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Adjusting Stressors – Job-Demand Stress in Preventing Rustout/Burnout in Estimators

Mei-yung Leung and Janet Sham and Yee-shan Chan[1]

ABSTRACT

In Hong Kong, the majority of estimators experience high stress levels since the cost estimation task requires a high degree of accuracy (Peurifoy and Oberlender, 2002). In the striving for high performance, stress and stressors should be managed well in the estimation process. Stress is defined as the deviation between the expected workload and the actual ability of individual estimators in construction projects. Since stress involves both a quantitative workload (e.g., too many/few tasks) and a qualitative workload (e.g., repetitive/complicated tasks), this study investigates the stressors and stress of estimators based on two workload dimensions of Job-Demand Stress. It aims to (1) identify the stressors in the estimation process, (2) investigate the impact of stressors on the Job-Demand stress of estimators in Hong Kong, and (3) analyze the interrelationship between different stressors of the construction estimators.

Using factor analysis and correlation analysis, six main stressors have been revealed in the estimation process. The study revealed that there is a significant relationship between quantitative and qualitative stress levels. Job-Demand stressors such as Work Underload and Home-Work Conflict have a significant effect on qualitative Job-Demand stress and indirectly affect the quantitative stress of estimators. Stress is not only caused quantitatively and qualitatively by workload, but also affected by personal stressors in the estimation process.

KEYWORDS

Estimators
Job-Demand stress
Qualitative stress
Quantitative stress
RO-BO Scale
Stressors

[1]*Department of Building and Construction*
City University of Hong Kong
Tat Chee Avenue
Kowloon Tong
Hong Kong
Tel: (852) 2788 7142
Fax: (852) 2788 7612
Email: bcmei@cityu.edu.hk

INTRODUCTION

According to the Occupational Handbook of the U.S. Department of Labor (Bureau of Labor Statistics, 2004), the functions of an estimator include compiling and analyzing data on all of the factors that will influence the project cost, gathering information on site, determining the quantities of materials and labor the project will need to furnish, and preparing a cost summary for the entire project. The main function of estimators is to accurately estimate the cost associated with the project and ensure that the project is profitable. Estimators, therefore, play a vital role in preparing estimates (Peurifoy and Oberlender, 2002). Their accuracy in making the cost prediction determines the success of the contracting business (Petri, 1979). In fact, the complicated project information to be handled within a stringent tendering period during the cost estimation process increases the stress level of estimators. Hence, Leung (2004) and Leung *et al*. (2005b) identified different stressors during the cost estimation process and investigated the significant relationship between stress and estimation performance in Hong Kong.

Since stress depends on individuals' workload/work difficulty and their actual ability to carry out a task, Job-Demand (JD) stress is applied in the study to measure the stress of estimators in construction projects. The paper aims to (1) identify the stressors in the estimation process, and (2) investigate the impact of stressors on the job-demand stress of estimators in the industry.

STRESSORS FOR ESTIMATORS

In construction projects, estimators often carry out a series of tasks, such as a feasibility estimate, a preliminary estimate, a pre-tender estimate, a detailed estimate, a change order estimate, a progress estimate, and so on (Schuette and Liska, 1994). They need to work with different project participants on a particular project in a specific environment. There are four main types of stressors (Leung and Lam, 2002; Leung *et al*., 2005b): personal, interpersonal, task, and physical stressors.

Personal Stressors: These refer to individuals' personal behavior (type A) and an estimator's private life involving family and friends. *Type A Behavior* is characterized by extreme interpersonal competitiveness, aggression, time-urgency, and chronically hostile behavior (Friedman and Roseman, 1974), while private life refers to the demand on time, energy, and commitment by families, friends, communities, and other spheres of one's private life (Quick and Quick, 1989).

Interpersonal Stressors: These refer to the personal relationships between estimators, their colleagues, and project team members in formal or informal capacity. *Role Conflict* mainly focuses on negative emotion. It arises when a person is required to take on more than one role and when the adequate performance of one role jeopardizes the adequate performance of the others (Burke and Greenglass, 1993). *Distrust* among project team members/colleagues may lead to poor communication, and a lack of social support causes stress from being isolated or ignored (Cooper, 2001). Therefore, *Social Support* can act as a stress buffer (Cohen and Hoberman, 1983) which involves the resources of one's interpersonal relationships.

Task Stressors: These refer to the workload (too much/little) and role ambiguity of estimators involved in a project. *Role Ambiguity* in the estimating team may induce stress due to inadequate information about

the responsibilities, scopes, and objectives of tasks. *Work Overload* causes stress and anxiety because of intensive work carried out in stringent timeframes (quantitative overload) and because of managerial inability to deal with tasks (qualitative overload) (Cooper and Marshall, 1981). *Work Underload* arises when estimators are in a state of boredom and apathy due to the insufficient tasks in the surplus period (quantitative underload) or because they are required to carry out boring and repetitive tasks (qualitative underload). Since all tasks have to be carried out by an individual, the expectation of estimators should also be considered as an attribution of estimators' stress in the form of depression, low self-esteem, dissatisfaction, futility, and intention to leave (Buller and Schuler, 2000).

Physical Stressors: These refer to poor working conditions such as extreme high/low temperature, noise, overcrowded environment, or poorly designed office. An uncomfortable *Working Environment* can disturb estimators' privacy or social interaction. Noise, temperature, ventilation, lighting, hygiene, overcrowdedness, and the like within an organization can create stress in an individual (Mind Tools Ltd., 2006).

Job-Demand stress is generally assessed by Job-Demand stressors such as work overload, work underload, role ambiguity, and role conflict. In order to examine whether Job-Demand stress is solely produced by work-related stressors, other stressors including personal behavior, social support, distrust, work environment, and private life are also considered in the study.

MEASUREMENT OF STRESS LEVEL

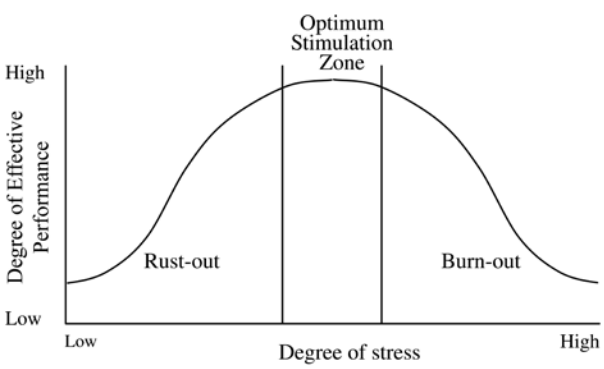
Job-Demand Stress

It is a common perception that stress comes from task stressors. Job-Demand stress involves the volume of work that has to be accomplished (quantitative) and the difficulties involved in the work (qualitative) (Fernet *et al.*, 2004). It is defined as "a perceptual phenomenon arising from a comparison between the demand on the person and his ability to cope" (Cox, 1978, p.25). Since Job-Demand stress depends on the deviation between one's perception of his/her expected ability and the actual ability to achieve the task (Gmelch, 1994). Task stressors, especially the workload, are the common factors that influence individual stress.

RO-BO

When talking about 'stress', people generally mean 'over-stress' and its effects. Though too much stress (over-stress) can result in 'burn-out', too little stress ('under-stress') can also affect the performance of civil engineers through 'rust-out' (Lingard 2003). Previous research studies (Fisher 1986; Hebb 1995) have suggested that there is an inverted U-shaped relationship between degrees of stress and levels of performance (Leung *et al.* 2005a). Performance will not reach an optimum level if estimators are under- or over-stressed (see Figure 1).

Figure 1 RustOut–BurnOut Scale (Gmelch, 1994)



The RustOut-BurnOut (RO-BO) scale (Gmelch, 1994) is an easy way to identify the positive/negative signs of respondents' stress in the estimation process, which enables the separate measurement of the stress of estimators in the quantitative and qualitative dimensions.

Rustout Syndrome is a widespread ailment in many organizations today. From the organization's point of view, rustout means less productivity and less ability to respond to emerging challenges. From a personal perspective, rustout means that employees are passive and unwilling to grow and change (Leider and Buchholz, 1995).

Burnout Syndrome includes headaches, ulcers, illnesses, or disabilities. From the organization's point of view, burnout may cause an increase in the overall absentee rate and hence reduce the productivity. From a personal perspective, burnout means that employees feel fatigue and frustration with their job. They may also exhibit signs of detachment from their organization (Maslach and Jackson, 1981).

RESEARCH METHODOLOGY

To measure the individuals' stress level, RO-BO scale was included in the survey to reflect both quantitative (number of assignments) and qualitative (difficulty of assignments) dimensions of workload on an individual. Eighteen questions (refer to Table 1) were extracted from the literature review, covering personal, interpersonal, task, and physical items (Leung and Lam 2002; Leung 2004; Leung *et al.* 2005b). The respondents were requested to rate each item on a 7-point Likert scale ranging from 1 (extremely disagree) to 7 (extremely agree).

The questionnaire was distributed to 500 estimators in Hong Kong by post or fax. One hundred and sixty-three questionnaires were returned, representing a response rate of 32.6%. All the respondents had had relevant estimation experience in construction projects, and they covered several main sectors in the construction industry such as developers, consultant firms, main contractors, public sectors, subcontractors, and other types of companies. The majority of respondents were from contractor firms (30%).

RESULTS

Principle Estimation Stressors for Estimators

In order to identify the main categories of estimation stressors for estimators, 18 "expected" response items of stressors were factor-analyzed by SPSS with varimax rotation (eigenvalue = 1 was selected as the cut-off value). To ensure similar characteristics for each category, only those items with a factor loading greater than 0.5 were accepted as principle estimation stressors (Rahim *et al.*, 2000). The corresponding factor loadings with the coefficient alpha reliabilities are summarized in Table 1.

The results generated seven factors of stressors: Personal Behavior (S1), Social Support (S2), Role Conflict (S3), Poor Environment (S4), Work Underload (S5), Distrust (S6), and Home-Work Conflict (S7). They were basically loaded onto the appropriate factors, except for factor 1 (S1) and factor 6 (S6). A new factor, named Personal Behavior (S1), was formed, consisting of three Type A Behavior items (items 1-3) and two Work Overload items (items 4 and 5). Since item 16 (Role Ambiguity) had a factor loading smaller than 0.5 and the reliability of S6 was lower than 0.5, the Distrust factor (S6) was deleted in the following study (see Table 1). In general, these six stressors can be grouped into two main categories, Job-Demand stressors (S5 and S7) and Non Job-Demand stressors (S1, S2 and S4).

Table 1 Scale Items, Factor Loadings, and Coefficient Alpha Reliabilities for Stressors

Factor (Stressor)			Item	Factor Loading	Alpha (α)
S1	Personal Behavior	1	I demand a lot of the quality of my work.	0.733	0.676
		2	I do not go home before I have finished what I have planned.	0.723	
		3	I am an achievement-oriented person who has the need to win.	0.608	
		4	I have a lot of responsibility in my job.	0.568	
		5	There is constant pressure to work every minute, with little opportunity to relax.	0.555	
S2	Social Support	6	I feel well supported by my friends and/or family.	0.758	0.635
		7	There are trustworthy persons that I could turn to for advice if I was having problems.	0.674	
S3	Role Conflict	8	My beliefs often conflict with those of the organization.	0.860	0.791
		9	I am often caught between conflicting demands from my supervisor and staff.	0.838	
S4	Poor Environment	10	My office is too crowded.	0.885	0.776
		11	My office is too noisy.	0.881	
S5	Work Underload	12	I frequently find my work boring and repetitive.	0.776	0.645
		13	I feel my skills and abilities are not being used well.	0.757	
S6	~~Distrust~~	~~14~~	~~There often seems to be a lack of trust between myself and my subordinates.~~	~~0.844~~	~~0.490~~
		~~15~~	~~I seldom delegate tasks because others cannot complete the tasks as well as I can.~~	~~0.666~~	
		~~16~~	~~I am not sure I have divided my time properly among task.~~	~~0.471~~	
S7	Home-Work Conflict	17	My family/friends would like me to spend more time with them.	0.843	0.629
		18	My devotion to work is usually in conflict with my devotion to family.	0.734	

Note: All items were measured on a 7-point scale rangingn from "extremely disagree" to "extremely agree."
Kaiser-Meyer-Olkin Measure of Sampling Adequacy = 0.635.
"~~xxx~~" – Items with a factor loading less than 0.50 or factors with an alpha coefficient (α) less than 0.5 were deleted from the above data analysis.

Table 2 Means, Standard Deviations, and Correlations between Stressors and Stress

Stress/Stressors	M	SD	Qtt Stress	Qlt Stress	S1	S2	S3	S4	S5	S6
Quantitative stress	0.610	3.336	-	-	-	-	-	-	-	-
Qualitative stress	0.160	3.361	.641**	-	-	-	-	-	-	-
S1 Personal Behavior	21.031	4.633	-.056	-.009	-					
S2 Social Support	14.129	2.683	-.111	-.087	.110	-				
S3 Role Conflict	6.871	2.323	.029	.079	.218**	-.106	-			
S4 Poor Environment	6.135	2.684	.089	.101	.182*	.278**	.213**	-		
S5 Work Underload	7.086	2.430	.032	.175*	.137	-.059	.311**	.073	-	
S7 Home-work Conflict	8.423	2.477	.051	.180*	.082	-.107	.220**	.360	.181*	-

Note: n = 163 construction estimators.
* Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).
Qtt stress Quantitative Stress Level ; Qlt stress Qualitative Stress Level.

Relationships between Principle Estimation Stressors and Stress Level

To investigate the relationships between estimation stressors and the Job-Demand stress of estimators (quantitative stress and qualitative stress), bivariate correlation analysis was applied in the study (see Table 2). Figure 1 illustrates the results of correlation analysis found in the study.

Table 2 shows that the level of quantitative stress of estimators is higher than that of the qualitative stress. The Job-Demand stress of estimators is mainly due to the number of tasks rather than the task difficulty. Estimators often work overtime on construction projects. Therefore, they usually operate under stress, especially when they are facing deadlines (Anonymous, 1998).

However, the results reveal that quantitative stress has a significant correlation ($r = 0.641$; $p<0.01$) with qualitative stress. This shows that the number of tasks the estimators have to carry out is significantly related to the difficulty of tasks that they have to handle. Estimators/ estimating managers should not consider the quantity or quality of the tasks independently.

No relationship was found between quantitative stress and the stressors, while qualitative stress was found to be significantly

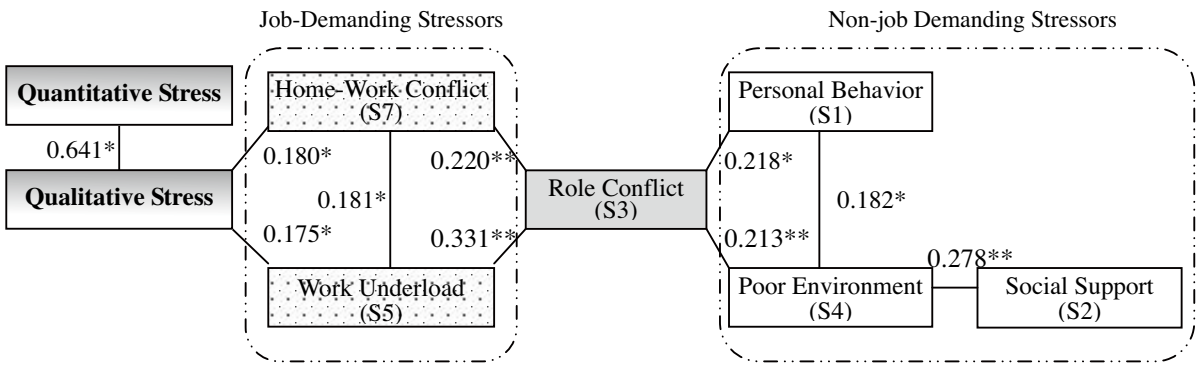


Figure 1 Hypothesised Model based on Results of Correlation Analysis
Note: ——— significant relationship ($p<0.01$**) ; ------ significant relationship ($p<0.05$*)
xxx -Critical Stressor; xxx -Job-demanding Stressors; xxx -Non-job demanding related Stressors.

related to two stressors Work Underload (S5: $r = 0.175$; $p<0.05$) and Home-Work Conflict (S7: $r = 0.180$; $p<0.05$). Hence, the principle stressors affected the qualitative stress of estimators rather than the quantitative stress. Estimators/estimating managers should not only adjust the workload assigned to them, but also consider their private life and their relationships with their family and friends (Kanter, 1977). However, the positive relationship between qualitative stress and Work Underload was an interesting result: those who are delegated tasks beneath their ability also experience qualitative stress (task difficulty). Work Underload represents boredom and repetitiveness in doing a task. It is difficult for estimators to carry out a boring task repetitively when they find that their skills and abilities are not being used well or appropriately.

Among the six stressors, Role Conflict (S3) can be considered as a critical stressor in the estimation process, as it links the Job-Demanding stressors and the Non Job-Demanding stressors. (refer to Fig. 1) Although the remaining stressors have no significant relationships with the Qualitative and the Quantitative Stress, the results still indicated that four of them are related to the stress indirectly. Role Conflict of estimators in a consultant firm or construction company is directly related to work underload, personal behavior, home-work conflict and the working environment.

Social Support (S2) acts as the root of the stressors-stress relationship for the construction estimators. It is well known that construction estimation involves complicated and demanded tasks. Estimators are required to review all drawings, contact different experts/suppliers, clarify uncertainties, call quotations, check historical data, calculate unit rate, allow accuracy mark-up percentage, etc. In practice, it is common to work overtime in the estimation process. Thus, social supports (S2) from estimator's family and friends are very important for the demanding estimation tasks. This implies that a lack of social support of an individual estimator would lead to an increase in the individual stress level of estimators indirectly by chain reaction.

In sum, estimators are more likely to have conflict with the organization and their supervisors (S3), if they work underload (S5), involve the particular personal behavior (S1) and work in a crowded and noisy environment (S4). Role Conflict can also be attributed from the conflict between their estimation tasks and their family (S7), or the support by their friends and family (S2).

RECOMMENDATIONS

In order to optimize the estimation performance, estimators' task difficulty and working ability have to be appropriately balanced. It is suggested that regular examination of estimation teams' RustOut/BurnOut degree of stress be carried out in all construction firms, as the RO-BO scale involves both quantitative and qualitative RustOut/BurnOut dimensions. Estimating managers can then adjust the workload and the nature of tasks for each estimator before the estimators experience rustout or burnout.

Since Work Underload and Home-Work Conflict are the main stressors influencing qualitative rustout and burnout respectively, estimating managers need to clarify whether the tasks given to estimators are too boring or repetitive. They should perhaps hold meetings with those estimators who have high qualitative stress and provide psychological consultation to their employees to solve/support their personal problems. By understanding their personal life and adjusting their workload, estimation performance can be improved.

Many studies have found an inverted U-shaped relationship between stress level and performance (Jex, 1998; Leung *et al.*, 2005a), while other recent studies have questioned such a relationship (Westman, 2001). Moreover, Allen *et al.* (1982) and Friend (1982) found only negative linear relationships between stress and performance. This survey investigates the impact of stressors on both quantitative and qualitative stress, but it does not reveal the relationship between quantitative stress and estimation performance or between qualitative stress and estimation performance. To understand overall stress management in the estimation process, further study on the impact of different types of stress is recommended.

CONCLUSION

This paper has identified the stressors experienced by estimators and investigated the impact of such stressors on the qualitative and quantitative stress of estimators in Hong Kong. The results indicated a significant relationship between quantitative and qualitative stress levels. Job-Demand stressors such as Work Underload and Home-Work Conflict have significant effects on qualitative and quantitative Job-Demand stress. Other estimation stressors including personal/interpersonal stressors (personal behavior, social support and role conflict) and physical stressor (work environment) are correlated to the qualitative stress indirectly via Job-Demanding Stressors.

The study found that Work Underload and Home-Work Conflict are two main stressors affecting the estimators' qualitative Job-Demand stress directly. Private Life cannot be easily controlled by a company; and Role Conflict is found to be a critical stressor for the stress level of the construction estimators. It is recommended that the RO-BO scale, which is a simple and fast indicator of stress, be used by construction companies to examine the stress situation of estimators and as a guideline for how to adjust the workload among company estimators. Construction companies should pay attention to the qualitative and quantitative Job-Demand stress situation of estimators in order to prevent the occurrence of burnout or rustout.

In sum, stress is not only caused quantitatively and qualitatively by workload, but it is also affected by personal stressors in the estimation process. Estimating managers need to consider both the task and personal stressors in order to prevent rustout and burnout in estimators.

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