9].

This relationship differs between service and manufacturing organizations. The difference emerges from the difference in operation process. Generally, operation process in service organizations relies more on human resource skills, whereas operation in manufacturing relies more on production technology and technical skills [10]. Therefore, soft TQM practices (people management) dominate in service organizations [11].

All studies on the relationship between TQM and innovation were completely or partially conducted in manufacturing organizations. Studies on the relationship between TQM and innovation in service organizations are scarce and hard to be found in the literature. This study addresses this gap through modeling the relationship between services related TQM practices and innovation. Results of this study will help managers to positively link TQM implementation with innovation.

II. THEORETICAL FRAMEWORK AND HYPOTHESES

Some earlier studies (e.g. Kanji, 1996) discovered the positive relationships between TQM and innovations. Continuous improvement was the main framework of the relationships [12, 13]. Following those earlier studies, Prajogo and Sohal [14] placed a controversial argument on the impact of three TQM principals, Continuous improvement, Customer focus and Human resource management, on innovation.

Recent studies on the relationship between TQM and innovations are two groups. The first group involved in their scopes both service and manufacturing organizations, while the second group involved only manufacturing organizations.

The first group investigated the impact of TQM on product innovation [15], on level of product newness and number of new products [16], on administrative innovation [17], on process and product innovations [18, 19], on number of new product/service [20], and on radical process, incremental process, radical product, incremental product, and administrative innovation [21]. on the other hand the second group investigated the impact of TQM on number of commercialized products or services, rate of introduction of new processes and rate of introduction of new products or services [22], on technological innovation [23-25], and on none technological innovation [25].

All results of the first group showed positive or significant relationships between TQM and innovation. All of them found people management and leadership practices have positive impact on different types of innovation investigated, while in the second group, two studies [22, 23] showed no significant or no relationship between TQM and innovation.

Many TQM practices frameworks have been developed on the relationship between TQM and innovation [16, 19, 21, 24, 26-28]. This study used the framework of Bon & Mustafa [26]. Bon and Mustafa developed the framework from the most recent studies such as Kim et al., (2012) and Sadikoglu and Zehir (2012) [20]. The framework involves seven TQM practices that dominate in service organizations and five types of innovation. TQM practices are: Management Leadership, Employee empowerment, Employees involvement, Training, Customer focus, contnious improvement and information and analysis. Types of innovation are: radical process innovation, incremental process innovation, radical product innovation, incremental product, and administrative innovation. The main change made to the adapted model was combining three practices (Employee empowerment, Employees involvement and Training) in one construct named People managemet [21, 39].

Based on the preceding discussion on the trends of relationsip between TQM and innovation in the literature, and based on the adapted theoretical framework, the following hypotheses were developed:

H1: TQM has positive relationship with radical service innovation.

H2: TQM has positive relationship with incremental service innovation.

H3: TQM has positive relationship with radical process innovation.

H4: TQM has positive relationship with incremental process innovation.

H5: TQM has positive relationship with administrative innovation.

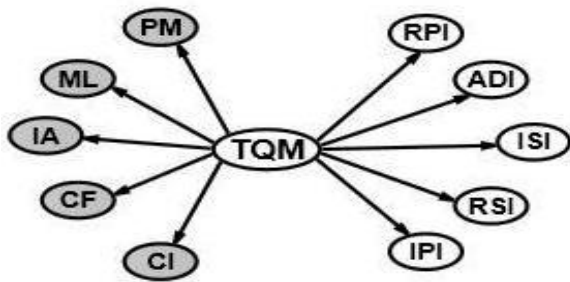Fig 1 shows the path diagram of the study and the hypothesized relationships.

Fig. 1. Path diagram

III. METHODOLOGY

A sample of 650 service organizations operating in Malaysia was selected. The sample was selected from different service subsectors (e.g. Distributive Trades, Food and Beverages, Transport and Storage, Health care, and Accommodation) and different firms sizes (small, medium and large). Criteria of the selection were ISO 9001:2000 certification, Malaysia's Quality Management Excellency Award (QMEA) certification, or any other local or international business quality management and business excellence certified, and/or TQM implementation.

Organizations lists were obtained from different sources such as Service Companies Index in the Federation of Malaysian Manufacturers directory (43th edition 2012) and Malaysian Service Organizations Directory of Ministry of International Trade and industry [29]. Stratified random sampling technique was followed in selecting the organizations, each stratum presented one subsector.

Measurement items of the 11 constructs were adapted from Kim et al., (2012) and Sadikoglu and Zehir (2012). A pilot study were conducted to ensure the clarity and to simplify the questionnaire in order to support more validity.

The useable returned questionnaires were 209 presented a response rate of 32.2% which considered satisfactory in the organizational level studies [30].

Statistical Package for Social Sciences (SPSS) version 19 for Windows and Structural Equation Modeling (SEM) using Analysis of Moment Structures software for windows (AMOS ver. 20) were used. SPSS was used in data screening, reliability test and Harman's test for total variance explained (common method bias test). AMOS was used to apply Confirmatory Factor Analysis (CFA) technique then structural model to test the hypotheses.

IV. RESULTS AND DISCUSSION

A. Respondent profile, reliability analysis and Harman's test

Distributive trade subsector presented the highest response rate (52.15%) followed by food and beverage (29.67%) then accommodation subsector (9.1%). Firms with less than 50 employees presented the majority of the respondents (80.86%).

Data screening showed no missing values, outlier or normality issues to be considered [31, 32]. Cronbach's alpha of the 11 constructs ranged between .77 and .98 presented overall good constructs reliabilities.

Harman's test was applied to test the common method bias. The result of the test showed 8.1% of total variance that explained by one factor which indicates no common variance to be considered [31].

B. Measurement models

Showed in fig 1 and fig 2, two pooled measurement models (CFA models) were graphically created then enhanced through deleting poor loading items (standardized loading less than 0.6) and applying some errors covariations suggested by AMOS [33, 34]. The first model is for TQM constructs and the second one is for innovation constructs. Multiple Good-of-fitness indices (GOF) were used: CHI-square statistic (CMIN in AMOS), normed CHI-square (CMIN /degree of freedom DF), the Root Mean Square Error of Approximation (RMSEA), and Comparative fit index (CFI) showed acceptable fit values met thresholds. The thresholds are: CFI > 0.90 is acceptable fit and >0.95 is good, RMSEA < 0.1 acceptable and < 0.08 is good fit, and CMIN/DF < 3.0 is good fit [33-35].

GOF indices of TQM measurement model show acceptable fit: CMIN is significant (588.012), CMIN/DF is less than 3.0 (1.832), CFI is above .90 (.927) and RNSEA is below .08 (.063). While GOF indices of innovation model show good fit: CMIN is significant (196.516), CMIN/DF is less than 3.0 (1.803), CFI is .950 and RNSEA is below .08 (.062).

C. Constructs validity

Construct validity is assessed through assessing four validities: convergent validity, multicollinearity validity, discriminant validity and face (or content) validity ([33, 36, 37]. Convergent validity is assessed through checking construct items loadings; construct Average Variance Extracted (AVE) and Construct Reliability (CR). Convergent validity achieved when all items loading are above 0.6, all AVEs are above 0.5 and all CRs are above 0.7 [33, 34]. All items loadings in both measurement models are higher than 0.6 except one item loaded .54 All constructs AVEs are above 0.5 and all CRs are above 0.7. Thus, convergent validities assumed to be achieved, see table 1 for TQM constructs

convergent validity and table 2 for innovation constructs convergent validity.

Multicollinearity does not exist when all correlations between constructs are less than 0.9 [38]. Correlations matrices show in table 1 and table 2 are all less than 0.9. Thus, multicollinearity assumed does not exist.

Discriminant validity assessed through comparing the squared interconstructs correlation estimates (SIC), which is correlation matrix squared, with the AVE of the corresponding construct [33]. SIC of a construct should be less than its corresponded AVE. Table 1 and table 2 show all SIC are less than its corresponded AVE. Thus, discriminant validity assumed to be achieved.

Face validity assumed to be achieved through adapting the measurement items and through conducting pilot study.

Table 1: TQM constructs convergent and multicollinearity assessment

	CR	AVE	ML	IA	CF	CI	PM
ML	0.83	0.62	1.0				
IA	0.93	0.73	0.02	1.0			
CF	0.77	0.54	0.11	-0.01	1.0		
CI	0.83	0.55	0.10	-0.12	-0.10	1.0	
PM	0.74	0.51	-0.05	0.19	-0.02	-0.14	1.0

Discriminant validity assessment						
	AVE	ML	IA	CF	CI	PM
ML	0.62	1.0				
IA	0.73	0.00	1.0			
CF	0.54	0.01	0.00	1.0		
CI	0.55	0.01	0.01	0.01	1.0	
PM	0.51	0.00	0.04	0.00	0.02	1.0

Table 2: Innovation constructs convergent and

	CR	AVE	RSI	RPI	IPI	ISI	AD
RSI	0.85	0.66	1.0				
RPI	0.90	0.68	0.17	1.0			
IPI	0.85	0.65	-0.01	0.14	1.0		
ISI	0.87	0.62	0.08	0.47	-0.02	1.0	
AD	0.80	0.58	-0.01	0.01	0.07	-0.15	1.0

Discriminant validity assessment						
	AVE	RSI	RPI	IPI	ISI	AD
RSI	0.66	1.0				
RPI	0.68	0.03	1.0			
IPI	0.65	0.00	0.02	1.0		
ISI	0.62	0.01	0.22	0.00	1.0	
AD	0.58	0.00	0.00	0.00	0.02	1.0

D. Hypotheses testing

To test the hypotheses, structural model was developed from the measurement models. Showed in fig 4, items loadings are all above 0.6. GOF indices show acceptable fit. CMIN = 1424.655, CMIN /DF = 1.599, CFI = 0.904 and RMSEA = 0.054.
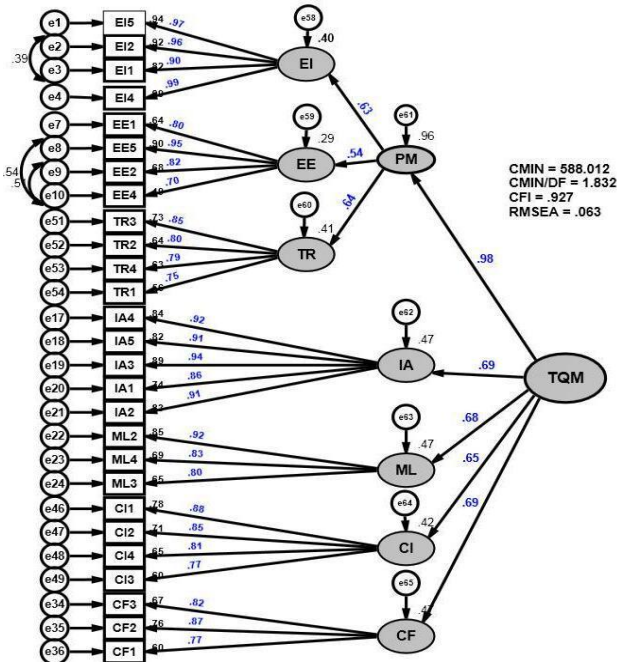

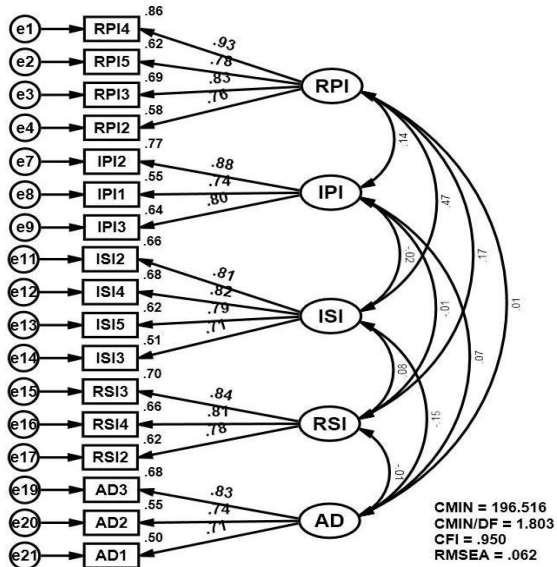Fig. 2. TQM constructs measurement model
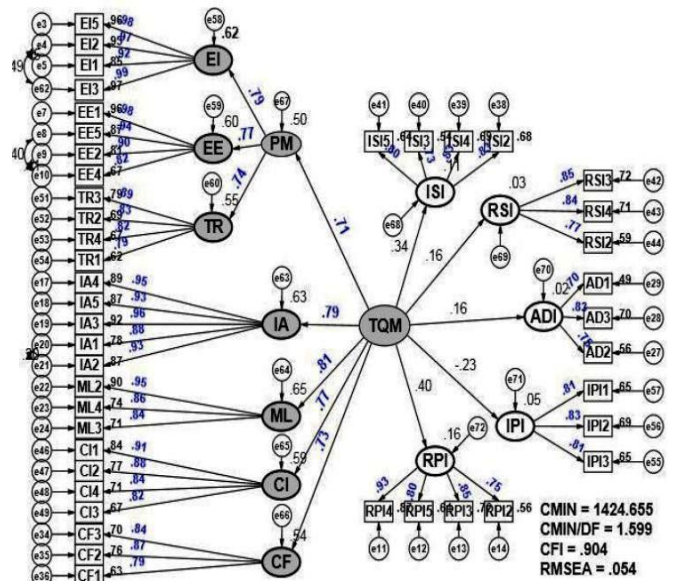

Fig. 3. Innovation constructs measurement model

Fig. 4. Structural model

Table 3: Hypotheses testing

Hypotheses			Estimate	S.E	C.R	P	Significant?
H1	TQM	→ RSI	.138	.068	2.02	.043*	Yes
H2	TQM	→ ISI	.269	.062	4.32	***	Yes
H3	TQM	→ RPI	.331	.061	5.38	***	Yes
H4	TQM	→ IPI	-.175	.059	-2.95	.003**	Yes
H5	TQM	→ ADI	.094	.049	1.91	.056*	Yes

$***P < .001, **P < .05, *P < .1$

E. Discussion

All hypothesized relationships between TQM and innovation were supported, see table 3. In other words, TQM has a positive relationship with radical innovation (service and process), incremental innovation (service and process) and administrative innovation. These findings supported the findings of Kim et al., (2012), Abrunhosa & Moura E Sá, (2008) and Ooi et al., (2012), and contradicted findings of Singh and Smith (2004).

The positive relationship between TQM and all five innovations imply that TQM practices measured in the study have played their roles: (i) managements encourage change through suportive and positive people management practices, continual process improvement and effective use of information and analysis in developing innovation. (ii) People in the surveyed organizations are invovlved in strategies and process, empowered with quality skills gained through training which positively reflected in innovative performance. (iii) Information and analysis are gathered and observed then used effectively in positive benchmarking which gives positive outcomes on innovation. (v) Customers were cetered to be satisfied through continually considering their needs, gathering customers information, getting their feedback and response to their complains.

V. CONCLUSION

This study investigated the impact of TQM innovation in service organizations in Malaysia. The data were collected from organizations from 12 service subsectors. CFA and SEM analysis techniques were used to test the hypotheses. Results of hypotheses testing revealed TQM has positive relationship with innovation. Theoretically, this study joined the debate on the relationship between TQM and innovation from service organizations perspective. Our results show managers of service organizations which TQM practices impacts their innovations.

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