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Valuing the Contribution of Knowledge-oriented Workers to Projects: A Merit Based Approach in the Construction Industry

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Abstract

Evidence points to the fact that frequent resignation of project engineers from construction companies is primarily the result of dissatisfaction with the factors that shape the salary scale. This research aims to identify the major influencing factors in merit based salary calculation systems for knowledge-oriented engineers so as to more accurately reflect their contribution to construction projects. Results from a questionnaire sent to managers, engineers and HR professionals throughout the Iranian construction industry revealed that while there was overall agreement on principles for a merit-based approach, engineers in particular stressed 'professional skills', 'experience' and 'creativity'. Management-oriented parties should take into account engineer perspectives in order to more accurately reflect the self-assessed contribution of these workers to construction projects. This research provides a basis for understanding the key factors in the merit based salary scale formulation through the construction industry.

Keywords: Construction industry, knowledge-oriented workers, salary scale formulation

Introduction

As a rule of thumb the objective of any payment system is to attract, hold, and motivate employees. Consequently, such a system should be designed to not only help organisations to meet their goals, but also to improve employee performance and company productivity. Because construction projects are very employee intensive and need to attract a knowledge-oriented and professional workforce (Shabanikia 2009), the design of the payment system is crucial to employee retention.

The aim of this study is to explore how managers, engineers and HR professionals in the Iranian construction industry perceive the value of the contribution of engineers to construction projects. It will then discuss a merit based wage system that includes project process and outcome in the salary scale formulation for "knowledge-oriented" engineers.

This research has a direct application to construction industry supply chain companies that are seeking to reform their salary scales so as to retain their valuable assets by rewarding the contribution of a knowledge-oriented workforce.

Literature Review

Engineering companies work in a knowledge-oriented atmosphere. They are also production-oriented provided that drawings and document are considered as products. From this perspective, the construction industry needs engineers as knowledge-oriented workers. Knowledge workers are active in analyzing information, solving problems by means of their expertise, proposing opinions, and creating new items and services. In other words, engineers are idea and information processors. They are individuals who deploy their analytical and mental strengths more than hands in adding value to workplaces and are

likely to be autonomous, active and proud (Abdul-Aziz & Law 2012; Arif et al. 2012; Horibe 1999).

Compensation systems can produce competitive advantages for construction firms as salary, working conditions, opportunities for promotion and lifelong learning are reported by both male and female employees as the most important factors (Chileshe & Haupt 2010). Valuing the contribution of knowledge-oriented HR to projects can increase productivity and skills of the personnel (Zakeri et al. 1996). One of the main methods of achieving job satisfaction in companies is to improve the salary structure and the social security system especially in developing countries (Fan & Yong 2011; Yisa, Holt & Zakeri 2000).

Compensation structure acts as a tool for achieving companies' strategic goals. Human resource performance appraisal is the core of project human resources management and the objective basis for implementing the scientific and rational salary management in project organisation (Cheng & Fan 2010). In fact, compensation strategy is the major component of the companies' strategy, creating competitive advantages and success as well (Ferguson and Parsons 1992). Valuing the contribution of knowledge-oriented HR has two functions of attracting and retaining skilled workforce and also directing their efforts towards organisational goal (Chen & Edgington 2005). Therefore, the most important outcome of a merit-based compensation system is to create a fair dealing atmosphere within organisations (Konopaske & Werner 2002; Milkovich et al. 1999).

In terms of employees' demonstrable qualities, knowledge-oriented workers usually have four characteristics: performing cross-disciplinary tasks, acting with flexibility, attempting towards organisational objectives and collaborating with team members (Arashpour & Arashpour 2012; Flannery, Hofrichter & Platten 2003). Motivational pay systems aim to arouse the initiatives of staff by means of perfecting the structure of pay management, expanding the proportion of unfixed pay and defining the bonuses based on measures of performance (Anantatmula & Shrivastav 2012; Li 2011).

In the field of human resource studies, little if any research has analysed interdependent factors associated with valuing the contribution of knowledge-oriented workers in the construction industry. The present research tries to bridge this gap.

Research Method

The method for the present study comprises a comprehensive literature review and a survey of the Iranian construction industry. Finally factors influencing the salary scale formulation in the construction industry are ranked based on respondents' perspectives and significant differences in perspectives are discussed comprehensively.

The questionnaire was designed to elicit perspectives that respondents had with regard to the significant factors for salary scale formulation. As such, the main feature of the survey asked respondents to classify influencing factors on salary calculation by their level of importance in the construction industry. A bipolar scaling system, which helps the respondents to express their ideas clearly, was employed (Sekaran 2006). Respondents identified each of the factors as "very insignificant = 1", "insignificant = 3", "neither significant nor insignificant = 5", "significant = 7" or "very significant = 9".

A total of 185 survey questionnaires were sent out in April-August 2011 to selected construction firms. The respondents were an array of experts from the construction supply chain. Managers, engineers and HR professional were targeted as responding groups due to the aim of the research. The majority of participants came from firms employing more than 200 people (46.5 per cent), whilst 33.7 per cent were employed by firms with 50- 200 personnel. Only 19.8 per cent of respondents worked for firms employing less than 50

people. Care was taken to select experienced individuals. No respondent had less than 10 years of experience in the construction industry.

Of 185 sent questionnaires, 150 responses were deemed valid. The survey listed 20 factors associated with job and personal characteristics, which were sourced from a number of references presented in Table 1.

Personal and Job related factors	Who and when
1. Professional skills	(Clemens 2009)
2. Leadership skills	(Morrison 1994)
3. Compliance with organisations norms and values	(Becker, Huselid & Ulrich 2001; Weaver & Trevino 1999)
4. Academic records	(Chen & Edgington 2005; Robinson & Sexton 1994)
5. Creativity	(Tian & Belk 2005)
6. Duration of employment in the current company: long term commitment	(Cowherd & Levine 1992; O'Malley 2000)
7. Education relevancy	(Arashpour & Farzanehfar 2011; Coelho 2010)
8. Experience quality: Local experience	(Monks 1996)
9. Graduating university	(Dowling & Fisher 1997)
10. Level of responsibility	(McAuliffe et al. 2009)
11. Number of employees under management	(Arashpour & Arashpour 2010; Delaney & Huselid 1996)
12. Overtime amount	(Wilson 2008)
13. Performance speed and efficiency	(Flannery, Hofrichter & Platten 2003)
14. Relevant past experience	(Medoff & Abraham 1981)
15. Tasks complexity	(Allan 2000; Verburg, Den Hartog & Koopman 2007)
16. Working condition: Physical and psychological	(Milost 2007)
17. Years of experience	(Arashpour, Wakefield & Blismas 2012)
18. Working hours	(Johnson & Lipscomb 2006)
19. Workload	(Bradley et al. 2010; Hollands & Wickens 1999)
20. Performance quality: outcomes	(Paauwe & Boselie 2005)

Table 1 Summary of personal and job related factors influencing salary calculations for knowledge-oriented workers

The final question asked respondents to evaluate their own organisational attitudes towards knowledge-oriented workers. They were asked to select 'satisfactory' or 'unsatisfactory' in response. They had opportunity to make suggestions for improving salary scales through the construction industry.

Data Analysis

The analysis included the frequencies of the various respondents' answers and the relative importance or rank of answers compared to others based on analysis of variance (ANOVA)

test. The results demonstrated significant differences among the means of the various responding groups. The F statistic demonstrated if two given variances differed from one another or were from the same population (Sekaran 2006).
A post-hoc test complemented the ANOVA to identify the groups with opposing views. Tukey's HSD (honestly significant difference) test was selected as the post-hoc to compare all possible pairs of means based on a studentized range distribution (q) which is very similar to t-test distribution.

First and foremost, to evaluate the reliability (providing same results in different situations by measurement instrument), and validity (exact measurement of the variables by the instrument), the following results were extracted by SPSS. Software evaluation illustrates the reliability of survey outcomes. Since Cronbach's Alpha is 0.771 and it is greater than the benchmark of 0.7, the reliability of questionnaire results analysis is approved (See table 2). This table also illustrates the validity of results analysis for the two groups of variables. For the set of variables the *Kaiser-Mayer-Oklin Measures of Sampling Adequacy* is 0.575. As it is greater than the benchmark of 0.5, the validity of results is approved.

Reliability of results	Validity of results
Cronbach's alpha= 0.771	KMO measure of sampling adequacy= 0.575

Table 2 Data reliability and validity test

Results and Discussions

A key measure for the validity of this research was the distribution of survey responses across knowledge-oriented workers in the construction industry. In the current research, engineers (41.3%), and managers (40.8%) made up the majority of respondents and the remainders were HR professionals (17.9%). All respondent were involved in the construction industry projects. Of the respondents surveyed, 40.1% had 10-20 years of experience in the construction industry and 54.7% had more than 20 years. The wealth of experience is evenly dispersed throughout the industry and thus the high percentage of experienced respondents also validates the results of the survey. Furthermore, none of the HR professionals who responded to the survey had less than 10 years of experience.

Influencing factors on salary calculations in construction industry

Table 3 presents factors influencing the salary scale of knowledge-oriented personnel identified by the respondents. It compares and contrasts opinions of managers, engineers and human resource professionals. The most important factor identified was 'performance quality' with a mean of 8.34 and standard deviation (σ) = 0.98. It was followed by 'compliance with organisation norms and values' with a mean of 7.81 and σ = 0.90. Other important factors averaging above significance (scale 7) were 'professional skills', 'relevant past experience', 'creativity', 'educational relevancy', 'leadership skills', and 'level of responsibility'. The factors considered to be least important were 'academic records', 'graduating university' and 'duration of employment in the current company'.

Some significant factors such as 'compliance with organisations norms and values' and 'professional skills' identify that personal characteristics are important factors in the salary calculation of knowledge-oriented workers. This finding is consistent with the literature where Horibe (1999) identified similar results, indicating this as a characteristic for unique knowledge workers. A great evidence to validate the survey design and factor selection is that none of the 20 investigated factors were identified 'insignificant' (i.e. factors with average means below 3) by the survey respondents.

Key factors to calculate salary			Total perspective		Managers' perspective		Engineers' perspective		HR professionals' perspective	
			Mean	SD	Mean	SD	Mean	SD	Mean	SD
1	Performance Quality (outcomes)	Most important factors	8.34	0.98	8.40	1.20	8.27	0.84	8.35	1.20
2	Compliance with organisation norms and values		8.29	0.90	8.01	0.64	7.98	0.79	8.87	0.80
3	Professional skills		7.69	0.88	7.47	0.70	8.53	0.70	7.07	1.10
4	Relevant past experience		7.63	0.88	7.00	0.89	8.43	1.00	7.47	1.07
5	Creativity		7.43	0.85	7.43	0.68	8.41	0.89	6.45	0.85
6	Educational relevancy		7.23	0.83	7.02	0.83	7.00	1.01	7.67	1.40
7	Leadership skills		7.19	1.01	7.76	0.71	7.08	0.81	6.73	1.25
8	Level of responsibility		7.01	1.00	7.02	1.23	7.74	0.70	6.27	0.65
9	Years of experience		6.64	0.93	6.45	0.65	7.09	0.85	6.38	1.00
10	Work load		6.46	1.05	6.02	1.06	7.43	0.99	5.93	1.10
11	Working hours		6.45	0.90	6.79	0.63	5.35	0.95	7.21	1.00
12	Performance speed		6.24	1.03	6.31	0.99	6.70	0.93	5.71	1.05
13	Experience quality (Local experience)		6.21	0.97	6.29	0.76	5.93	0.85	6.41	1.25
14	No. of employees under management		6.05	0.89	6.18	0.61	5.81	0.79	6.16	1.20
15	Complexity of tasks		5.88	1.16	6.01	0.84	7.00	0.80	4.63	0.70
16	Working condition	Least important factors	5.54	0.80	5.01	0.89	6.61	0.91	5.00	0.52
17	Overtime amount		5.43	1.06	4.63	0.98	6.76	0.70	4.90	1.00
18	Duration of employment in the current company		5.16	1.05	6.09	1.00	4.10	1.00	5.29	0.40
19	Graduating university		5.06	1.13	4.94	1.00	5.26	0.70	4.98	1.00
20	Academic records		5.03	1.11	4.83	1.07	5.23	0.90	5.03	1.40

Table 3 Influencing factors on salary calculation: Diverse perspectives across construction industry

Interestingly, engineers considered 'professional skills' as the most important factor. This is perhaps due to the high emphasis that knowledge-oriented workers place on the professional promotion. In the case of managers, 'performance quality' ranked as the most important factor in the salary calculation within the construction industry. This finding implies that there are continuous concerns at the top managerial levels about actual quality performance of highly skilled recruited employees. This result is alarming considering that compensation practices should contribute to competitive advantage by promoting more

productive workers. High-ranking factors reflected by HR professionals were 'Compliance with organisation norms and values', 'Performance Quality (Best effort)' and 'Relevant professional experience'. As the frontline agent in recruiting, HR professionals consider the organisation norms and values as very important and employees' compliance is regarded as highly significant factor in the salary scale formation. Table 4 summarizes significant factors (i.e. factors averaging above scale 7) identified in valuing HR contribution by the knowledge-oriented workers in the construction industry.

Respondent	Factors (In Order of Importance)	Mean
Manager Perspective (8 factors)	Performance Quality	8.40
	Compliance with organisation norms and values	8.01
	Leadership skills	7.76
	Professional skills	7.47
	Creativity	7.43
	Level of responsibility	7.02
	Educational relevancy	7.02
	Relevant past experience	7.00
Engineer Perspective (11 factors)	Professional skills	8.53
	Relevant past experience	8.43
	Creativity	8.41
	Performance Quality	8.27
	Compliance with organisation norms and values	7.98
	Level of responsibility	7.74
	Workload	7.43
	Years of experience	7.09
	Leadership skills	7.08
	Educational relevancy	7.00
	Complexity of tasks	7.00
HR professional Perspective (6 factors)	Compliance with organisation norms and values	8.87
	Performance Quality	8.35
	Educational relevancy	7.67
	Relevant past experience	7.47
	Professional skills	7.07
	Working hours	7.00

Table 4 Most significant factors in valuing knowledge-oriented workers' contribution to construction projects

Surprisingly, whereas engineers identified 11 significant factors that should contribute to their salary calculation, managers and HR professionals only suggested eight and six factors, respectively. It shows that engineers expect the salary scales to include more contributing factors.

To find the controversial factors that attracted different perspectives, analysis of variance (ANOVA) was used for further statistical analysis of the survey results. As there were 20 variables and three groups of respondents, namely managers, engineers and HR professionals, ANOVA is the best mean to find out significant differences among survey participants' opinions. "Whereas the (independent samples) t-test indicates whether or not there is a significant mean difference in a dependent variable between two groups, an analysis of variance (ANOVA) helps to examine the significant mean differences among more than two groups" (Sekaran 2006, p. 347). Table 5 summarizes the ANOVA results, highlighting six factors with significance difference (less than 0.05).

No.	Factor	Sum of Squares	Mean Square	F statistic	Significance of F
1	Performance Quality	.430	.215	526.750	0.043
2	Compliance with organisation norms and values	25.543	12.772	31290.583	0.065
3	Professional skills	56.920	28.460	69727.000	0.034
4	Relevant past experience	53.123	26.562	65076.083	0.057
5	Creativity	96.040	48.020	117649.000	0.048
6	Educational relevancy	14.530	7.265	17799.250	0.066
7	Leadership skills	27.430	13.715	33601.750	0.045
8	Level of responsibility	54.030	27.015	66186.750	0.059
9	Years of experience	15.310	7.655	18754.750	0.061
10	Workload	70.770	35.385	86693.250	0.000
11	Working hour	90.750	45.375	111168.750	0.066
12	Performance speed	24.870	12.435	30465.750	0.052
13	Experience quality (Local experience)	6.240	3.120	7644.000	0.062
14	No. of employees under management	4.330	2.165	5304.250	0.067
15	Complexity of tasks	96.330	48.165	118004.250	0.043
16	Working condition	85.870	42.935	105190.750	0.062
17	Overtime amount	134.490	67.245	164750.250	0.056
18	Duration of employment in the current company	1.270	.635	1555.750	0.054
19	Graduating university	3.040	1.520	3724.000	0.071
20	Academic records	4.003	2.002	6538.778	0.066

Table 5 ANOVA analysis results: significantly different factors by participating groups (Sig<0.05 highlighted)

As it is evident from the results, there are six significantly different factors by responding groups: compliance with organisation norms and values, professional skills, creativity, leadership skills and complexity of tasks, applying a confidence level of 95%.

In the next step of the data analysis, Tukey's HSD (honestly significant difference) test was used to compare all possible pairs of means based on a studentized range distribution. Table 6 illustrates the results of post-hoc Tukey test.

Dependent Variable	(I) Person	(J) Person	Mean Difference (I-J)	Std. Error	Significance
Performance quality	engineer	manager	-.13000	.00407	.045
		HR	-.08000	.00516	.011
Professional skills	engineer	manager	1.06000	.00362	.037
		HR	1.46000	.00601	.008
Creativity	engineer	manager	.98000	.00404	.030
		HR	1.96000	.00516	.016
Leadership skills	engineer	manager	-1.06000	.00209	. 063
		HR	.40000	.00103	.038
Workload	engineer	manager	1.41000	.00415	.039
		HR	1.50000	.00328	.022
Complexity of tasks	engineer	manager	.99000	.00439	.047
		HR	2.37	.00401	.003

Table 6 Tukey's HSD (honestly significant difference) test: significantly different perspectives among groups

The Post-hoc test reveals that engineers have significantly different perspectives about performance quality than have managers and HR professionals. Engineers rank this factor below other factors such as professional skills and creativity. This could be due to the fact that engineers consider the process of doing tasks as more important than outcomes; however, managers and HR professionals focus more on outcomes to measure performance quality as evidenced by their high ranking of this factor in salary scale formulations. In addition, the similar perspectives of management-oriented parties unveils the deep influence of managers on HR practices in engineering companies (Paauwe & Boselie 2005).

Tukey's HSD results for the Post-hoc test reveal significantly different perspectives about professional skills and complexity of tasks. Both managers and HR professionals underestimated these factors compared to engineers, which is evident from the negative mean difference illustrated in table six. It is probable that engineers regard professional skills as a kind of toolkit to get the work done. However, the other two management-oriented groups paid less attention to these factors focusing more heavily on the best results from their knowledge-oriented workers.

Creativity is also a source of controversy. While engineers consider creativity as a very significant factor, HR professionals did not believe so. This might be because of the fact that HR professionals tend to quantify outcomes of employees' jobs; however, creativity is very hard to quantify. It is not surprising that managers ranked creativity below compliance to organisational norms and values. In fact, some managers consider this quality as a potential threat to established rules and work routines in their organisation (Arashpour & Arashpour 2011).

Interestingly, HR professionals did not rate leadership skills as a significant factor but managers put more stress on this factor. It is likely that managers prefer a more autonomous workforce without the need for continuous instructions. Despite the managers' desire to maintain hierarchy in their organisations, this finding shows their reluctance to be involved in administrative tasks.

Results illustrate that 'workload' is another significant factor identified by engineers. It is likely that engineers, who work at the frontline of construction projects, are more concerned about balancing professional and family lives. However, management-oriented respondents did not consider workload as important as the performance quality.

In response to the question about the degree of satisfaction about organisational attitudes towards knowledge-oriented workers, the majority of respondents (62.5%) felt that their organisation's attitude was unsatisfactory, and this perception was stronger downstream in the industry (i.e. engineers). Most of the 27.5% of respondents considering their organisation's performance as satisfactory were managers. Less dispersed in the results was the typical consensus that respondents' organisations could implement the merit-based approach to salary calculation, paying special attention to both job outcomes and the processes involved to do jobs (83% of survey participants).

Conclusion

Prior work has documented the measures assessing performance of employees in the construction industry; Becker, Huselid and Ulrich (2001) for example, report how to link people, strategy and performance in firms. However, few researchers have analysed interdependent factors associated with valuing the contribution of knowledge-oriented workers in the construction industry This paper has presented the results of a survey on factors influencing merit based salary scale formulation in order to optimize the contribution of knowledge-oriented engineers in construction projects. It was assumed that process-oriented (engineers) and management-oriented (managers and HR professionals) parties would be able to provide valuable perspectives on the issue. The engineers perceive their work as complex and the salary scale should reflect that complexity by the inclusion of more process-oriented factors. This view conflicts with that of the two management-oriented parties, which focus more on outcome-related factors.

While all parties agree in principle to a merit-based approach to salary calculation, each identified different key criteria for measuring merit. The survey illustrated that 'performance quality' was the most important factor identified by all parties. Other important shared perspectives included 'Compliance with organisation norms and values' and 'Professional skills'. However, variations were identified in the ranking of these factors. From the HR professionals' perspective, 'Compliance with organisation norms and values' was identified as the most important factor followed by 'Performance Quality', factors which emphasize job outcomes over processes. This is in direct contrast with factors identified by engineers as most significant, such as professional skills, experience and creativity.

The findings suggest that if companies are to value the work of these knowledge-oriented engineers, not only the job outcomes but also the processes involved in doing the job should be considered in the formulation of a merit based salary scale. After all, the construction industry is only as strong as its knowledge-oriented workers.

Replication of this study in construction industries in other regions of the world is recommended. Similar results might be achieved because of the significant difference in focus between management-oriented and process-oriented individuals, which is a characteristic of the different work aims and intentions.

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