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Author(s)	Ng, TST
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Using Balanced Scorecard for Subcontractor Performance Appraisal

S. Thomas NG, Hong Kong, China

Key words: Subcontractor performance, performance appraisal, balanced scorecard

SUMMARY

Several influential industry reports have pointed out that a decline in construction quality and productivity could be attributed to the performance of subcontractors who are entrusted to complete the actual works, yet subcontractor performance appraisal is a much neglected subject in construction. To facilitate subcontractor registration, management and/or selection, an equitable and reliable subcontractor performance appraisal would be indispensable. Being regarded as a reliable and practical means for performance evaluation, the balanced scorecard should have a high potential for improving the quality subcontractor appraisal decisions. This paper discusses the issues in developing a balanced scorecard model for subcontractor performance appraisal. The current practice of appraising subcontractor performance begin is first outlined. It is then followed by introducing the research methodology. The structure of the balanced scorecard model for subcontractor performance appraisal is proposed. Finally, a prototype Internet-based model for appraising subcontractors based on the balanced scorecard concept is presented. The initial results indicate that it is possible to establish a balanced scorecard model to formalise the subcontractor performance appraisal decisions.

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1. INTRODUCTION

Subcontractors could contribute to as much as 90% of the total project value (Matthews *et al*, 1997), and the performance of subcontractors could inevitably affect the productivity and quality of a project (Hsieh, 1998). A recent industry report to the Chief Executive of HKSAR points out that many subcontractors are tempted to save cost at the expense of quality especially when surviving in a competitive environment. PCICB (2002) urges the industry to monitor subcontractor performance regularly, and hence the setting up of a formal subcontractor appraisal model is relevant to the current trend and needs of the industry.

Despite that, little research has been carried out to address the 'soft issues' inherent in the appraisal of subcontractors (*cf:* Ling, 2002; Amaratunga *et al*, 2002). Since subcontractor performance is usually difficult to measure and assess (Black and Porter, 1995), expert judgement is construed as inevitable in formulating the evaluation criteria and benchmark (Muralidharan *et al*, 2001). To improve the fairness, transparency and rationality of subcontractor performance appraisal (Garg *et al*, 1996), any appraisal model must be founded on unequivocal yardsticks instigated by the objectives and expectations of the client (*cf:* CIPS, 2001).

In recent years, certain organisations such as the US Department of Commerce, Canadian Government, etc. have begun to realise the benefits of the balanced scorecard techniques and apply these methods to various kinds of performance-based appraisal schemes including business, environment, quality, etc. Literatures confirm that balanced scorecard have been successfully applied to various construction domains to measure the service/product quality (e.g. Gronroos and Christian, 1982; Kaplan and Norton, 1992; Winch *et al*, 1998; Ahn, 2001). There is a need to examine the full potential of balanced scorecard in promoting the objectiveness and transparency of construction SPA.

In this paper, the initial result of a more comprehensive research study into the application of balanced scorecard techniques for subcontractor performance appraisal is presented. The paper begins by unveiling the current practice of subcontractor performance appraisal. Based on a questionnaire survey, a conceptual balanced scorecard model is devised. The paper concludes by presenting a prototype web-based balanced scorecard-based subcontractor performance appraisal model.

2. SUBCONTRACTOR PERFORMANCE APPRAISAL PRACTICE

An extensive literature review was conducted which confirms that only few subcontractor performance assessment models operate in the industry worldwide. Examples of current models include the US governmental departments located at South Carolina, the Department

of Administration in the State of Wisconsin, Los Alamos National Laboratory, Fermi National Accelerator Laboratory, etc. Guidelines and procedures were solicited and detailed comparison on the potentials and pitfalls of each of these systems was carried out.

In the UK, there is a Quality Mark initiative for builders in the domestic repair, maintenance and improvement sector. Under this scheme, consumers can identify reputable builders who have demonstrated to independent assessors that they possess the skills and competence to complete work to a high quality standard.

In Singapore, the performance of subcontractor is assessed and fed back to a registration system known as the Singapore List of Trade Subcontractors Registry. This system is administered by the Singapore Contractors Association Limited. Subcontractors seeking registration should satisfy the requirements set out by SCAL which include their company's status, personnel resources, financial capability, track record and performance.

In Hong Kong, except for the model being adopted by the Hong Kong Housing Authority for assessing piling subcontractors, there is no other bespoken system for measuring subcontractor performance. Despite that, there are idiosyncratic systems being used by individual organisations to evaluate the performance of main contractors such as those used by the government and quasi-governmental organisations like the Mass Transit Railway Corporation, Kowloon-Canton Railway Corporation, etc.

3. RESEARCH METHOD

To determine the structure of the balanced scorecard model for subcontractor performance appraisal, a major literature review was first conducted to identify the decision criteria and quantitative indicators to be considered. Based on the previous research of Chung and Ng (2006), a list of ten decision criteria and seventeen quantitative indicators were identified. This information was used for the development of a questionnaire for capturing the necessary data for model development.

The questionnaire consisted of two sections. In the first section, respondents were asked to provide their personal particulars, i.e. their job title, number of years of experience in the engineering industry, type of organisation they are working for, and the size of their companies. The second section required the respondents to express their opinions on the quarterly evaluation of large-scale skilled subcontractors. Respondents were asked to fill in the relative importance of decision criteria and quantitative indicators, and to indicate their perception of the target level and baseline level for each quantitative indicator. The questionnaire was piloted by two experts experienced in appraising the performance of subcontractors.

The questionnaires, together with cover letters, were sent to the directors of contractors and subcontractors by post, and they were requested to return the questionnaire either by fax or by electronic mail.

4. CONCEPTUAL BALANCED SCORECARD MODEL

The data pertinent to the perception of decision-makers on the target and baseline levels for each quantitative indicator were analysed statistically and translated into a quantitative yardstick. Therefore, meeting the yardstick set for the target level implies that a subcontractor has achieved an excellent level of performance on the particular aspect being examined. In contrast, should they fail to meet the yardstick set for the baseline level, their performance shall be rated as poor. Any performance levels between the target and baseline levels should attract a performance rating between the two extremes, i.e. acceptable, average or good as shown in Table 1.

Table 1: Conceptual balanced scorecard structure

Criteria	***Poor*** *10*	***Acce*** *30*	***Ave*** *50*	***Good*** *70*	***Exc*** *90*	***Weighting***	***Score***
Workmanship							
% of work that has to be redone	>4.25	4.25	3.42	2.58	<1.75	0.106	
Progress							
% deviation from subcontractors' project milestones	>7.13	7.13	6.05	4.96	<3.88	0.101	
Safety							
no .of fatal accidents per 100,000 man-hour	>0.63	--	--	--	<0.63	0.038	
no. of reportable injuries per 100,000 man-hour	>1.4	1.4	1.32	1.23	<1.15	0.036	
no. of prosecutions made by Labour Department	>0.13	--	--	--	<0.13	0.038	
Environment							
no. of prosecutions made by EPD	>1	--	1		0	0.106	
Relationship							
no. of unresolved disputes with client or other S/C	>3	3	2	1	0	0.092	
Resource Control							
no. of days of delay in the delivery of material	>5	5	4	3	<3	0.031	
% shortage of labour at critical stage	>6.5	6.5	5.71	4.92	<4.13	0.031	
% shortage of plant at critical stage	>6.75	6.75	6.04	5.34	<4.63	0.031	
Attitude to Claims							
% of unsuccessful claims	>5.38	5.38	4.71	4.05	<3.38	0.092	
Communication							
% of site meetings not attended	>3.50	3.50	2.63	1.75	<0.88	0.052	
no. of times not responding to contractor's instruction	>1.38	1.38	0.96	0.55	<0.13	0.055	
Promptness of Payment							
no. of days in delaying payment to workers	>7	7	6	5	<4	0.051	
no. of days in delaying payment to sub-subcontractors	>7	7	6	5	<4	0.051	
General Obligations							
no. of days of delay in responding to instructions	>6	6	5	4	<3	0.043	
no. of incidents of damaging public utilities	>1	--	1	--	0	0.048	
TOTAL						1.00	

Take the percentage of work that has to be redone as an example, if 2.5 percent of the work conducted by a subcontractor over the previous quarter had to be pull down and rebuilt again, this subcontractor shall be regarded as achieving a good performance standard on workmanship and should therefore be awarded 70 marks. When multiplying by the weighting, a weighted score can be computed. The final score a quarter is calculated by summarising all weighted scores representing the quantitative indicators.

5. PROTOTYPE MODEL

A rapid prototype was developed to illustrate the idea of the proposed subcontractor performance appraisal model based on the conceptual balanced scorecard model as shown in the preceding section. The prototype model was developed in a web-based format. To begin the appraisal process, decision-makers have to key in the project and subcontractor data into the model. As the stage of subcontract might influence the performance of a subcontractor, users are required to indicate the approximate percentage of completion of the subcontracted work. The type and size of subcontract are also entered so as to facilitate benchmarking.

Having entered the basic information, the quarterly project performance is evaluated through the balanced scorecard model. In this model, decision-makers are provided with a list of ratings for each criterion for selection (Figure 1). One can simply click on the appropriate radio button that best represent the performance of subcontractor under investigation during the last quarter. Once completed, users can press the submit button provided.

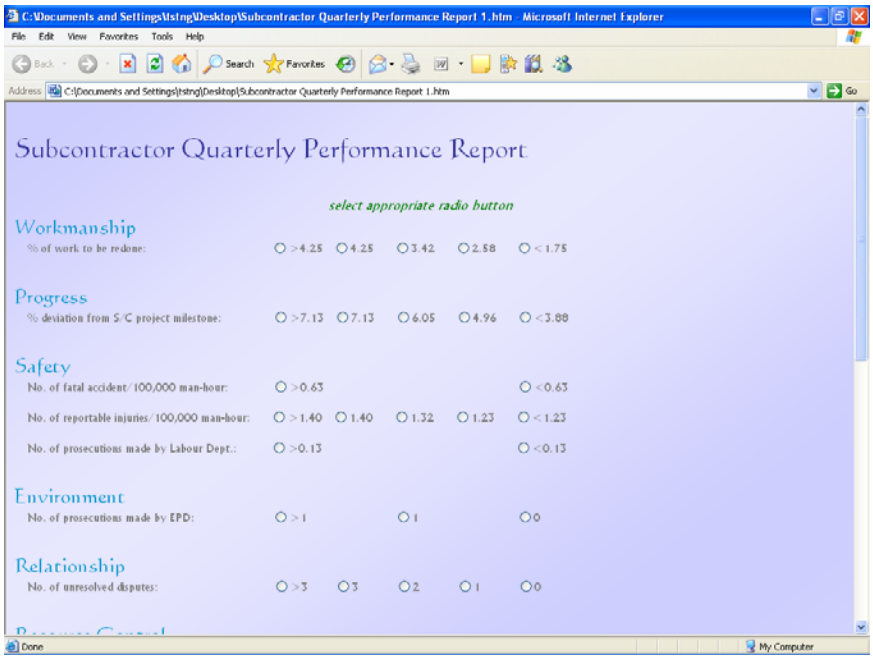

Figure 1: Rating subcontractor performance on line

While the weighting for each criterion provided (i.e. based on the findings of the survey), decision-makers are allowed to adjust the weighting by pressing the Amend button and enter an appropriate weighting in the space provided (Figure 2) to reflect the predominant characteristics of the subcontract.

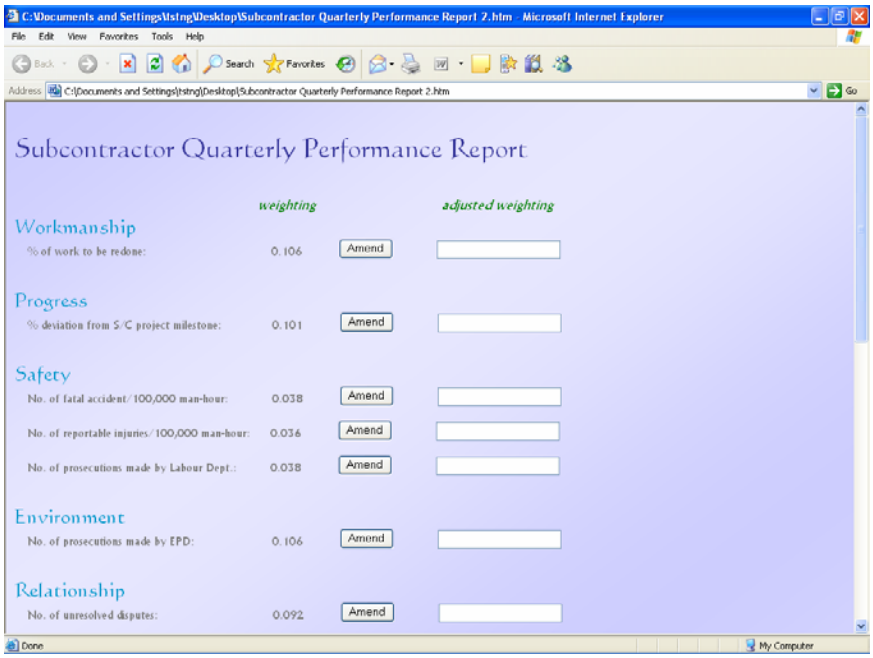

Figure 2: Adjusting the weighting for the balanced scorecard model

Based on the weighting and rating provided, the model will assign mark for each criterion and compute the score and overall score for the subcontractor. By referring to the summary (Figure 3), users can check to ensure the input data is correct.

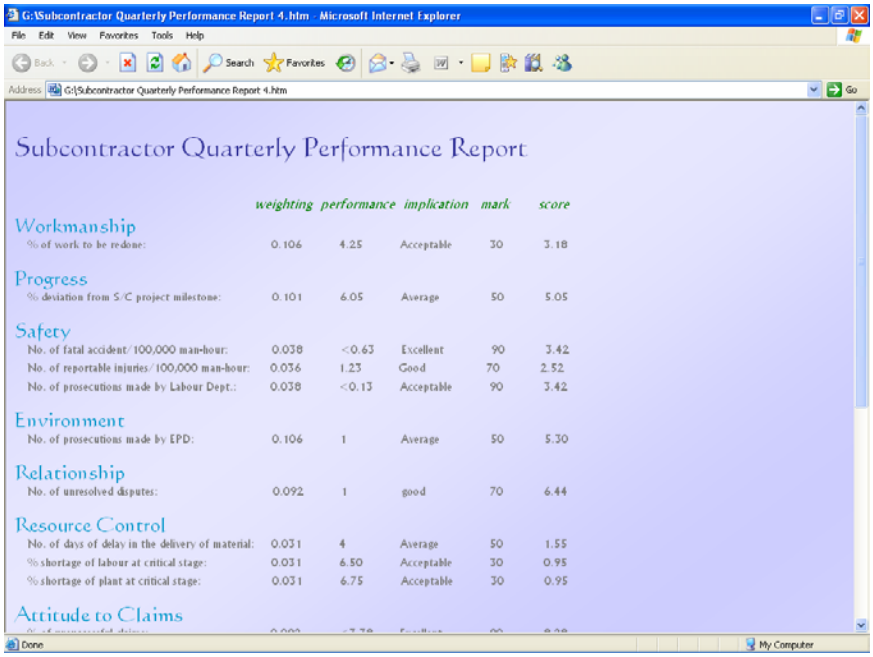

Figure 3: Summary generated after the weighting and rating are entered

A summary showing the project and subcontract details as well as the quarterly performance and unsatisfactory performance aspects are highlighted (Figure 4) for the information of both the main contractor and subcontractor being appraised.

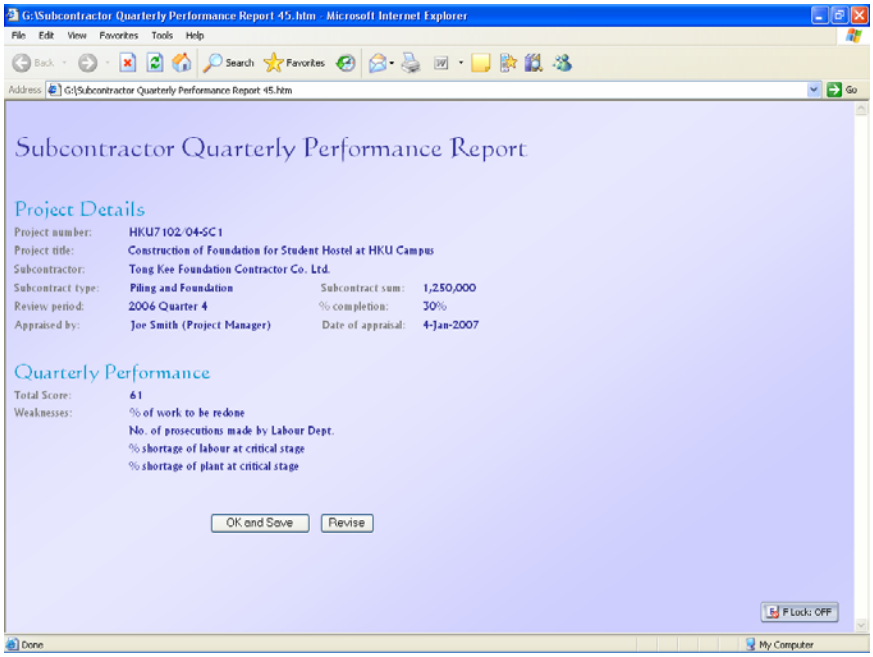

Figure 4: Report for the balanced scorecard model

6. CONCLUSIONS

In this paper, a balanced scorecard-based subcontractor performance appraisal model is presented. The results indicate that balance scorecard can help rationalise the decision process by providing a much better guideline as to the standard required for each performance level. This could eliminate the reliance on subjective judgement as characterised in the current subcontractor performance appraisal practice.

The balanced scorecard model is simple and easy to use by decision-makers. The concept is setting the target and baseline levels are indeed employed by decision-makers subconsciously in their decision making process. By determining the target and baseline levels through empirical studies, decision-makers no longer have to rely on their own standard thus improving the consistency and reliability of appraisal. The results in this paper set a solid foundation for future investigations as to how to further improve the accuracy of balanced scorecard models for subcontractor performance appraisal.

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BIOGRAPHICAL NOTES

Dr. Ng is an Associate Professor in Department of Civil Engineering, The University of Hong Kong. He worked in the construction industry for more than ten years and participated in a number of prestigious construction and civil engineering schemes before his academic career. His research interests include contractor and consultant selection, delays mitigation, time/cost relationship, accuracy of cost estimation, and the application of information technology in construction management and economics. He serves as a member of Editorial Board for Construction Innovations – Information, Process, Management.

CONTACTS

Dr. S. Thomas Ng
Department of Civil Engineering
The University of Hong Kong
Pokfulam
Hong Kong
Tel. + 852 2857 8556
Fax + 852 2559 5337
Email: tstng@hkucc.hku.hk
Web site: http://www.hku.hk/civil/staff/ngtst.html