

A Paradigm for Developing TQM-Role Stressors Model and Index

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Abstract – TQM practices have been increasingly implemented in both manufacturing and service organizations, yet research has neglected the study of role stressors induce from the implementation of TQM practices. Drawing from the extant TQM and role stressors literature, this paper examines the relationship between TQM and role stressors by addressing three critical gaps: (1) conceptualizing the multidimensionality of TQM practices as a preventive approach to role stressors; (2) formulating TQM-Role Stressors index for the use of industrial benchmarking; and (3) constructing a model for assessing the nonlinear influences of TQM on role stressors. This study concludes with a discussion of potential practical applications of the TQM-Role Stressors index and model for longitudinal study aimed at deepening our understanding of the role of TQM practices in reducing undesirable role stressors experienced by employees.

Keywords – Total Quality Management, role stressors, modeling

I. INTRODUCTION

The introduction of Total Quality Management (TQM) on practical and theoretical levels plays an important role over the years [1]. Manufacturers and service providers apply approaches such as TQM and business process re-engineering to improve quality and productivity in order to strive for continuous improvements in business performance [2]. Following Dar-E1 [3], TQM is both a philosophy and guiding principle that embody the basis for continuous improvement and thus it is recognized as the most “holistic” approach available to date in supporting organizational improvement efforts. There is an extensive consensus that TQM program improves operating performance [4, 5], and promotes greater implementation of human resource management practices [1].

At the outset, TQM has been known as an integrated program of social and psychological engineering which has an impact on the consciousness and behavior of managerial and supervisory staff [6]. Following Allen and Brady [7], some studies on cognitive theory self-concept theories [8], namely, organizational identity theory, personal construct theory and self-discrepancy theory have been used to relate to TQM failures. Role stressors perpetuate detrimental consequences for individuals and organizations such as lower salesperson performance [9], lower job satisfaction and higher turnover [10, 11].

Singh *et al.* [12], Brown and Peterson [13] and Michaels *et al.* [14] studied the impact of role stressors on

job satisfaction and job performance. The idea of role stressors on job satisfaction and job performance thus goes beyond the narrow consequentialism of employees’ well-being. As the researchers emphasized corrective approach in their studies, this makes it vulnerable to the accusation of being tautological: every situation can be redefined in order to explain the employees’ job satisfaction and job performance. Thus, this study concerns on the conditions under which outcomes that are generated are not instrumental in a sense that people expect beneficial outcomes (i.e., role stressors). In addition, this study focuses on preventive approach rather than corrective approach. Johnson *et al.* [15], Jackson and Schuler [16], Nicholson and Goh [17] studied the impact of managerial practices (e.g., formalization, participation in decision making and leader consideration) on role stressors. However, little is known of the implementation of TQM leading to the role stressors experienced by employees. This is surprising in light of its widespread practices. In this regard, it is apposite to focus on building a conceptual model to connect the theoretical relationships between TQM practices and role stressors.

Given that TQM is an addition of the deregulation ideology in firms, TQM operates on a management system that could make employees work under stress [18]. Therefore, this study proposes an index to estimate the levels of TQM practices and role stressors for manufacturing and service industries with respect to some base and standard of the total levels of TQM practices and role stressors for ISO certified organizations in Malaysia.

This study also proposes a model to determine how rapidly role stressors are generated by the implementation of TQM. The examination of the relationship between TQM practices and role stressors is fruitful for three reasons: First, it serves to fill the gap and extends the scope of TQM literature with respect to employees’ attitudes. Second, such study is likely to enhance the knowledge of an increasingly popular form of role stressors. Third, it facilitates the organizations to benchmark the levels of TQM practices and role stressors.

This paper is organized as follows: The conceptual model between TQM and role stressors is presented in section 2. The TQM–role stressors index is discussed in section 3. Section 4 continues with a discussion on the modeling of the impact of TQM practices on role stressors. Section 5 discusses the practical implications of the present study and concluding remarks.

II. CONCEPTUAL MODEL BETWEEN TQM AND ROLE STRESSORS

A. TQM Practices

Ever since the 1990s, most organizations have modeled after the quality awards such as the Deming Prize in Japan, the Malcolm Baldrige National Quality Award (MBNQA) in the USA, and the European Quality Award in Europe, as a framework for TQM implementation [19]. It is widely recognized that the MBNQA is a well-accepted framework for operationalizing the dimensions of quality management [20]. For this reason, the TQM constructs of the present study are conceptualized in terms of six dimensions as described by the MBNQA criteria, namely, leadership, strategic planning, customer focus, human resource focus, process management and information analysis.

B. Role Stressors

Some researchers define “stress as a deviation from normal psychological or physiological functioning caused by exigencies in the individual’s immediate environment” [21:164]. Lee and Lee [22] asserted that stressors began from role problems (e.g. conflict and ambiguity), professional viewpoints (e.g. career ambiguity and underutilization) and physical surroundings (e.g. noise and safety). Role conflict and role ambiguity are the major types of role stressors that have been studied extensively in research [10, 16]. Role conflict is the extent to which an employee is challenged by assigned tasks involving an incompatibility between rules or policies, job demands, resources and people [11, 17]. Role ambiguity arises when an individual receives ambiguous goals and responsibilities [11].

Prior studies [e.g., 15, 16, 17] reported that managerial practices such as formalization, participation in decision making and leader consideration were negatively related to role stressors. Other researchers [e.g., 10, 11, 12, 13, 23] contrast this perspective with studies framing role stressors as antecedents to individual attitudinal and behavioral outcomes such as external individual outcomes (e.g., customer loyalty, customer satisfaction) and internal individual outcomes (e.g., employees’ job satisfaction and job performance). These studies [e.g., 12, 23] suggested that the external and internal individual outcomes such as customer satisfaction and employees’ job performance can be improved through refinement of their organizational practices (e.g., increasing influence of leadership in work commitment and providing training program for the employees). This implies that the prior studies have been focused on “corrective approach” in which they realize that the individual attitudinal and behavioral outcomes are apparently influenced by the organizational practices.

C. The Hypothesized Relationship between TQM Practices and Role Stressors

Leadership is defined as the ability of the firm’s top management to give clear direction and vision, to identify and cultivate individual abilities and to motivate one to be fully committed in realizing organizational goals [24]. The higher levels of leadership role clarification result in lower role stressors experienced by employees.

Strategic planning is viewed to be a mechanism that can reduce the levels of employees’ role stressors [25]. Employees experience reduced role stressors when incompatible and ambiguous role expectations among departments are clarified and addressed through strategic planning.

Customer focus is a major dimension of TQM because firms could outperform their competitors by satisfying customers’ needs and anticipating customers’ increasing demands [26]. Therefore, employees working in a TQM-oriented organization are likely to face greater levels of role stressor because they deal with both external and internal customers whom often have different personalities and incongruent demands.

According to Ahire and O’Shaughnessy [27], quality-oriented HRM supports quality management efforts through employee empowerment, employee participation and training employees in both technical and managerial perspectives of their role in TQM. Therefore, some workers endure greater stress in a TQM-oriented firm because more skills and efforts are required [28].

Process management refers to the design of processes to make and deliver products and services that meet the customers’ needs, to manage daily control and continual improvement [29]. The activities underlying process management are sets of interlinked processes and formalized organizational structures. Therefore, the occurrence of role stressors among employees is reduced in a highly formalized organization.

The inclusion of information and analysis in the MBNQA model is to encourage the practice of management by fact compared with management by instinct or feel [30]. The enhanced use of quality information and analysis would result in lower levels of role stressors because employees are able to acquire timely information and have a better understanding of their roles and tasks expected of them.

Drawing from the literature, we noted that the implementation of TQM practices has an impact on employees’ role stressors, yet research has neglected the study of role stressors induce from the implementation of TQM practices. Furthermore, individual outcome such as employees’ job satisfaction can be seen as the attitudinal counterpart to the behavioral responses that is reflected – loosely speaking – in role stressors. Therefore, the present study proposes a conceptual model (see Fig. 1) to analyze the impact of six TQM practices (i.e., leadership, strategic planning, customer focus, human resource focus, process management and information analysis) on role stressors. The model proposed emphasizes “preventive approach” in

which a systematic investigation of organizational practices (i.e., TQM practices) on employees' role stressors is an attempt to prevent the occurrence of negative consequences (e.g., job satisfaction and job performance) arising indirectly from the organizational practices through employees' role stressors.

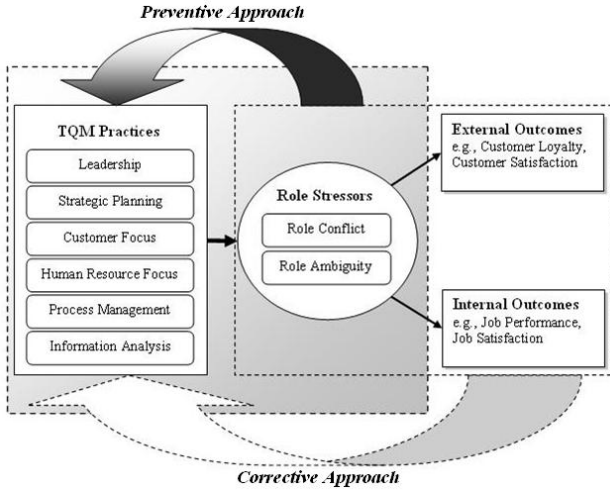


Fig. 1. Research Model

III. TQM-ROLE STRESSORS INDEX

This section proposes the index to benchmark the levels of TQM practices and role stressors experienced by the employees of ISO manufacturing and service organizations. The index is computed using (1), calculating the ratio between the components of TQM practice in a respective industry and the current TQM practices as a reference unit (i.e., the standard practice adopted by all ISO organizations in Malaysia).

$$Index_i = \left(\frac{\bar{x}_{ie} / \bar{x}_e}{\bar{x}_e / \bar{x}_r} \right) \quad (1)$$

Where:

i = the six dimensions of TQM practices and role stressors

e = individual industry

r = total of manufacturing and service industries

\bar{x} = mean

The calculation of index is based on a survey result. The questionnaire survey was conducted to measure the six dimensions of TQM practices (i.e., leadership, strategic planning, customer focus, human resource focus, process management and information analysis) and two components of role stressors (i.e. role conflict and role ambiguity). The unit of analysis for the survey was the individual employees of ISO 9001:2000 certified firms in Malaysia. Drawing from a stratified random sampling procedure, the questionnaires were distributed to 100 ISO-certified firms indexed in the Federation of Malaysian Manufacturers Directory [31]. Of 650

questionnaires sent, 453 surveys were completed and returned. Thirty-one questionnaires had to be excluded as outliers, thereby resulting 422 surveys were used for analysis. The calculation of index required several items to measure each of the dimensions of TQM practices and role stressors. Confirmatory factor analysis was used to identify the items underlying the observed dimensions of TQM practices and role stressors.

The results of index indicate three outcomes. First, index value of less than one suggests that the current levels of TQM practices or role stressors are lower than the expected levels for a given industry. Second, index value of one indicates that the current levels of TQM practices or role stressors meet the standard levels for a given industry. Third, index value of greater than one implies that the current levels of TQM practices and role stressors are greater than the expected levels for a given industry.

TABLE I
INDEX FOR ISO MANUFACTURING AND SERVICE FIRMS

	Index for Manufacturing Firms	Index for Service Firms
TQM Practices	1.005 [†]	0.99 [†]
Leadership	1.03	0.99
Strategic Planning	1.02	1.00
Customer Focus	1.01	1.02
Human Resource Focus	0.97	0.97
Process Management	1.00	0.97
Information Analysis	1.00	1.00
Role Stressors	0.98 [†]	1.03 [†]
Role Conflict	1.00	1.03
Role Ambiguity	0.97	1.02

Note: [†] The overall TQM and role stressors indexes are obtained by averaging the indexes of the dimensions of TQM practices and role stressors respectively.

The index calculated for each TQM practices and role stressors is shown in table 1. Since all index value is approximately equal to one, the results indicate that the current levels of TQM practices meet the standard levels of TQM practices for a given industry. For manufacturing firms, the TQM practices index reveals a concentration in all dimensions of TQM practices except for human resource focus. Within the service firms, the TQM practices are less concentrated in leadership, human resource focus and process management. The overall indexes of TQM practices and role stressors show a greater concentration and a more equal distribution of TQM practices will reduce role stressors of employees in manufacturing firms. In contrast, a less concentration and less equal distribution of TQM practices will increase the role stressors of the employees in service firms.

IV. MODELING THE IMPACT OF TQM PRACTICES ON ROLE STRESSORS

This section examines the mathematics to analyze the impact of TQM practices on role stressors and proposes a model to determine the time elapsed between the implementation of TQM practices and its impact on role

stressors. The derived indexes of TQM practices and role stressors can be used either as dependent or independent variables to examine the TQM-role stressors relationships.

In order to operationalize the process of TQM practices, it is necessary to specify the return generating from the process of TQM practices. The impact of TQM may be described by (2), a geomantic Brownian motion as follows:

$$\frac{\delta TQM(t)}{TQM(t)} = \mu \delta t + \sigma \delta \omega(t) \quad (2)$$

Where:

$\frac{\delta TQM(t)}{TQM(t)}$ = the impact of TQM practices

μ = instantaneous expected outcomes

σ = standard deviation per unit time of outcome

$\delta \omega(t)$ = Wiener process with mean zero and unit variance

The movements of TQM practices towards the role stressors (RS) can be explained in (3).

$$\delta RS(t) = \lambda [TQM(t) - RS(t)] \delta t + \phi \delta q(t) \quad (3)$$

Where:

$\delta RS(t)$ = instantaneous change in role stressors

$TQM(t)$ = value of TQM practices at time (t)

$RS(t)$ = level of role stressors at time (t)

λ = speed of adjustment coefficient

ϕ = standard deviation of $\delta RS(t)$ per unit time

$\delta q(t)$ = Wiener process with mean zero and unit variance

Equation (4) assumed that the change in the levels of role stressors is constant. In order to address the issue of constant change in role stressors, therefore,

$$RS(t) = TQM(t)^\beta e^{\alpha(t-k)} \quad (4)$$

Where:

β = some parameters

$\alpha(t)$ = a function which will be defined at a later stage

k = constant

Based on (3), the movements between TQM practices and the levels of role stressors move together in time. However, the movements of TQM practices may not be instantaneously transmitted to the levels of role stressors but adjusted partially. The speed of adjustment coefficient, λ determines the time elapsed between the implementation of TQM practices and the impact on role stressors.

Taking logarithms of (4),

$$\log RS(t) = -k + \beta \log TQM(t) + \alpha(t) \quad (5)$$

Where:

$\alpha(t)$ = stationary process

Therefore, (4) represents the long run relationship and (5) represents linear relationship in logarithms between TQM practices and role stressors.

By applying Ito's Lemma [32] to (4) and imposing condition that $\delta \alpha(t) = -\lambda \alpha(t) \delta t + \delta dz(t)$, we obtain $RS = TQM(t)^\beta e^{[\alpha(t) - (\delta^2 + 2\rho\sigma\delta\beta + \sigma^2\beta(\beta-1))/2\lambda]t}$ (6)

Where:

ρ = correlation between $dz(t)$ and $d\omega(t)$

$dz(t)$ = stochastic shocks to mean reversion process

$d\alpha(t)$

$d\omega(t)$ = stochastic shocks to TQM

Then, substitute $t + \Delta t$ for t into (6) and subtracting $RS(t)$.

$$\begin{aligned} \log \frac{RS(t+\Delta t)}{RS(t)} &= (e^{-\lambda\Delta t} - 1) \left[\frac{\delta^2 + 2\rho\sigma\delta\beta + \sigma^2\beta(\beta-1)}{2\lambda} \right] + \\ &\beta \log \frac{TQM(t+\Delta t)}{TQM(t)} + \\ &(e^{-\lambda\Delta t} - 1) [\log RS(t) - \beta_1 \log TQM(t)] + \\ &e^{-\lambda(t+\Delta t)} \int_t^{t+\Delta t} e^{\lambda u} \delta dz(u) \end{aligned} \quad (7)$$

From (7), the role stressors level is not only a function of TQM but also a function of difference between $\log RS(t)$ and $\log TQM(t)$ which has a speed of adjustment coefficient of $(e^{-\lambda\Delta t} - 1)$.

The regression model based on (7) is given by regression model (8) as follows:

$$\begin{aligned} \log \frac{RS(t+1)}{RS(t)} &= \gamma_0 + \gamma_1 \log \frac{TQM(t+1)}{TQM(t)} + \\ &\gamma_2 \log TQM(t) + \gamma_3 \log RS(t) \end{aligned} \quad (8)$$

Where:

γ_0 = constant term

γ_1 = estimated coefficient for nonlinear impact of TQM practices

γ_2 = estimated coefficient for TQM practices

γ_3 = determine the time elapsed between the implementation of TQM practices and the impact on role stressors

V. CONCLUSION

This paper has bridged an important research gap between TQM and role stressors literature by establishing and examining the relationships between TQM practices and role stressors. A TQM-Role Stressors index has been proposed for practical usage by organizational administrators and managers to assess and benchmark the levels of different TQM dimensions and role stressors experienced by the employees. Because the adoption of TQM practices invariably introduces new roles and responsibilities which gradually influence the employees' role stress, a model has been developed for the use of longitudinal study to estimate the time elapsed between the implementation of TQM practices and its impact on

role stressors. The model proposed can serve as a supplementary screening instrument in assisting TQM-oriented organizations to make the right choices in terms of designing and implementing TQM practices in reducing undesirable role stressors experienced by employees.

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