

Critical Evaluation of Professional Development and Training Programs for Civil Engineers in Baghdad

Evaluación crítica de programas de desarrollo y formación profesional para Ingenieros Civiles en Bagdad

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Abstract

Construction industry comprises a high degree of competition; the performance of construction projects is highly affected by the performance of civil engineers who are the core of construction productivity. Professional development is one of the essential milestones toward improving the performance of civil engineers. This paper, critically, evaluates the professional development and training of civil engineers in Baghdad. This encompassed the study of the existing programs offered for the professional development, the expected impact, and suggestions. Data were collected from 113 professional civil engineers about the existing professional development programs and training courses and analyzed. Large variations were found in terms of the time spent for professional development, despite the fact that they are comparable to some developed countries. Pitfalls in the field of professional training and development were clear. Remedial suggestions including professional development program and appraisal system were presented. It was emphasized that collaborative efforts by all stakeholders are required to ensure sustainable professional development.

Keywords: Professional development, training, civil engineers, Baghdad.

Resumen

En la industria de la construcción existe un alto grado de competencia, y los ingenieros civiles, quienes constituyen el núcleo de la producción en la construcción, afectan enormemente los resultados de los proyectos de construcción. El desarrollo profesional es uno de los hitos esenciales para mejorar el desempeño de los ingenieros civiles. Este artículo evalúa críticamente el desarrollo profesional y la formación de ingenieros civiles en Bagdad, y abarca tanto el estudio de los programas ofrecidos para el desarrollo profesional, como su deseado impacto, y sugerencias. Este estudio recogió y analizó datos de 113 ingenieros civiles profesionales acerca de programas de desarrollo profesional existentes y cursos de capacitación. Se encontraron variaciones grandes en términos del tiempo empleado para el desarrollo profesional, aunque los resultados son comparables a los de algunos países desarrollados. Los peligros en el campo de la formación y el desarrollo profesionales fueron claros. Se presentaron sugerencias correctivas, incluyendo programas de desarrollo profesional y sistemas de evaluación. Se hizo hincapié en que se necesita más colaboración de parte de todos los interesados para poder garantizar la sostenibilidad del desarrollo profesional.

Palabras clave: Desarrollo profesional, formación, Ingeniero civil, Bagdad.

Introduction

The construction industry (Udhayakumar, & Karthikeyan, 2014) should focus on their people development and form a core group to guide the personnel in the right way for continuous career up-gradation and skill enhancement. For that, acquiring such training (Edum-Fotwe, & McCaffer, 2000) would maintain the competency. Typically, as per (LOUISIANA REVISED STATUTES, 2012), 30 Professional Development Hours (PDHs) are required every other year for renewal of professional engineer license, while every licensee is required to obtain the equivalent of 15 PDHs per annual renewal period (NCEES, 2013), 30 PDHs per biennial renewal period, or 45 PDHs per triennial renewal period.

In many developed countries (Oladiran, 1999), it has been noticed that some aspects of the engineering curriculum were not covered during their undergraduate studies. The theoretical part is widely covered during their undergraduate study in different areas of the major. The need of training for civil engineers can be ranked in (Hassan, Griffith, & Stephenson, 2005) (i) meeting the site managers' job needs; (ii) adhering to the requirements of the industry; (iii) meeting the needs of the organization; and; (iv) meeting the site managers' career development needs. Civil engineer as a site manager needs the training to achieve some objectives such as (ODUSAMI, OYEDIRAN, & OSENI, 2007); increasing self-competencies, accumulating training units as modular, award and recognition in term of certificates, and long-term career development.

The most relevant management areas of training (Teixeira, 2006) were: (1) project conception, (2) development/feasibility, (3) planning and scheduling, (4) project cost estimation and cost management, (5) quality management, (6) procurement and tendering procedures and (7) health and safety management.

Description of the Problem

The construction industry in Iraq has come into the view by the end of the last decade due to some political changes. One of the challenges facing this industry is how to meet the international standards, particularly in terms of professional development and training of civil engineers which is a part of human resources management which is acknowledged as a key factor in the success of construction projects toward an efficient competition in this industry. Furthermore, civil engineers are the core engine in construction projects, consequently, the performance of civil engineers would be reflected on the whole performance positively and negatively.

The aim of this research is to evaluate the current situation of professional development and training programs offered for civil engineers in Iraq, and consequently to develop a future perception and through elucidating the determining factors in the professional development as well as highlighting the dual action of maximizing strengths and minimizing weakness of the current situation, which is for sure improve the performance of civil engineers in Iraq and eventually the construction industry. The scope of the study is limited to Baghdad where the majority of the population and engineers are there.

State of Art

Training sessions and professional development programs aim toward a higher value of employees' performance in terms of more efficient performance through ensuring the compliance of the planned performance and the actual performance showed by the employee and consequently decreasing the gap between them. Training sessions and professional development programs can improve the overall productivity of the organization through one of the most important factors which is the motivation of employees for higher performance (Elnaga & Imran, 2013).

In engineering consulting firms it's found that staff education and training have obvious impact of business performance; where human capital will affect the structural capital and relational capital which at the end will affect the business performance (Huang & Hsueh, 2007).

Distinguishing professional development as a crucial factor had brought the attention of many researchers to investigate the needs, factors influencing, and the evaluation of the training in different countries.

Under the heading of training needs, Dulaimi (2005) highlights the need for academic and professional development programs to provide the right balance, in content and emphasize, between the technical knowledge and the people management skills for young professionals to take project management responsibilities. In the line of evaluation of training and expected improvement in performance, some studies have been conducted, starting with Bibby, Bouchlaghem, & Austin (2003) who reported on a research project at a major UK building design and construction company to develop and deploy a training initiative capable of making significant improvements to its design management performance and deliver benefits to many project stakeholders. They concluded that the design management training initiative provides a sound understanding of the issues surrounding modern design management and practical ways of managing the process. Eventually, any changes to design management practices must involve educating all project parties that interface with the design manager. Goedert (2011) developed a framework for a virtual interactive construction education system taking full advantage of these technologies. In his paper, a framework developed for virtual interactive education systems using domain expertise from the construction industry was introduced. The framework uses a formal deductive synthesis approach. It formulates situation-specific solutions by applying automated inference technologies on codified construction domain facts obtained from domain experts.

Rusty (2001) investigated the current overall civil engineer officer contingency training program and determines if civil engineer officers think it is adequately preparing them to perform in a contingency environment. The results of his study showed that from an overall perspective CE officer training is adequately preparing them to perform in a contingency environment. However, the results also indicate that there are several areas where improvements could be made to make the program even better.

Zhang & Lui (2012) concluded that universities and society should pay full attention to the civil engineering work of applied training of personnel, clearly applying the civil engineering training objectives, clarifying the application of civil engineering talents ideas, researching appropriate to the current civil engineering personnel training methods to construct a scientific and systematic application of civil engineering talents training system, in order to cultivate a large number of applied talents in the construction industry, for greater contributions to the construction of our country.

The study of Bibby, Austin, & Bouchlaghem (2006) was for the purpose of deployment of a design management training initiative to improve performance in a major UK civil and building design and construction company. They investigated the impact of the training initiative, critical practices and a suite of 25 tools on design management performance across the company. They showed that thirty out of the 39 practices and tools had critical impacts on design management. The most significant impacts were on a timely delivered design, design meeting client requirements, coordinated design, and fewer late design changes but few practices and tools helped provide cost certainty of design.

Muench (2006) analyzed the current training environment revealed the following key ideas:

- Knowledge obsolescence must be countered by continuing training
- Participation in training depends on upon motivation and barriers.
- Current training methods are skewed toward the instructor led-classroom.
- The standard training model is inefficient.
- Self- managed learning SML is better able to meet civil engineering training needs.
- The dearth of quality self-directed training options is a critical barrier to SML implementation.

Two of these keys were identified; the first is to implement SML. Although it is up to each individual organization to choose whether or not to use an SML training model, professional organizations and industry groups could provide valuable information on what such a model can and cannot do, as well as steps necessary to a successful implementation, and the second is to create more self-directed training options.

Another area has been searched by Ma (2011) who discussed the need for education reform in surveying practice for the civil engineering major in application-oriented universities and made some approaches to reform. Keywords- Application-oriented university; civil Engineering; surveying practice; education reform. On the other hand, health and safety was the core topic of training for (Billy & Iain, 2011) and (Wall, Carney, McNamee, Madden, Hurst, Vrasidas, Chanquoy, Baccino, Acar, Önwyy-Yazici, & Jordan, 2007).

Tse & Choy (2005) revealed some interesting facts that are useful to managers of the construction industry in making decisions on investment in IT. This study provides a good reference for the extent of the strategic use of IT in the construction industry of developing countries. However, future research can be carried out to measure the difference between users' subjective assessment and the companies' objective productivity figures.

Methodology

The objective of the paper represented by the evaluation of professional development and training for civil engineers in Baghdad has contributed to shaping the methodology of the research. Starting with the theoretical basis of evaluation of professional development and training. . The next step was collecting data to have a clear picture about professional development for civil engineers in Iraq, a data collection form to be designed distributed for this purpose in a form of field survey. The field survey has been conducted using a structured questionnaire about the determining factors of professional development of civil engineers. The variables included in the questionnaire were:

- Professional development details during the last five years, number of hours (PDHs), place, organizer, the of funding entity, topics, evaluation of the program.
- Professional development budget (entity and personal).
- The actual outcome(s) of professional programs, and the reasons behind the low level of the actual outcome(s).
- Future vision and topics for professional development and training programs.

The analysis step comprises some measures and indicators of data analysis such as percentages, weighted mean, and relative importance index (RII) use adopted in the analysis.

$$RII = \frac{\sum a*n}{A*N} \quad (1)$$

Where a = weighting given to each factor by the respondents (ranging from 1-5)

n = frequency of the responses

A = highest weight (5 in this case)

N = total number of respondents

RII= value of Relative Importance Index (generally 0-1).

Research sample

A diverse range of civil engineers was enrolled in the research to collect the data required for the purpose of evaluation of civil engineering training. The designed questionnaire has been distributed to a number of civil engineers involved in the construction industry in Baghdad. As per Iraqi Engineers Association which is the entity responsible for engineers' registration in Iraq, the total number of active civil engineers in Baghdad for the last 8 years is 9117. A sample of 113 available records in different stages of construction industry represented by supervision, consultancy, and contracting, Table 1 shows the distribution of the sample based on the field and the number of years of experience in that field. Where 94% of the sample was public sector engineers, others were private sector engineers.

The actual sample size can be considered as an accepted value, taking into account that the theoretical sample size is 94 using a confidence level of 95% and interval of 10%.

Table 1. Distribution of the sample according to the experience and field of work.

Experience (yrs)	Consultancy %	Supervision %	Contracting %
1-5	26.55	37.17	37.168
6-10	7.08	20.35	24.779
>10	7.96	24.78	25.664
No experience	58.41	17.70	12.39

Results and discussion

Based on the field survey results and analysis, 67.57% of the sample declared of no clear plan for training in their entities, this will be taken seriously as an indicator for ambiguity of the professional development and training plans and the right of civil engineer to develop his performance, moreover, this fact highlights the low awareness about performance evaluation of employees and the role of professional development and training in performance evaluation and the required development toward performance improvement. This is potentially supported by another indicator that only 23.9% of the respondents are having an idea about the value of the budget assigned for training in their firms with an average of 2.85% of the total budget ranged from 2-5%. Some of the collected records have been excluded from this result due to the abnormality of the results where these values between 10-20%, again it would reflect the level of ambiguity training plans. In term of self-development, 86.73% of the respondents didn't assign an amount of their own budget for training, this percentage highlights a minor importance and role of professional development and training for civil engineers, the remaining 13.27% of the sample assigned 3.4% of their income for professional development and training.

It's found that the average annual hours of training were 17.51 PDHs which satisfies the USA scale where the annual number of professional development is 15 PHDs. The average value would give the reader a good impression of professional development and training for civil engineers in Iraq, however, the following points might an opposite view for the reader:

- The standard deviation of the sample is 28.31 which is very high for an average of 17.51 PDHs
- 58.41% of the sample was less than 15 PDHs
- 12.78% of the sample of zero PDHs

Such facts show the high variation among respondents, consequently the variation among public establishments in term of professional development and training. Furthermore, the variation reflects the trend of public establishments toward the field of professional development in addition to the importance of training for them along with performance improvement.

Authors believe of the need for a higher number of professional development hours for Iraqi engineers as there is a need for more enhancement and performance development to fill the gap with American standards. This would give both civil engineers and entities the motivation to adopt a new strategy for training to escalate the rhythm of professional development and training toward international standards. Professional development programs will be certainly as an added value to the civil engineers and entities in term of competition construction industry as well as the high performance incurred through training programs.

The topics of professional developments programs and training sessions were distributed in four categories; civil engineering techniques, computer-aided design, computer aided management, and project management and administration skills. The most demanded topic is computer-aided design such as STAAD Pro, SAP, AUTODESK, etc. with a percentage of 30.11% to show the willingness of Iraqi Engineers to fill the gap of knowledge due to the lack during the nineteenth decade. Followed by project management and administration skills of 29.74%, as these skills are vital for civil engineers as they are sooner or later will be involved in construction project management. For computer-aided management and civil engineering techniques, the percentage was 21.56 and 18.59 consequently.

All training courses have been funded by one of three categories; public sector (76.58%), non-government organizations (14.5%), and own funding (8.92%). The percentage of fund reflects the high dependency of civil engineers on the public sector for funding training programs and gives a clear perspective of the construction industry environment. In addition, there is a need for necessary development in construction industry itself in Iraq to cope with international standards.

Another argument to be raised, in the line of the place of training course, whereas around 40.52% of the sample were trained either in the same ministry or engineering entity belongs to the same ministry; the question is "are these entities qualified to offer professional development courses and training sessions? This question should be answered to assure the compliance of these courses and sessions in the line of performance improvement, as a result, all of these places of training should be evaluated whether they can offer the service of training efficiently and effectively. The academic entities contribute 26.02% of the training courses, it seems they are in the line of offering high-level training courses as the curriculum of these courses to be reviewed periodically, but the need for evaluation for the purpose of training also is a must to assure the quality of offered training courses. The rest of training courses are run by either engineering entities (13.75%) or nongovernment organizations- NGOs (19.7%). The only entity would present high-quality training is NGO, taking into consideration that most of these NGOs belong to United Nation(UN) or other international organizations, hence, quality is a concern for them.

All respondents have declared their viewpoint for the evaluation of the courses they participated; in general, the evaluation shows a high need for these training courses in spite many criticisms in forms of the place of training and funding. The first criterion of the evaluation was the topic of the training course whether it complies with the needs of civil engineers or not, results show that the topics of the training courses have satisfied about 88.45% of the respondents. Secondly, training courses were evaluated in term of facilitator performance, 85.58% shows their satisfaction of the facilitator. Finally, all respondents show the very good evaluation of the entire benefits from training courses of 86.45% of satisfaction. Evaluation of training courses would reflect an accepted level of the degree of satisfaction with training courses they involved.

As a comprehensive result, 85.42% of the sample has confirmed the importance of professional development for the purpose of performance improvement; such results would keep the spot of professional development under focus. The rest of respondents in opposite opinion with 89.8%, many clarifications have been indicated to object the idea of utilizing professional development in performance improvement. These clarifications can be summarized in: i) professional development courses topics were not in the line of their specialty, ii) professional development courses couldn't get along with international advancement, and iii) the inapplicability of some topics of professional development. All of these concerns support what has been discussed above in term of topics, level, and the organization of professional development.

The future of professional development was the scope of the last part of the questionnaire, where respondents to depict the future picture of professional development. Theoretically, 98% of the sample confirms that professional development will lead to performance improvement to highlight the importance of such activities for civil engineer and consequently construction industry. As a part of fulfilling needs of professional development for civil engineers, future

courses would take into consideration the ranking of the topics shown in Table 2, these topics have been ranked on the basis of relative importance.

Most of the respondents in construction industry either in the field of supervision of construction, for that the first topic on the priority list was civil engineering techniques which certainly would affect their performance and positively and negatively, followed by softwares required for structural design represented by STAAD Pro, Etabs, PROKON, etc, softwares of planning and control of construction projects such as Primavera and so., and finally professional development programs relevant to the managerial aspects of construction projects for example; quality assurance, health and safety, feasibility study, and crisis management.

Table 2. Relative importance of professional development programs topics.

Professional development programs	Relative importance
Computer aided design	0.922
Advancement in civil engineering techniques	0.865
Computer aided management	0.858
Management and administrative skills	0.744

From the viewpoint of the authors, there is an urgent need for the construction industry in Iraq to the first topics and the last one because of the new trends in the construction industry and the management of construction projects.

Conclusions

All aspects of professional development have been evaluated critically to trace a full clear picture of the professional development programs, some concluding remarks can be extracted as follows:

- High attention to be given to the issue of professional development in the construction industry to move along with international standards, professional development to take more dose in the planning of construction industry entities in term of topics, Number of hours, budget, place of programs.
- Civil engineers to understand the importance of professional development for the purpose of performance improvement and consequently the need for such programs quantitatively and qualitatively.
- Entities offering professional development programs need to be evaluated for the purpose of the quality of these programs.
- Most of the professional development programs are locally designed and implemented, that is, more internationalization of these programs is required to fill the gap of knowledge in the construction industry, provided that these programs comply with human resources plans incorporating the topics of international programs.
- Future professional development plans to avoid all weak points incurred from the previous experience, adding to that, adopting topics of these programs which can promote, improve, and develop civil engineer performance
- A special focus on advancement in civil engineering to be given toward a clear escalation of the performance of civil engineers.
- Professional development and training sessions to be as one of the potential factors for all public and private sectors taking into consideration all topics demanded by civil engineers along with offering these programs and sessions in well-reputed institutes. This should be linked to the performance of the civil engineers in their entities and firms.

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