Job Performance Evaluation for Construction Companies: An Analytic Network Process Approach

Eddie W. L. Cheng[1] and Heng Li[2]

Abstract: This paper aims at presenting a job performance evaluation process for construction companies. Human resource is a core economic asset. Organizations are responsible for helping their employees work at their optimal level. Job performance evaluations become an essential organizational activity, which can sustain employee performance. Existing literature has suggested that the construction industry does not pay attention to the importance of job performance evaluation. This paper presents the use of the analytic network process (ANP) to assign weights to a set of job performance criteria. It also describes a process for job performance evaluation. An example is demonstrated to illustrate how to construct the supermatrix for ANP.

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Introduction

Human resource has been documented as a key production input for producing economic products (Lee and Nagaraj 1988). By maintaining an optimal level of job performance, organizations are better able to achieve their preset goals and missions. Improving and sustaining job performance involves using well planned employee evaluation criteria to assess employee performance. Although construction companies are responsible for undertaking job performance appraisals, a recent study conducted by Hanna and Brusoe (1997) in the United States indicated that only 31% of the respondents admitted that their companies had job performance evaluations, implying that the construction industry may have neglected the importance of employee performance evaluation. They further found that the more the income earned by or the larger the size of a company, the more is its willingness to evaluate employee performance. This may be due to the premise that larger companies have more available resources to adopt new tools and methods for improving their productivity. Nevertheless, as Hanna and Brusoe (1997) suggested, the workforce can be improved constantly if employee performance is evaluated and monitored regularly. For the benefit of employees, organizations, and projects as well, there is no excuse for not conducting job performance evaluation.

Traditionally, job performance evaluation (usually known as performance appraisal) is to assess a set of job performance criteria. Due to their "fragmented" nature (e.g., partnered with various parties, conducted with individual project specifications and contract types), different projects may possess different sets of job performance criteria. Moreover, to evaluate job performance accurately, the construction companies must consider the impact of project performance on job performance. In other words, job performance and project performance are perceived to be interdependent. Both job attributes and project attributes are thus the key criteria essential for actual performance evaluation. Apparently, job performance evaluation and project performance evaluation have different sets of criteria. The criteria in each set are not equally important and have to be weighted separately.

Construction companies are fond of using a simple linear rating method to prioritize criteria, which is however argued to be less scientific. In considering this, a promising approach is to use the analytic network process (ANP), being a multicriteria decision-making (MCDM) tool established by Saaty (1996). It is a generic form of the analytic hierarchy process (AHP), which has both qualitative and quantitative components in managing a decision making process. In AHP, the set of job performance criteria and that of project performance criteria are rated or prioritized separately. When job performance and project performance are interrelated, ANP can be employed. Yet, there is a lack of research focusing on the use of ANP to weight job performance criteria, especially when project performance criteria are taken into account. This paper presents the adoption of ANP to assign weights to a set of job performance criteria. As Meade and Sarkis (1999) mentioned, by means of ANP, researchers are able to establish a more complete multicriteria model that specifies interdependent relationships that are originally assumed to be uncorrelated.

This paper proceeds as follows. The first section presents a process that can undertake job performance evaluation. The second section is to demonstrate an example to assign weights to a set of job performance criteria. The procedure for ANP and a decision model for applying the ANP tool are also described in individual paragraphs. In the final section, an example of job performance evaluation is presented.

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Job Performance Evaluation Process

Assessment of job performance has long been a core activity of human resources management practices. Companies should be concerned about their employee performance at work, which is expected to directly affect organizational performance. As Ireland (2004) estimated, by bringing project participants up to the required professional standards, project times would reduce by up to 20% and project costs by up to 10%. Job performance evaluation has been extensively defined. For example, performance evaluation or appraisal is "a formal, structured system of measuring and evaluating an employee's job related attributes, behaviors, and outcomes to assess an employee's productivity and judge whether he or she will perform (equally well) or more effectively in the future, so that the employee, the organization, and society all benefit" (Shaout and Al-Shammari 1998, p. 323).

Deadrick and Gardner (2000) defined employee performance as the achieved work outcomes for each job function during a specified period of time. In complex organizations (as those in the construction industry), it is often difficult to measure employee performance because work outcomes are a result of multiple interdependent work processes (Borman 1991). Therefore, job performance can be seen as an individual's overall performance or as performance on specific dimensions, such as the quality and quantity of work (Meyer et al. 1989). When viewed this way, job performance in construction can be measured using a variety of criteria that describe an employee's pattern of performance over each project or a batch of projects being undertaken simultaneously. It is because each construction project is distinctive in terms of the involved construction parties, project specifications, and contract types.

Although there are researchers supporting the use of objective performance measures that are expected to limit both intentional and unintentional supervisory biases (e.g., leniency and halo errors) occurred in subjective performance evaluation (e.g., Siders et al. 2001), objective measures such as market share or profit may be too broad to define the performance of employees. Therefore, the writers of this study still support the use of subjective measures for job performance criteria until reliable and valid objective measures are developed. This viewpoint is prevailing in mainstream research (e.g., Meyer et al. 1989, 1993)

Existing literature and practices have ample methods for performance evaluation. Woods et al. (1998) noted that recently, organizations in the United States were shifting away from the use of collaborative evaluation approaches in which managers and employees participate together in the goal-setting process [e.g., management by objectives (MBOs) and behaviorally anchored rating scale (BARS)] to more traditional approaches such as graphic or numeric rating scales (based on scoring). Empirical evidence supports this view that rating scales were most commonly used in United States companies (57.1%), followed by open-ended surveys (21.3%) and MBOs (18.1%) (Locher and Teel 1988).

As stated earlier, job performance evaluation in construction can be undertaken on a project-by-project basis. The role of conventional performance evaluation (or appraisal) methods in a project-oriented environment has to be redefined so that the evaluation process can trace the actual employee performance at work. Being aware of this, the writers of this paper present a process for job performance evaluation. Fig. 1 illustrates the essential steps of this process.

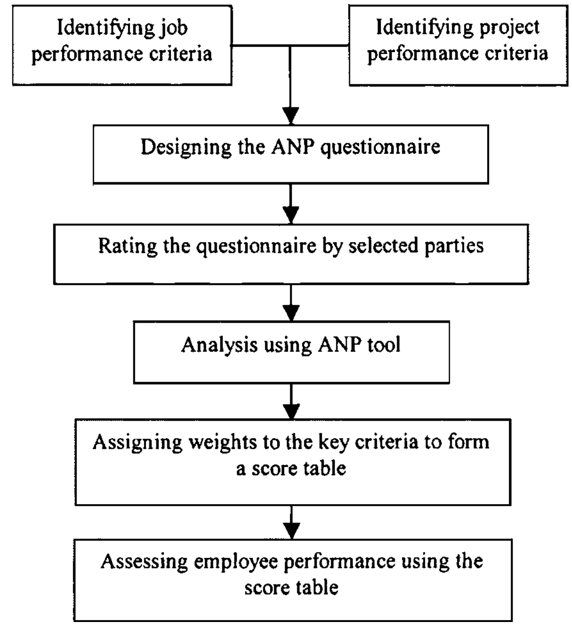

Fig. 1. Job performance evaluation process

The first two steps involve those activities pertaining to the identification of job and project performance criteria. During these steps, job experts (e.g., human resource managers) establish the frame of reference in a manner similar to conventional performance appraisal systems. As Horowitz and Zappe (1995) mentioned, the criteria for the evaluations can be objective or subjective, easily quantified, or less quantifiable. So, job experts must ensure that the measures of the criteria can be combined if both subjective and objective criteria are used.

Then, job experts have to design the ANP questionnaire for subsequent ratings. ANP and AHP are similar in process for the formation of local eigenvectors for compared elements in a matrix format, except that the former needs to create a supermatrix for calculating the global eigenvector. Saaty (1980) advocated the use of pair-wise comparison to collect more information for comparing elements. He further suggested the use of a nine-point priority scale of measurement. Details of AHP or ANP are not discussed in this paper. For details, refer to Saaty (1980, 1996). In the following individual paragraphs, some description of AHP and ANP is provided when necessary.

At the fourth step, the involved management together with the job experts would select the parties who are best to assign weights to the criteria. These parties should have solid knowledge about their functions or departments. Examples are functional managers or departmental managers. Each function or department should have an individual set of weighting. After the analysis using the ANP tool, the criteria have been assigned weights, which would form a score table (or score card). Each function or department would use an individual score table.

Once the score table has been prepared, the function or department can use it to rate employee performance. Who should be responsible for this important task? Recent research has supported the use of the multitrait-multirater method (MTMM) (e.g., Conway 1996). This method calls for alternative rating sources to supplement the common supervisor appraisal judgments (Mount 1984). Yet, research suggests that only supervisor and subordinate ratings are more adequate in terms of psychometric properties (e.g., convergent and discriminant validity) and leniency and halo

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Table 1. Quantitative Studies of Job Performance

Source	Description of job performance criteria
Igbaria (1991)	Task dimension: ability; job knowledge; productivity; creativity; quality of work; initiative; judgment; planning; accuracy; and responsibility. Relationship dimension: cooperation; honesty; interpersonal relationship; attitude; dependability; communication skills; and punctuality.
Hanna and Brusoe (1997)	Leadership; personal conduct; sets good example; communication skills; public/customer relations; attendance; attitude; trustworthiness; ability to motivate; dependability; productivity; ability to catch mistakes; quality of work; ability to deal with problems; safety awareness; delegation of responsibility; ability to instruct; work ethic; initiative; accepts responsibility; ability to work with others; knowledge of work; planning; communication with crews; scheduling; and maintenance of records.
Lee and Nagaraj (1988)	Positive dimension: job knowledge; speed; quality; attitude; and attendance. Negative dimension: initiative; leadership; and communication.

effects (Malka 1990), In fact, the score table has several functions: (1) tracing employee performance; (2) improving employee performance by preset score targets; and (3) performance appraisal intended for promotion or salary increment. The following example is demonstrated for these functions.

Illustrated Example

This paper presents an illustrated example of the use of ANP to weight a set of job performance criteria. It is noted that ANP is a MCDM tool but not a statistical method. A decision-making tool is different from a statistical method. Although statistical methods can be applied to assign weights to criteria in terms of correlation coefficients, statistical analyses always rely on an appropriate sample size to generalize the results to a larger population. Decision making does not require this kind of generalization, and hence decision-making tools are used instead. It is understood that only a small group of people is involved in making a decision. For example, the chief executive officer of a company determines the profit to be made in the following year, while the job performance of an employee may be collectively determined by the employee, the immediate supervisor, and the personnel manager.

Job performance is a multifaceted term. It is not able to measure job performance by a single criterion. A set of criteria has to be employed. This study was not intended to create an exhaustive list of job performance criteria and to statistically test their importance level. Instead, the study employed a more practical approach that was to select key job performance criteria from prior empirical studies. After a review of the relevant literature, three studies that had tested different sets of job performance criteria were identified (as shown in Table 1). A brief description of these studies is given as follows:

1. Igbaria (1991) studied the antecedents and consequences of job performance of management information systems (MIS) professionals. One hundred four supervisors and 94 MIS employees participated in the research. Part of the research was to ascertain the multi-item measure of job performance. Supervisors were required to rate each of their MIS employees on 17 items on a seven-point scale. The resulting factor analysis produced two factors that accounted for 66.2% of the common variance. Factor 1 was labeled "task," while Factor 2 was labeled "relationship."
2. The quantitative study of Hanna and Brusoe (1997) used 193 respondents (either managers or supervisors) from electrical construction contractors, representing a 19.3% response rate, who provided scores (five-point scale) to various job performance criteria, Twenty six criteria were viewed as more important in evaluating a supervisor.
3. Lee and Nagaraj (1988) used the secondary data of a sample of assembly bench workers in an electronics company to examine eight job performance attributes. They performed factor analysis and extracted two principal components. It is worth noting that their study found that initiative, leadership, and communication were negative components of job performance.

Among these studies, Igbaria's (1991) model was adopted in the present research. For the ease of demonstration, this study would not use the whole original model but focused on a reduced number of criteria, where the selection of these criteria was based on their important level in the original study and suggestions from other studies. For example, productivity was one of the important criteria in the original study but was excluded in this study because it is technically not identical to production or performance but pertains to the outcomes of a total system expressed as a ratio to inputs (e.g., a firm's annual sales in dollars relative to its annual payroll, or a department's turnover rate, etc.) (Katzell and Thompson 1990). It is noteworthy that construction companies should establish their own decision model with a specific set of criteria. They have to undertake a diagnosis regarding potential job and project attributes before determining the final set of criteria.

Fig. 2 illustrates the decision model for this example. The two job performance dimensions in the proposed decision model were identical to those in Igbaria (1991), each of which was decomposed into a set of criteria. Specifically, task performance criteria were ability, job knowledge, quality of work, efficiency, and responsibility, while relationship performance criteria were attitude, punctuality, cooperation, and equity. On the other hand, this study used seven common project performance criteria, which were time, cost, scope of work, quality, safety, profit, and rework (Cheng et al. 2000).

The decision model in Fig. 2 shows that the decision goal is the weighting of job performance criteria. This topmost level is then decomposed into two job performance dimensions—task and relationship. Each of these dimensions is further decomposed into a set of performance criteria. Assigning weights to the criteria at this criteria level is the goal of this example. Besides the dependent relationships, the interdependence occurred between project performance criteria and the two job performance dimensions, indicated by the bidirectional paired arrows. Due to their interdependent influences, ANP has to be employed since AHP is not workable.

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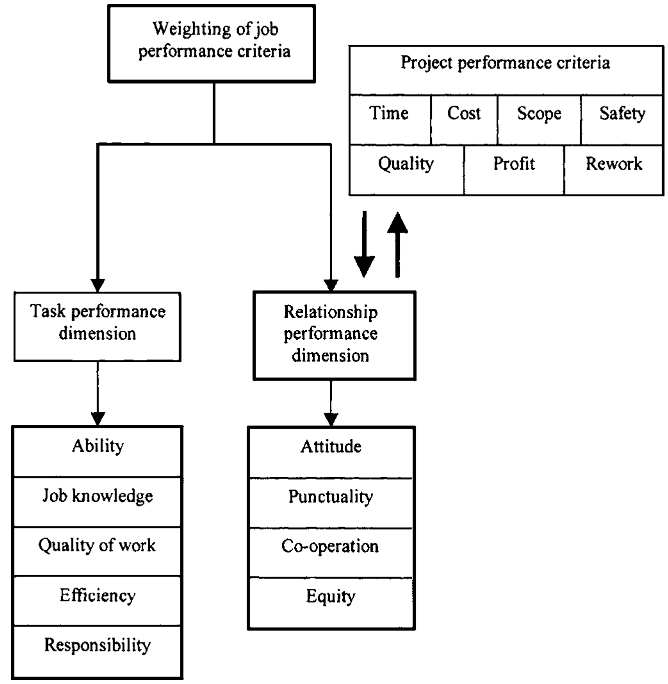

Fig. 2. Decision model for job performance evaluation

Selected Parties for Rating

As an experimental study, 25 construction practitioners (raters) were invited to complete the ANP questionnaire. They represented a group of experienced practitioners (most of them have 4 years or more work experience) with diversified backgrounds, including quantity surveyors, project engineers, site agents, clerk of works, etc. As previously stated, this paper is not intended to undertake a statistical study. The use of 25 responses is to demonstrate the importance of consistency measure, which would be elaborated more in the following paragraph. The questionnaire was created based on the dimensions and criteria of the decision model. Each matrix of elements corresponds to each rated set in the questionnaire. An example of the questionnaire is shown in Fig. 3.

Data of the completed questionnaires were entered into the MS Excel program, where formulas were constructed for calculating relative weights of the elements of the matrices and the consistency ratio (CR) that located inconsistent rating. Alternatively, commercial software packages that compute relative weights and consistency ratio are available (e.g., Expert Choice for Windows). Saaty (1994) set three threshold levels (CR values) for consistency ratio: (1) 0.05 for 3-by-3 matrix; (2) 0.08 for 4-by-4 matrix; and (3) 0.1 for all other matrices. Questionnaires that had inconsistent responses were excluded. In order to improve the consistency performance in rating, the raters were clearly informed about the concept of pair-wise comparison. Unexpectedly, only five questionnaires passed the consistency measure. This suggests that the consistency could not be guaranteed if the raters had no intention of providing objective opinions. This further indicates the importance of the consistency measure for filtering out inconsistent respondents, which could not be available when simple rating methods were used. For more empirical evidence for the salient role of consistency measure, refer to the study of Cheng and Li (2001, 2002, 2003, 2005). The five construction practitioners worked in different types of organizations (i.e., contractors, consultants, and governmental department). Their combined results may represent a general view of the construction sector.

Tables 2–4 show the relative weights and consistency ratio of each matrix for the five respondents. The first column of the tables lists the elements of each matrix that were tested. For example, in Table 3, two matrices of project performance criteria were rated with respect to the two dimensions of job performance (i.e., task and relationship). CR values are also provided in the tables. Those completed matrices with CR values higher than the threshold values are excluded for analysis, except for three marginally accepted matrices (see Table 4). The last column was

Please answer according to the following rating scale:

1 = the two items are **equally important**

2 on the left (right) = the left (right) item is **a bit more important** than the right (left) item.

3 on the left (right) = the left (right) item is more important **to a moderate extent** when compared to the right (left) item.

4 on the left (right) = an intermediate value between 3 and 5.

5 on the left (right) = the left (right) item is more important **to a large extent** when compared to the right (left) item.

6 on the left (right) = an intermediate value between 5 and 7.

7 on the left (right) = the left (right) item is more important **to a very large extent** when compared to the right (left) item.

8 on the left (right) = an intermediate value between 7 and 9.

9 on the left (right) = the left (right) item is more important **to an absolutely large extent** when compared to the right (left) item.

Relative weights of the criteria of relationship performance (Circle the number that mostly represents your viewpoint)

Column 1																		Column 2
Attitude	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Punctuality
Attitude	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Co-operation
Attitude	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Equity
Punctuality	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Co-operation
Punctuality	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Equity
Co-operation	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Equity

Fig. 3. Example of ANP questionnaire

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Table 2. Local Relative Weights of Job Performance Criteria

Job performance criteria	1	2	3	4	5	Mean
			(a) Dimensions of job performance			
Task performance	0.167	0.143	0.8	0.8	0.25	0.432
Relationship performance	0.833	0.857	0.2	0.2	0.75	0.568
			(b) Task performance criteria			
Ability	0.255	0.159	0.092	0.165	0.074	0.149
Job knowledge	0.077	0.158	0.106	0.466	0.127	0.187
Quality of work	0.177	0.088	0.138	0.065	0.148	0.123
Efficiency	0.279	0.262	0.286	0.228	0.369	0.285
Responsibility	0.213	0.333	0.378	0.076	0.281	0.256
Consistency ratio	0.045	0.072	0.053	0.092	0.019	—
			(c) Relationship performance criteria			
Attitude	0.351	0.175	0.178	—	0.2	0.226
Punctuality	0.095	0.234	0.115	—	0.2	0.161
Co-operation	0.254	0.427	0.368	—	0.4	0.362
Equity	0.300	0.165	0.340	—	0.2	0.251
Consistency ratio	0.069	0.030	0.089	0.136[a]	0.0	—

[a]Eigenvector of the matrix is not shown due to unaccepted CR value.

the average combined values of the relative weight results of all passed matrices. These values were entered into the supermatrix at correct locations.

Supermatrix and Limit Matrix

Table 5 illustrates the supermatrix that consists of the interdependent influences between the two job performance dimensions and the seven project performance criteria. The local priority vectors that were computed during the last step were entered into the supermatrix, which in turn was intended to obtain the global priorities.

Cheng and Li (2005) described the process for transforming the supermatrix to the limit matrix. Specifically, after entering the normalized values into the supermatrix and completing the column stochastically, the supermatrix was then raised to a sufficiently large power until convergence occurred (Saaty 1996). Given that the supermatrix was irreducible, this involved raising the supermatrix to the power $2k+1$ and converged if $k \rightarrow \infty$ (Saaty 1996; Meade and Sarkis 1998). In this study, convergence was stable at W^{11} with cyclical ratios. Those who are interested in how to transform the supermatrix to the limit matrix may refer to Saaty (1996). Those who want to skip the technical component of ANP

Table 3. Relative Weights of Project Performance Criteria with Respect to Two Dimensions of Job Performance

Project performance criterion	1	2	3	4	5	Mean
			(a) With respect to task performance			
Cost	0.123	0.117	0.132	—	0.202	0.143
Time	0.133	0.211	0.227	—	0.160	0.183
Quality	0.046	0.085	0.066	—	0.164	0.090
Scope of work	0.053	0.115	0.166	—	0.097	0.108
Safety	0.330	0.059	0.050	—	0.097	0.134
Profit	0.228	0.240	0.275	—	0.184	0.232
Rework	0.087	0.174	0.085	—	0.096	0.110
Consistency ratio	0.107[b]	0.102[b]	0.077	0.116[a]	0.077	—
			(b) With respect to relations performance			
Cost	0.142	0.112	0.199	0.207	0.220	0.176
Time	0.150	0.115	0.207	0.252	0.202	0.185
Quality	0.057	0.105	0.108	0.068	0.109	0.089
Scope of work	0.046	0.152	0.056	0.041	0.109	0.081
Safety	0.356	0.132	0.125	0.078	0.097	0.158
Profit	0.197	0.216	0.230	0.271	0.181	0.219
Rework	0.052	0.168	0.077	0.082	0.082	0.092
Consistency ratio	0.079	0.065	0.054	0.108[b]	0.025	—

[a]Eigenvector of the matrix is not shown due to unaccepted CR value.

[b]CR values are marginally accepted.

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Table 4. Relative Weights of Two Dimensions of Job Performance with Respect to Individual Project Performance Criteria

Dimension of job performance	1	2	3[a]	4	5[a]	Mean
(a) With respect to cost criterion:						
Task performance	0.5	0.25	0.833	0.857	0.5	0.588
Relationship performance	0.5	0.75	0.167	0.143	0.5	0.412
(b) With respect to time criterion						
Task performance	0.25	0.2	0.5	0.2	0.333	0.297
Relationship performance	0.75	0.8	0.5	0.8	0.667	0.703
(c) With respect to quality criterion						
Task performance	0.667	0.8	0.833	0.875	0.5	0.735
Relationship performance	0.333	0.2	0.167	0.125	0.5	0.265
(d) With respect to scope criterion						
Task performance	0.5	0.5	0.75	0.5	0.667	0.583
Relationship performance	0.5	0.5	0.25	0.5	0.333	0.417
(e) With respect to safety criterion						
Task performance	0.25	0.167	0.8	0.167	0.5	0.377
Relationship performance	0.75	0.833	0.2	0.833	0.5	0.623
(f) With respect to profit criterion						
Task performance	0.25	0.5	0.75	0.167	0.5	0.433
Relationship performance	0.75	0.5	0.25	0.833	0.5	0.567
(g) With respect to rework criterion						
Task performance	0.75	0.667	—	0.8	—	0.739
Relationship performance	0.25	0.333	—	0.2	—	0.261

[a]No values are available (no responses received).

may use the ANP software tool developed by Super Decisions (Saaty 2003). The final limit matrix is column stochastic and represents the final eigenvector.

Discussion

As shown in Table 6, the limit matrix, which shows the global relative weights for all the elements in the supermatrix, was transformed to local relative weights. It is able to observe that the relative weights of the two job performance dimensions have been changed: task performance ($0.432 \rightarrow 0.497$) and relationship performance ($0.568 \rightarrow 0.503$). Originally, their values were considerably different where relationship performance is more important than task performance. After the ANP process, their differential importance levels were reduced to be not so obvious. Table 6 also presents the final weighted values of the job performance criteria when the changed job performance dimensions have been taken into account. As shown, with respect to task performance, efficiency (0.142) and responsibility (0.127) were rated as the most important, followed by job knowledge (0.093), ability (0.074), and quality of work (0.061). With respect to project performance, cooperation (0.182) was perceived to be the most important, followed by equity (0.126), attitude (0.114), and punctuality (0.081). These weighted job performance criteria are ready to be used to rate individual employee performance.

Table 5. Supermatrix

	Job performance					Project performance criteria				
Performance	Job	Task	Relations	Cost	Time	Quality	Scope	Safety	Profit	Rework
Job performance										
Job	0	0	0	0	0	0	0	0	0	0
Task	0.432	0	0	0.588	0.297	0.735	0.583	0.377	0.433	0.739
Relations	0.568	0	0	0.412	0.703	0.265	0.417	0.623	0.567	0.261
Cost	0	0.143	0.176	0	0	0	0	0	0	0
Time	0	0.183	0.185	0	0	0	0	0	0	0
Project performance criteria										
Quality	0	0.090	0.089	0	0	0	0	0	0	0
Scope	0	0.108	0.081	0	0	0	0	0	0	0
Safety	0	0.134	0.158	0	0	0	0	0	0	0
Profit	0	0.232	0.219	0	0	0	0	0	0	0
Rework	0	0.110	0.092	0	0	0	0	0	0	0

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Table 6. Final Weighted Values of Job Performance Criteria

Values	Local relative weights (from the limit matrix)	Final weighted values (of job performance criteria)
(a) Dimensions of job performance		
Task	0.497	—
Relationship	0.503	—
(b) Task performance criteria		
Ability	0.149	0.074
Job knowledge	0.187	0.093
Quality of work	0.123	0.061
Efficiency	0.285	0.142
Responsibility	0.256	0.127
(c) Relationship performance criteria		
Attitude	0.226	0.114
Punctuality	0.161	0.081
Cooperation	0.362	0.182
Equity	0.251	0.126

Fig. 4 illustrates an example of a job performance evaluation scorecard. Each employee was rated according to the seven job performance criteria of the two dimensions. Job experts need to brief the raters about the expectations of the criteria, including score descriptions for raters so that consistent ratings can be maintained throughout the whole company. For example, given that scores are from 1 to 100, "1–10" represents a very poor performance that extensive training is urgently needed for the employee; "60–70" represents an acceptable performance where on-the-job training should be offered; "90–100" represents excellent performance that forms the benchmark for others to follow, etc. The general formula for computing job performance is

$$\sum W_i X_i \quad i = 1, \ldots, n$$

where W_i=weight of criterion i; and X_i=score of criterion i.

In addition, employee performance can be tracked by means of a radar chart audit for the need of improvement. Target scores are set to achieve in the radar chart. An example of a radar audit model can be found from Clarke and Manton (1997).

There are several hints useful to construction companies if they want to develop their ANP process:

1. The current study used a simplified example to propose the relationship between the two dimensions of job performance and the project performance criteria. Construction companies may directly relate the job performance criteria to the project performance criteria. They will need more time to perform the pair-wise comparisons because larger matrices have to form.
2. Before rating the ANP questionnaire, the job experts should clearly inform the raters how to achieve consistency. This would not only eliminate unnecessary inconsistency, but also remind the raters to think logically and thoroughly during rating.
3. Construction companies are encouraged to use the decision model developed in this study. However, they can develop specific sets of criteria for rating. They can also use more than two dimensions of job performance when they find sufficient theories supporting them to use other dimensions. There are no strict rules for the decision model except the presumption that there is inter-relationship between job performance and project performance. One of the journal reviewers (hereinafter called reviewer B) also suggested the use of more specific criteria, such as task results (or task accomplishments) and work approaches that bring with them areas of improvements relative to the organization's overall values (e.g., client/customer focus, people skills, teamwork,

Performance Evaluation Score Card

Staff Name: *Tony Lam*			Staff No.: *E00282*		Review Date: *1 Jun 03*	
Department: *Civil Engineering*					Sub-total	Total
Task performance criteria (Scored by 1 – 100):						
Ability (0.074)	Job knowledge (0.093)	Quality of work (0.061)	Efficiency (0.142)	Responsibility (0.127)		
75	*82*	*63*	*62*	*78*	*35.73*	
Relationship performance criteria (Scored by 1 – 100):						
Attitude (0.114)	Punctuality (0.081)	Co-operation (0.182)	Equity (0.126)	-----		
82	*80*	*80*	*78*	-----	*40.22*	*75.95*
Notes: (1) 1 = the worst; 100 = the best. (2) The maximum of total is 100.						
Reviewed by: *Sam Cheung*			Title: *Senior Manager*		Staff No.: *E00123*	
Remarks: *In general, performance has been improved, but is lower than the departmental average. On-the-job training will be provided for improving: first the efficiency; second the quality of work.*						

Fig. 4. Example of performance evaluation scorecard

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health and safety, employee ownership, financial/business impact, work attributes, etc.).
4. When a construction company involves more than one project at a time, they may need to consider all relevant projects for prioritizing the key job performance criteria. This would be more complicated unless the company can find common and useful job and project performance criteria.
5. Other than the general project performance criteria, companies can use specific criteria when they think it is necessary. Use of BARS for job performance criteria is not incorrect when companies think that the method provides a better evaluation of their employee performance. Deadrick and Gardner (2000) referred to BARS as the approach that can help develop meaningful outcome-level descriptors that pertain to either tangible (results-oriented) or intangible (behaviors-oriented) primary job functions. An example of job behaviors can be the levels of cooperation, while that of job results can be production cost.

Conclusions

This paper presents the ANP method to prioritize job performance criteria when taking project performance into consideration. A job performance evaluation process is introduced, which can incorporate the ANP tool to develop a decision model and to compute the local relative weights of elements and the final weighted values of job performance criteria when interdependent influences have been taken into account. An example is demonstrated showing how the supermatrix can be formed. Finally, the paper presents the use of a scorecard to evaluate job performance and radar chart audit to trace the performance periodically during the project.

It is suggested that construction companies should pay more attention to the importance of job performance evaluation, which can be done in a more thoughtful manner following a structural approach to the prioritization of job performance criteria. As reviewer B commented, the utility of the present paper will be enhanced if it is able to stimulate readers from the 69% of organizations not using performance evaluation methods to reconsider their management policy. Recently, organizations have been able to undertake performance evaluation with the user-friendly ANP software program—Super Decisions (Super Decisions 2005). Nevertheless, users must still be familiar with the concept before attempting to employ the ANP method. In order to draw readers' attention to the importance of personnel reviews, reviewer B also proposed ten reasons for such reviews, which are as follows:

1. Provide an opportunity to appraise in a positive and constructive way, the individual's previous year's work, and how this has been carried out;
2. Ensure that the individual's contributions to the organization are recognized, and that specific objectives are agreed upon for the next year;
3. Provide the link between the individual's work and the objectives of the organization as a whole;
4. Help guide the allocation of the individual's development resources;
5. Ensure that people are clear about what is expected of them;
6. Provide opportunities to discuss training needs for the current role;
7. Allow the supervision and the individual staff to discuss the developmental skills needed for future career opportunities and, as appropriate, to discuss promotion potential;
8. Allow the means to identify and discuss difficulties or obstacles, which hamper effectiveness;
9. Provide a means to integrate the needs of the individual with the overall objectives of the organization; and
10. Facilitate two-way communication.

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