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Post-evaluation System in Construction Projects in Gaza Strip-Palestine

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Abstract: A construction project can be described as successful when it is completed on time, within budget and according to specifications. Post-evaluation plays a major role in the construction industry when determining whether the project is a success or a failure. The objectives of this paper are as follows: to provide an overview of an organisation's interest in the post-evaluation system of the construction projects in the Gaza Strip, to identify and rank the most important factors used in the post-evaluation system for construction projects, to identify the obstacles of the post-evaluation system and to determine the factors that lead to a successful post-evaluation system. A structured questionnaire was adopted in this study; 40 questionnaires were distributed to international organisations that implemented construction projects in the Gaza Strip. The ordinal data were analysed by the relative important index method, which was used to rank the factors and the groups of the questionnaire and the nominal data were analysed by the relative frequency or percentage. The research findings revealed that international organisations in the Gaza Strip are concerned with the post-evaluation system of construction projects because post-evaluation is required by all donors. Cost, time and quality are found to be the most important group factors for the post-evaluation system of construction projects. The factors that are used in the process of post-evaluation include the following: project efficiency, owner satisfaction, project effectiveness, safety, risks, change orders, resources, communication, procurement and the environment. Overloaded projects were found to be the largest obstacle to the process of post-evaluation. A lack of awareness about post-evaluation will increase the risk of not complying with donor requirements, which affects potential future funding. Evaluator efficiency was found to be the most important factor leading to a successful post-evaluation system. This paper recommends that organisations consider other factors, such as safety and environmental impact. It is advisable to consider risk factors in the evaluation process because the Gaza Strip suffers from political and economic instability and to increase the evaluators' awareness concerning environmental and safety impacts in the evaluation process. The findings from this study would also be valuable for all construction professionals involved in the construction industry in general.

Keywords: Construction, Donors, Project success, Post-evaluation

INTRODUCTION

Construction is one of the most important economic sectors in the world and it plays a major role in the development of any nation; for many centuries, it was considered one of the major indicators for measuring the economic growth of countries (Alzahrani and Emsley, 2013). The construction industry is different from other industries because of its unique characteristics, which include the construction process, project management methods, working environment and conditions and worker behaviours (Fang and Wu, 2013).

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Meng (2012) agreed with Guangshu and Ershi (2009) that construction projects are very important because their results can be reflected on a society that needs the services to exhibit high performance. The evaluation of construction projects is one of the major tools used to ensure performance improvements and to minimise delays, cost overruns and quality defects. According to Fan and Sun (2010), evaluation is conducted at different project stages, which are divided into the following: evaluation of development, evaluation of implementation, evaluation of completion and evaluation of suspension. There are three types of project evaluation: pre-project evaluation, during-project evaluation and post-evaluation.

He and Mi (2009) stated that selecting criteria and determining performance indicators are difficult problems for evaluators. Cao and Hoffman (2011) agreed with Yanggyang and Ting (2011), who stated that some organisations' project schedules were still used as the sole project performance measures and evaluation process: however, other organisations have also used deviations from budgets. Previous studies have shown that an evaluation system is a complex system and needs to be improved. In Palestine, the construction industry is one of the main economic supports (Mahamid and Bruland, 2012). In the Gaza Strip, the construction sector is expanding, contributing approximately 4.4% of the GDP growth by economic activity (World Bank, 2012). The objectives of this study are as follows: to identify the main factors for the post-evaluation system of construction projects, to identify the obstacles of the post-evaluation system and to determine the factors that lead to a successful post-evaluation system.

LITERATURE REVIEW

Governments and organisations are concerned with the success of construction projects despite the different challenges that are faced by the project parties and the increasing complexity in design and implementation (Alzahrani and Emsley, 2013). Project success can be defined as meeting the goals and objectives of the project that were determined in the plan stage. A successful project is defined as one that has met its technical requirements, maintained its schedule and remained within budget (Frimpong, Oluwoye and Crawford, 2003). Elattar (2009) stated that success is defined as the degree to which project goals and expectations are met. Fan and Sun (2010) stated that project evaluation is the recommended programme for environmental impact evaluation, financial evaluation, economic evaluation, social evaluation and risk analysis. Li and Xiong (2011) defined engineering project evaluation as a systematic evaluation of the project based on the process and results using specific criteria to provide some suggestions for decision makers and to improve the performance of later projects. The Scottish government (2012) defined the evaluation as the process of assessing the impact of the project, programme and policy during implementation or after the project has been completed. This means that there are three types of project evaluation processes:

1. Pre-project evaluation before the project has begun to assess its impact
2. During-project evaluation for monitoring and controlling the project implementation

3. Post-evaluation at the end of the project and after completion

Wang et al. (2012) agreed with Olsson et al. (2010), who stated that the post-project evaluation is a comprehensive evaluation of indicators that are developed in the planned stage and includes the following: economic evaluations which have some indicators for actual costs and estimated costs, quality evaluation, effectiveness evaluation, safety evaluation and environmental evaluation. Cao and Hoffman (2011) reported that several organisations evaluate projects using cost and time. Schedules are still used as the sole project performance evaluation criteria at some firms, but this is ineffective because there are many inputs that affect project outcomes. Bing and Hao (2008) agreed that this traditional evaluation system is no longer applicable to the needs of construction organisations' development. A project performance evaluation system should consider quality, degree of owner satisfaction and the environment. These factors are critical for evaluating the performance of engineering projects (Guangshu and Ershi, 2009).

Post-Evaluation Factors in Construction Projects

It is important to evaluate a construction project to determine if the project has succeeded or failed. According to Elattar (2009), there is no single list that will ever be totally comprehensive in regard to a definition of success for a project. The criteria change from project to project and from place to place because the types of criteria and the differentiated parties affect the selection criteria. Several previous studies have illustrated several criteria that have been used; these criteria are presented below.

Time, cost and quality evaluations

Wen-Zhhou and Jia (2007) reported that the main factors in evaluating construction projects are time, cost and quality. Xian, Lingling and Ping (2009) stated that these three factors in project development remain in constant tension and influence the project objectives. Elattar (2009) stated that project success is the goal of all construction parties and the previous three factors are the basic criteria used to achieve this goal. Fan and Sun (2010) remarked that it is difficult to achieve the highest performance for these three factors at the same time. Cost evaluation is conducted by comparing the actual cost with the planned costs: if there is a deviation, the reason must be found. Mahamid and Bruland (2012) stated that the construction industry is full of projects that were completed with significant cost deviations. Many projects suffered from cost deviation; cost underestimates are more common than are cost overestimates in construction projects. According to Frimpong, Oluwoye and Crawford (2003), monthly payment difficulties from agencies are the most important delay and cost factor overruns in developing countries. Indeed, low-cost, speedy construction should not be achieved at the expense of the quality of the project (Alzahrani and Emsley, 2013). The actual timeframe is an important criterion because it indicates if a project is completed on time or if it is delayed and the actual cost is important because it indicates if a project is completed within budget or if it is over budget. Some

problems will affect the compliance with specifications and may be noted as quality defects (Meng, 2012).

Resource evaluation

Alzahrani and Emsley (2013) remarked that people are responsible for creating, managing, operating and utilising projects; they play a major role in the success or failure of a project. Contractors need to provide qualified and skilled staff that has project management responsibilities and execution capabilities during construction to deliver a successful project. Fan and Sun (2010) stated that human resource evaluation includes evaluating the staff requirements, ascertaining tasks from the available workers and the incentive mechanism on the basis of performance appraisals. Meng (2012) showed that it is very important to realise that performance measurement and improvement work well when they are linked to an incentive and disincentive mechanism. Cheng and Fan (2010) constructed a model for evaluating the human resource performance in projects.

Efficiency and effectiveness evaluation

Xu and Yeh (2011) focused their study on two aspects for evaluating projects:

1. *Efficiency*: This aspect is related to the numbers of inputs and outputs, whereby many outputs using minimum inputs needs to be achieved and is often defined as "doing things right".
2. *Effectiveness*: This aspect is related to the degree of the project objective achievement and is often defined as "doing the right things".

They concluded that these two dimensions of the evaluation are not correlated with each other because the project may achieve all objectives but be inefficient. In addition, the project may be efficiently performed, but the degree of objective achievement may not be high. These dimensions are very useful when comparing the performance of projects with other projects because these dimensions help to establish benchmarks of high-performance projects and allow decision makers to learn how to improve the performance of later projects. According to Meng (2012), the best value and mutual benefits can only be achieved through a shared commitment between parties toward common goals and objectives to ensure that the interests of every party involved will be best served by concentrating on the overall success of the project.

Procurement evaluation

The term procurement process is used to describe the process required to supply equipment, materials and other resources required to carry out a project (Alarcón, Rivas and Serpell, 1999). This process usually involves various sub-processes, such as acquisition, purchasing, logistics, monitoring, quality assurance and contract administration. The main problem of procurement is related to schedule delays and to a lack of specified quality for the project. To prevent this situation, it is often necessary to dedicate important resources such as money, personnel and time to monitor and control the process as planned. The authors recommended using

performance indicators to evaluate the procurement process. Frimpong, Oluwoye and Crawford (2003) stated that material procurement and the escalation of material prices have a degree of influence on time and costs.

Communication evaluation

Son et al. (2012) stated that construction is an information-intensive industry and the success of a construction project is dependent on the availability of accurate and timely data. During the implementation phase of a construction project, a large amount of information is generated, processed and stored and such information should be provided to construction professionals. Elattar (2009) highlighted the importance of an interactive communication process during the various stages of construction projects to facilitate effective coordination throughout the project lifetime and to provide sufficient information about the project to the appropriate stakeholders. According to Meng (2012), the lack of open communication is a main reason for the failure of construction projects. The open exchange of information and effective communication facilitate the exchange of ideas and visions, which can result in fewer misunderstandings and open and effective communication can reduce cost overruns.

Environmental evaluation

Alzahrani and Emsley (2013) stated that environmental protection is no longer simply a concept; it has become a challenge facing the construction industry worldwide. Failure to meet environmental obligations at any point during construction could be very costly in terms of costs and delays to the project. Fan and Sun (2010) stated that an environmental evaluation is used to determine the site, investigate environmental conditions, identify and analyse the impact on the environment, propose environment protection measures and ensure environmental protection.

Risk evaluation

Altug (2002) concluded that risks are a major part of post-project evaluations and vice versa. Learning points are easily identified in risk issues and the risk management process outcomes may provide insights into the weaknesses in the project management processes. Post-project evaluation helps in building a knowledge database of possible risks, which is to be used in the risk management process. Historical databases may help to manage the risk checklists and create information for estimations and response strategies. It is important to clearly define responsibilities in the contracts and allocate risks equitably (Meng, 2012).

Safety evaluation

Li and Li (2009) remarked that the poor safety performance of the construction industry continues to give cause for concern in the international community. A proper performance evaluation is also found to be crucial for effective safety management at construction sites. Construction accidents have not been effectively prevented. There are various factors influencing safety management in

the construction industry. These factors can be grouped into peoples' roles, organisation, management, technology and industrial relationships. Alzahrani and Emsley (2013) stated that the construction industry has long been known to lag behind other industries; it has the highest rate of accidents among all industries. Accidents in construction may stop work in one area of the job and lower work morale, thus decreasing productivity. The measurement of safety is mainly focused on the construction period because most accidents occur during this stage.

Owner satisfaction evaluation

Li and Xiong (2011) stated that the satisfaction degree of the owner should be included in the evaluation system. According to previous studies (Wen-zhhou and Jia, 2007; Fan and Sun, 2010; Mahamid and Bruland, 2012), the primary objective of the owner is to accomplish the project on time and within budget while meeting quality and safety requirements and specifications.

Based on previous studies, 34 factors, which are distributed into 13 groups, were identified, as illustrated in Table 1.

Table 1. Factor Groups of the Post-Evaluation of Construction Projects

Factors	Alarcón, Rivas and Serpell (1999)	Altug (2002)	Frimpong et al. (2003)	Wen-zhhou and Jia (2007)	Bing and Hao (2008)	Li and Li (2009)	Guangshu and Ershi (2009)	Elattar (2009)	Xian, Lingling and Ping (2009)	Fan and Sun (2010)	Cheng and Fan (2010)	Cao and Hoffman (2011)	Xu and Yeh (2011)	Meng (2012)	Mahamid and Bruland (2012)	Son et al. (2012)	Wang et al. (2012)	Alzahrani and Emsley (2013)
Time	√		√	√	√			√	√	√		√		√				√
Planned duration										√				√				
Actual duration										√				√				
Insufficient time to complete project										√								
Delay and its reasons	√		√							√				√				√
Cost			√	√	√			√	√	√		√		√	√		√	√
Budget or planned cost										√				√	√			
Actual cost										√				√	√		√	
Cash flow			√															
Reasons for costs increasing			√							√					√			
Quality	√			√	√		√	√	√	√		√		√			√	√

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Table 1. (*continued*)

Factors	**Alarcón, Rivas and Serpell (1999)**	**Alfug (2002)**	**Frimpong et al. (2003)**	**Wen-zhhou and Jia (2007)**	**Bing and Hao (2008)**	**Li and Li (2009)**	**Guangshu and Ershi (2009)**	**Elattar (2009)**	**Xian, Lingling and Ping (2009)**	**Fan and Sun (2010)**	**Cheng and Fan (2010)**	**Cao and Hoffman (2011)**	**Xu and Yeh (2011)**	**Meng (2012)**	**Mahamid and Bruland (2012)**	**Son et al. (2012)**	**Wang et al. (2012)**	**Alzahrani and Emsley (2013)**
Compliance with specifications				√										√				√
Human Resources	√									√	√			√				√
Staff working efficiency											√							√
Number of project workers										√								
Performance Evaluation (Productivity)										√				√				
Incentives										√				√				
Physical Resources	√		√															√
Devices and equipment																		√
Materials	√		√															
Project Efficiency													√					
Usage of available resources											√		√					
Project outputs													√					
Compare inputs with outputs													√					
Project Effectiveness													√	√			√	
Project objective achievement													√	√				
Procurements	√		√															
Resource acquisition process	√																	
Communication								√						√		√		
The existence of an ambiguous communication process between all parties								√						√				
Information arriving to the right person in the suitable time frame								√						√		√		
Problems occur because of misunderstandings														√				
Environment							√			√								√
The environmental impact after the project is complete										√								√
Risks		√												√				
Risk plan		√																
Actual risks		√												√				
The organisation's ability to address risks														√				
Parties that have been allocated risks		√												√				
Safety					√	√											√	√

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Table 1. (*continued*)

Factors	Alarcón, Rivas and Serpell (1999)	Alhug (2002)	Frimpong et al. (2003)	Wen-zhhou and Jia (2007)	Bing and Hao (2008)	Li and Li (2009)	Guangshu and Ershi (2009)	Elattar (2009)	Xian, Lingling and Ping (2009)	Fan and Sun (2010)	Cheng and Fan (2010)	Cao and Hoffman (2011)	Xu and Yeh (2011)	Meng (2012)	Mahamid and Bruland (2012)	Son et al. (2012)	Wang et al. (2012)	Alzahrani and Emsley (2013)
Compliance with all safety regulations						√												
The parties that have the main responsibility of applying safety regulations						√												
Accidents occurring and their causes						√												√
Owner Satisfaction			√	√			√	√	√	√					√			
The implementation of conforming to the requirements				√					√	√					√			
Implementing project within budget			√	√				√	√	√					√			
Implementing project on time			√	√				√	√	√					√			

METHODOLOGY

A questionnaire was adopted in this study to investigate the evaluation system in construction projects in the Gaza Strip-Palestine. The survey was used because it is one of the most speedy and economical methods for collecting a large amount of data in a short period. From the literature review and from previous studies, the researchers used different methods to achieve the objectives and goals of the research. Alzahrani and Emsley (2013) used a questionnaire to study 35 critical success factors that greatly impact the success of projects from a post-construction evaluation perspective. Meng (2012) developed a questionnaire with 10 factors to study the effect of relationship management on project performance in construction; in addition, he used interviews as a complement to the questionnaire to examine the findings of the questionnaire result analysis. Frimpong, Oluwoye and Crawford (2003) used a questionnaire with 26 factors to evaluate and analyse the causes of delays and cost overruns in groundwater projects in Ghana. Cao and Hoffman (2011) answered their research questions and achieved their objectives by using the case study approach for designing a project performance evaluation system; they gathered data for the case study by conducting interviews. He and Mi (2009) adopted a case study for the application of the quality function employed method (QFD) to engineering project evaluation. The researchers tended toward questionnaires for collecting data because compared to other data collection methods, questionnaires are cheaper, less time consuming and yield larger amounts of data; interviews are used to obtain more knowledge and practical information about evaluation factors.

A total of 40 questionnaires were randomly distributed to project managers/coordinators involved in the post-evaluation process in international organisations. A total of 35 questionnaires were received, yielding an 87% response rate. The questionnaire was constructed based on a literature review and on face-to-face interviews with six project managers with more than 15 years of experience in the project evaluation process. Prior to the interview, questions regarding various factors were prepared, the interviews were conducted while preparing the literature review between February and March of 2013, each interview was transcribed and lasted 40 minutes on average and every factor identified in the interviews were considered on the questionnaire to identify other important factors of the evaluation system. A total of 34 factors distributed into 13 groups were identified and reported in 18 previous studies, as shown in Table 1. As a result of the face-to-face interviews, 16 factors and one group on variation orders were added and according to their practical experience, the interviewees add the following factors:

1. Additional factor for time:
    a. Effective use of time to perform tasks: Given an activity, the time it takes to be accomplished, spending time on the activity at hand as opposed to other activities, which wastes time.
2. Additional factors for cost:
    a. Human resources cost: This includes the wages of workers and the number of workers, comparing it with other workers' wages in the country and determining if it is considered as a heavy load on the project budget.
    b. Physical resource cost: This includes equipment, devices and material costs.
    c. Financial transfers: In the Gaza Strip, transferring money to the organisations that implement projects is difficult and takes time, especially when donors are external. In some projects, this causes many problems with contractors because of payment delays.
3. Additional factors for quality:
    a. Monitoring and controlling quality plans: In the planning stage, a plan for quality with achievable milestones is prepared and if management considers this plan in the implementation, the quality is monitored and corrective actions are taken. This also includes what was monitored and what control methods were used.
    b. Reasons for low quality: If the quality of the work carried out did not meet the requirements, what were the reasons that led to this? The reasons for this may be the unqualified workers, inappropriate materials, or the construction method not being practical or appropriate.
4. Additional factors for physical resources:
    a. Site/office fittings: the facilities and fixtures of the site office and the main office.
    b. Transportation: the method of transporting workers, materials, equipment and machinery to the site.

5. Additional factor for project effectiveness:
   a. The influence of project objectives in achieving the organisational goals.
6. Additional factor for procurements:
   a. The procurements plan: the methods of acquiring resources for the project.
7. Additional factors for communication:
   a. Parties' ability to provide means of communication: This includes the ability of owners, designers, engineers, contractors, subcontractors, workers and all parties working on the project to use means of communication and utilise technology such as mobile mail.
   b. Hierarchy in data transformation: compliance with the project structure or organisation structure in transferring data.
8. Additional factor for environment:
   a. Problems damage the environment during implementation: Some problems may occur during implementation, the causes of which are not being considered in the beginning, which may negatively impact the environment.
9. Variation order group and their factors:
   a. Changes in design.
   b. The effect of changes on time.
   c. The effect of changes on costs.

In addition, five factors concerning obstacles of post-evaluation systems and eleven factors that lead to a successful post-evaluation system were identified from previous studies. A pilot study was conducted by distributing the modified questions to five experts to identify ambiguous questions and to test the techniques used to collect data. The results of the pilot study were reviewed and minor adjustments were made accordingly to produce the final questionnaire.

The respondents were asked to rate the importance of each factor using a five-point Likert scale. To measure attitudes with respect to the surveyed variables, the Relative Importance Index (RII) technique was employed. This technique is widely used to analyse the factors affecting the accuracy of cost estimations. The relative index technique has been widely used in construction research for measuring attitudes with respect to surveyed variables. Likert scaling was used for ranking questions that have an agreement level. The respondents were required to rate the importance of each factor on a five-point Likert scale using 1 for "not important", 2 for "of little importance", 3 for "somewhat important", 4 for "important" and 5 for "very important". Then, the relative importance index was computed using the following equation:

$$\text{Relative Importance Index Formula} = \frac{\sum w}{AN} = \frac{5n_5 + 4n_4 + 3n_3 + 2n_2 + 1n_1}{5N}$$

where W is the weight given to each factor by the respondent, which ranges from 1 to 5; n_1 is the number of respondents indicating "not important"; n_2 is the number of respondents indicating "of little importance"; n_3 is the number of respondents indicating "somewhat important"; n_4 is the number of respondents indicating

"important"; and n_5 is the number of respondents indicating "very important" (Enshassi et al., 2007). A is the highest weight (i.e., 5 in the study) and N is the total number of samples. The relative importance index ranges from 0 to 1 (Naoum, 2007).

RESULTS AND DISCUSSION

Respondents' Profile

Table 2 illustrates the results of the respondents' profile. Most of the respondents have experience totalling more than nine years and most of them are project coordinators.

Table 2. Respondents' Profile

General information	Frequency	Percent
Types of Organisation		
Owner	22	62.86%
Consultant	13	37.14%
Types of Projects		
Buildings	22	62.86%
Roads and transportation	3	8.57%
Water and sewage	3	8.57%
Other	7	20%
Experience of the Organisation		
0–3 years	1	2.86%
Three to five years	1	2.86%
Five to 10 years	2	5.71%
10 to 15 years	6	17.14%
15 to 20 years	12	34.29%
20 years or more	13	37.14%
Number of Projects Executed in the Last Five Years		
0–10 projects	7	20%
10 to 20 projects	7	20%
20 to 30 projects	9	25.71%
30 projects and more than	12	34.29%
Value of Executed Projects in the Last Five Years		
USD 0–1 million	10	28.57%
USD 1 million to 5 million	5	14.29%
USD 5 million to 10 million	8	22.85%
USD 10 million or more	12	34.29%
Job Title of the Respondent		
Organisation Manager	0	0%
Project Manager	10	28.57%
Project Coordinator	16	45.72%
Site/Office Engineer	9	25.71%

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Table 2. (*continued*)

General information	Frequency	Percent
Experience of the Respondent		
0–3 years	2	5.71%
Three to five years	4	11.43%
Five to 10 years	3	8.57%
10 to 15 years	12	34.29%
15 to 20 years	9	25.71%
20 years or more	5	14.29%

Organisation Interest in Evaluation System

The results regarding the organisation interest in the evaluation systems of construction projects in the Gaza Strip are shown in Table 3.

Table 3. Organisation Interest in Evaluation Systems of Construction Projects in the Gaza Strip

Factor	Percent%		
	Yes	No	Sometimes
Your organisation has a specialised person for the monitoring and evaluation process.	51.43	17.14	31.43
Your organisation has a template form for the post-evaluation of construction projects.	42.86	37.14	20.00
During the preparation of construction project proposals, the budget of the evaluation stage is considered.	65.71	8.57	25.71
A plan is created for the post-evaluation of construction projects.	48.57	17.14	34.29
Your organisation acquires an external consultant to evaluate construction projects.	25.71	31.43	42.86
The donor has a major role in the evaluation stage.	65.71	5.71	28.57
The construction type affects the project evaluation.	57.14	5.71	37.14
The project size affected the presence of the evaluation stage.	31.43	45.71	22.86
The delay of the evaluation leads to an imbalance in the organisation performance.	40.00	25.71	34.29
Evaluating projects leads to an improvement in the performance.	97.14	0.00	2.86

The results showed that 51.43% of the respondents stated that their organisations have a specialised person for project monitoring and evaluation because their employees have a large amount of experience. In contrast, 31.43% of respondents chose "sometimes" because project evaluator may be available during and after the completion of the project. 17.14% of the respondents stated that their organisations do not have a project evaluator because they are not

interested in the evaluation process. 42.86% of the respondents have a template for the evaluation system for construction projects. 37.14% of the respondents do not have a template; some of these organisations have a specialised evaluator or external evaluators. The results showed that 20% of the respondents sometimes have templates; this is when it is required by donors.

65.71% of the respondents agreed that their organisations considered a special budget for the evaluation phase budget when they prepare proposals for construction projects. 48.57% of the respondents agreed with the creation of an evaluation plan because they believed that it is crucial to have a formal plan. The findings revealed that 42.86% of the respondents acquired external consultants for the project evaluation when it was required by donors because they do not have a specialised person in their organisations for such an evaluation. The results showed that most respondents stated that donors have a major role in the evaluation stage. Some donors required to be present during the evaluation process when this is considered in the budget.

57.14% of the respondents agreed that the construction project type affected the main factors of the project evaluation. Each project is unique in its characteristics; the evaluation indicators for educational construction projects are different to the indicators for healthcare projects. 45.71% of the respondents did not agree that the size of projects affected the evaluation process; this is because these organisations have a permanent specialised person for evaluations. The results indicated that most respondents (97.14%) agreed that evaluating projects leads to an improvement of the performance. This means that organisations have an awareness about the benefits of the post-evaluation system.

Ranking of Factors That Are Used in the Post-Evaluation Process

The results in this section illustrated the relative importance index and the ranks of the factors for post-evaluation systems that are used in construction projects in the Gaza Strip. Table 4 shows a summary of the standard deviation, relative importance index and the rank for each factor.

Table 4. Factors of the Post-Evaluation System in Construction Projects

Post-Evaluation Factors	Standard Deviation	RII	Group Rank	Total Rank
Time				
Actual duration	7.874	0.846	1	5
Planned duration	8.367	0.829	2	9
Insufficient time for completing a project	7.517	0.817	3	11
Delay	7.000	0.783	4	19
Effective use of time to perform task	5.788	0.754	5	25
Cost				
Budget or planned cost	7.583	0.863	1	1
Actual cost	7.778	0.851	2	4
Reasons for cost increase	5.874	0.789	3	16
Financial transfer	5.958	0.783	4	18

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Table 4. (*continued*)

Post-Evaluation Factors	Standard Deviation	RII	Group Rank	Total Rank
Cash flow	5.788	0.771	5	21
Human resource cost	6.164	0.749	6	27
Physical resource cost	6.745	0.749	7	28
Quality				
Compliance with specifications	6.633	0.800	1	14
Monitoring and controlling quality plans	5.874	0.783	2	17
Reasons for low quality	6.083	0.766	3	23
Human Resources				
Staff efficiency	8.972	0.840	1	6
Number of workers per project	5.788	0.720	2	32
Incentives	6.595	0.686	3	45
Performance evaluation	5.941	0.663	4	48
Physical Resources				
Devices and equipment	5.148	0.743	1	29
Materials	7.176	0.726	2	31
Site/office fittings	5.099	0.714	3	34
Transportation	5.701	0.651	4	49
Project Efficiency				
Project outputs	6.442	0.800	1	13
Comparison of inputs with outputs	5.788	0.777	2	20
Usage of available resources	6.124	0.754	3	26
Project Effectiveness				
Project objective achievement	6.964	0.834	1	7
The influence of project objectives in achieving the organisational goals	6.442	0.806	2	12
Procurements				
Resource acquisition process	4.743	0.703	1	36
Procurement plan	7.348	0.691	2	42
Communication				
Ambiguous communication process between all parties	7.141	0.731	1	30
Information transferred to the right person at the right time	6.442	0.714	2	35
Parties ability to provide means of communication	6.633	0.691	3	40
Hierarchy in data transformation	5.431	0.669	4	46
Problems occur because of misunderstandings	8.124	0.600	5	50
Environment				
The environmental impact	6.042	0.720	1	33
Problems resulting from damage to the environment	4.637	0.686	2	43

(*continued on next page*)

Table 4. (*continued*)

Post-Evaluation Factors	Standard Deviation	RII	Group Rank	Total Rank
Risks				
Organisational ability to address risks	6.442	0.760	1	24
Allocated risks to contract parties	6.481	0.691	2	39
Actual risks	5.385	0.686	3	44
Risk plan	5.958	0.663	4	47
Safety				
Compliance with safety regulations	5.831	0.771	1	22
Accident occurrence	5.196	0.703	2	37
Safety responsibility	7.036	0.691	3	41
Variation Orders				
The effect of changes on costs	7.906	0.823	1	10
The effect of changes on time	7.874	0.794	2	15
Percentage changes in design	6.042	0.691	4	38
Owner Satisfaction				
Project completion within budget	7.583	0.863	1	1
Project completion on time	8.276	0.863	2	3
Project completion according to the specifications	7.483	0.834	3	8

Table 4 shows that the actual duration is ranked as the first position in the time evaluation group, with an RII = 0.846. Identifying the actual duration is important and helpful in the process of evaluation. This result is in line with Meng (2012), who stated that the actual duration is important in evaluating the time of construction projects because it indicates whether a project is completed on time or delayed, which affects costs and quality. The budget, or planned cost, is ranked as the first position in the cost evaluation group, with an RII = 0.863, whereas the actual cost is ranked as the second position, with an RII = 0.851, which is close to the first position. The actual cost is very important to the evaluated cost, which determines if the project has been implemented within its budget. The results contradict the findings of a study conducted in UK by Meng (2012), who found that the actual cost was the most important factor in the cost evaluation of construction projects and that budget did not have the same importance. This discrepancy is not unexpected because of the nature of funding for construction projects in the Gaza Strip carried out by organisations using external funding, whereby the budget is difficult to increase. Therefore, the focus is on the planned cost and actual cost and the completion of the project within the planned cost to attract funding for other projects from external financiers. The demographics also play an important role, especially because the Gaza Strip is going through a reconstruction phase after the two wars, while projects in the UK were likely to secure funds from within the kingdom and thus, there may be more flexibility in increasing funding.

According to Table 4, compliance with specifications comes in first in the quality group, with an RII = 0.800. This is because the specifications are determined

at the beginning of the project based on the agreement between both owners and donors. The situation in the Gaza Strip is politically and economically unstable; the closures of crossings may force changes in the specifications. Therefore, it is necessary to evaluate compliance with the specifications of the newly approved materials. These result agreed with Alzahrani and Emsley (2013), whereby the most important factor in the quality evaluation in construction projects is to evaluate if the work performed conforms to the specifications established for the project. The efficiency of staff was ranked as the first position of the human resources group in construction projects, with an RII = 0.840. In the Gaza Strip, many unskilled youth work in construction projects and are poorly paid by contractors. This negatively affects the quality of the work and hence the timeframe and costs of the project. Cheng and Fan (2010) confirmed the importance of staff wages and incentives.

Devices and equipment, materials and site/office fittings have similar relative importance indexes of 0.743, 0.726 and 0.714, respectively. This means that when physical resources in construction projects are evaluated, these three criteria are equally important. Project output occupied the first position when evaluating the efficiency group of the construction projects, with an RII = 0.800. Project objective achievement was ranked as the first position in the effectiveness evaluation group, with an RII = 0.834. For evaluating procurement, Table 4 shows that the resource acquisition process ranks as the first position, with an RII = 0.703. This result can be interpreted as the acquisition process affecting the project implementation, especially in the Gaza Strip, which suffers from resource shortages. The process of acquiesce labour, material and equipment consumes time and financial resources and affects quality.

The existence of an ambiguous communication process between all parties ranks as the first position in the communication group, with an RII = 0.731. This result agrees with Son et al. (2012), Elattar (2009) and Meng (2012), who stated that an effective communication process leads to a successful project and to reduced misunderstandings and cost overruns. The environmental impact after completion of the project occupied the first position, with an RII = 0.720. Evaluating the organisational ability to address risks is ranked as the first position, with an RII = 0.760. This result reflects the situation in the Gaza Strip, which suffers from unstable conditions; thus, any organisation needs to respond to any unpredictable events. The Cooperative Housing Foundation (2011) was coordinating with the United States Agency for International Development (USAID) and the Israeli government to move the necessary construction materials into Gaza to complete its projects. This result is in contrast to a study conducted in the UK by Meng (2012), whereby allocation of risk between parties was the most important factor, which is ranked as the second position in our studies, with an RII = 0.691. This can be traced to the different research location environment of both countries. However, it is necessary to determine which party construction risks will be allocated to. In the Gaza Strip, the situation is unstable and there are other construction risks related to the political and ecumenical situation in the Strip. Organisations cannot control this situation; therefore, the ability to address risks needs to be evaluated.

The criterion that occupies the first position in evaluating safety was compliance with all safety measures to avoid accidents, with an RII = 0.771. This result is in agreement with Li and Li (2009), who connected all safety factors with safety management, which includes applying safety measures, rules and regulations to avoid accidents. Concerning the variation order group, the effect

of changes on costs was ranked as the first position, with an RII = 0.823. With regard to the owner satisfaction group, implementing projects within budget and on time have the same RII of 0.863, but according to the standard deviation, implementing the project within budget has a value of 7.583; therefore, it occupies the first position and implementing the project on time occupies the second position, with a value of 8.276 for the standard deviation. The implementation conforming to the requirements occupies the third position, with an RII = 0.834. This result is in agreement with some previous studies (Wen-zhhou and Jia, 2007; Fan and Sun, 2010; Mahamid and Bruland, 2012), which stated that the primary objective of the owner is to accomplish the project on time and within budget while meeting quality requirements and specifications.

Summary of the Most Important Factors Affecting Post-Evaluation Process

Table 5 shows the most important factors for the main groups of the post-evaluation process of construction projects in Gaza Strip with their standard deviation, relative importance index, rank and the group.

Table 5. The Most Important Factors in the Main Groups

Criteria	Group	Standard Deviation	RII	Rank
Budget or planned cost	Cost	7.583	0.863	1
Implementing project within budget	Owner satisfaction	7.583	0.863	1
Implementing project on time	Owner satisfaction	8.276	0.863	3
Actual cost	Cost	7.778	0.851	4
Actual duration	Time	7.874	0.846	5
Staff working efficiency	Human resources	8.972	0.840	6
Project objective achievement	Project effectiveness	6.964	0.834	7
The implementation conforming to the requirements	Owner satisfaction	7.483	0.834	8
Planned duration	Time	8.367	0.829	9
The effect of changes on cost	Variation orders	7.906	0.823	10

According to the respondents, budget or planned cost from the cost group, implementing the project within budget, or the planned cost and on time from the owner satisfaction group are the top two significant criteria for the main factors of the post-evaluation, with an RII = 0.863, but the standard deviation (7.583) places the budget and implementing projects within budget as the first position. These results are in agreement with previous studies (Wen-zhhou and Jia, 2007; Fan and Sun, 2010; Mahamid and Bruland, 2012), whereby the main objectives of any project is to achieve the goals of the project within budget and on time. Any cost and time overruns may cause problems for the involved parties. Actual costs occupies the fourth rank, with an RII = 0.85 and the actual duration follows with an RII = 0.846.

Ranking of Group Factors for the Post-Evaluation System

According to the respondents, the cost group was ranked as the most important group for the post-evaluation system of construction projects, with an RII = 0.937 (Table 6). Time is the second group, with an RII = 0.926. Quality was ranked as the third rank, with an RII = 0.880. The fourth group was project efficiency, with an RII = 0.857; project efficiency is important for comparing the total inputs with outputs and for comparing the cost (input), which is affected by resources and time, with the implementation working quality (output).

These three groups are critical because the Gaza Strip depends on external donors who are focused on costs and who always demand extensive details about the expenditures. The unstable situation influences the project time and quality because the political and economic risks are high. A successful project is defined as one that has met its technical performance goals, maintained its schedule and remained within budget (Frimpong, Oluwoye and Crawford, 2003; Wen-zhhou and Jia, 2007; Fan and Sun, 2010; Mahamid and Bruland, 2012).

Table 6. RII and Ranks of Group Factors for the Post-Evaluation System

Group Factors	Standard Deviation	RII	Rank
Cost	10.630	0.937	1
Time	10.100	0.926	2
Quality	8.367	0.880	3
Project Efficiency	8.000	0.857	4
Owner Satisfaction	8.000	0.857	4
Project Effectiveness	8.602	0.789	6
Safety	6.042	0.783	7
Risks	5.339	0.760	8
Variation orders	5.874	0.749	9
Human Resources	7.000	0.720	10
Physical Resources	6.964	0.709	11
Communication	6.164	0.703	12
Procurements	5.745	0.669	13
Environment	6.042	0.634	14

The environment group was ranked as the last position, with an RII = 0.634. Environmental issues in construction projects are considered as new issues in the evaluation system in the Gaza Strip; many engineers are not familiar with this term. Some international organisations in the Gaza Strip have conducted evaluations of the environmental impact in the proposal stage and some considered this evaluation group after the completion of the project. Alzahrani and Emsley (2013) stated that the environment is becoming a measure of success in addition to the classic triangle of time, cost and quality.

Obstacles of the Post-Evaluation System

The respondents agreed that overloaded projects and the need to complete the project and move on to other projects without evaluation is the most important obstacles in the post-evaluation system, with an RII = 0.811 (Table 7). When there are too many projects that are implemented at the same time and when other projects are waiting to start, there is a lack of time to evaluate the project after completion, especially when there is a lack of resources and insufficient funding for the use of external experts to evaluate the construction projects. The second factor is a lack of organisational awareness about evaluations, with an RII = 0.794. This is due to the lack of specialised staff in project evaluation and due to the organisation being unaware of the importance of post-evaluation.

Table 7. Obstacles to the Post-Evaluation System

Obstacles	Standard Deviation	RII	Rank
Overloaded projects and the need to complete the project and move on to other projects without evaluation	6.124	0.811	1
Lack of organisational awareness about evaluations	7.246	0.794	2
Cost evaluation	6.481	0.789	3
Time consuming	7.176	0.754	4
Objectives are ambiguous	5.612	0.737	5

Factors Leading to Successful Post-Evaluation Systems

The findings in Table 8 reveals that evaluator efficiency is the most important factor that leads to a successful post-evaluation in the Gaza Strip with an RII = 0.880, followed by sufficient budget for evaluation with an RII = 0.851. The evaluator efficiency is considered the most important element in the project evaluation system. Sufficient budgets is the second-most-important factor; evaluation systems require many resources and require substantial amounts of time and thus financial resources. The third factor is an ambiguous evaluation plan, which is affected by the evaluator efficiency. A neutral evaluator and impartiality is another factor for success.

Table 8. Factors That Lead to Success in an Evaluation System

Factors	Standard Deviation	RII	Rank
The evaluator efficiency	8.689	0.880	1
Sufficient budget for evaluation	7.681	0.851	2
An ambiguous evaluation plan	7.348	0.840	3
Interim assessments	7.483	0.806	4
The neutrality of evaluator	7.649	0.806	5
The clarity of objectives	5.612	0.800	6
Availability of data and documents related to the project	7.246	0.800	7
The accurate determination of indicators	7.314	0.783	8
Using appropriate tools to collect data	8.000	0.777	9
Involve all parties in the evaluation process	5.874	0.749	10
The actual perception in the organisation of the importance of evaluation	5.612	0.731	11

CONCLUSION AND RECOMMENDATIONS

The studies on post-evaluation systems are limited and include few evaluation factors for time, cost and quality. These factors are important, but there are other factors that projects should consider. Some research studies addressed individual factors but did not address all the factors in one study. The significant contribution of this research is the identification of the most important factors for the post-evaluation of construction projects in the Gaza Strip under one study. The area has shown significant growth in the construction sector, whereby it is very important to assess project success and many lessons can be learned that will be useful for increasing the performance of future projects. Organisations can consider this evaluation as an indicator of their overall performance. Identifying obstacles of the post-evaluation system can help construction organisations in considering the factors at the early stages of construction projects and taking proactive measures to avoid these obstacles.

The paper concludes that international organisations in the Gaza Strip are obliged to utilise post-evaluation systems for their projects. Some of these organisations have a specialised person for monitoring the evaluation system. Other organisations have templates or acquire an external consultant for the evaluation. The donor plays a major role during the evaluation stage. Most donors have a template, which includes the main factors that they are interested in, such as cost and time and the template appears to ignore other important factors. Cost, time and quality are the most important factor groups for the post-evaluation system of construction projects. Cost is considered as an important factor for projects in the Gaza Strip because project funding depends on external donors who are generally very focused on the project cost. The unstable situation in the Gaza Strip influences project timeframes and quality because the political

and economic risks are high. Considering the funding model, the planned cost is fixed and it is too difficult to increase funding, which eventually makes the actual cost very important in the evaluation process. There are many other factors that should be considered in the post-evaluation process, such as project efficiency, owner satisfaction, project effectiveness, safety, risks, variation orders, resources, communication, procurements and the environment.

Overloading projects and hastily completing projects and moving on to other projects without proper evaluation are considered the most important obstacles in the post-evaluation system. The lack of awareness about post-evaluation will increase the risk of not complying with donors' requirements, which may affect future funding. Evaluator efficiency is the most important factor that leads to a successful post-evaluation process in the Gaza Strip. Evaluator efficiency is considered the backbone of an effective project evaluation system. An approved budget and good planning are also considered as crucial factors that contribute to a successful evaluation process. Organisations should consider other factors in the post-evaluation process in addition to cost, time and quality, such as safety and the impact of the project on the environment. It is important that post-evaluation be conducted directly after the completion of the project because any delay may influence the performance of the organisation. Construction organisations should consider evaluation factors that are related to project types and project surroundings pertinent to special circumstances as factors in addition to project cost and time. Increasing the attention to risk evaluation in the Gaza Strip should be seriously considered due to political instability. Environmental factors should also be considered; therefore, training programmes regarding post-evaluation systems for construction organisations and their employees should be organised. The findings from this study would be valuable for all professionals involved with construction projects in general.

REFERENCES

Alarcón, L., Rivas, R. and Serpell, A. (1999). Evaluation and improvement of the procurement process in construction projects. *Proceedings: Evaluation and Improvement of the Procurement Process in Construction Projects Conference*. University of California, Berkeley, 26–28 July.

Altug, S. (2002). Risk management and post project evaluation processes for research and development projects. MSc diss. Sabancı University.

Alzahrani, J. and Emsley, M. (2013). The impact of contractors' attributes on construction project success: A post construction evaluation. *International Journal of Project Management*, 31(2): 313–322.

Bing, X. and Hao, Y. (2008). Study to the performance evaluation of construction enterprise project management based on the BSC. *Proceedings: International Conference on Information Management, Innovation Management and Industrial Engineering*. Available at: http://ieeexplore.ieee.org.library.neu.edu.tr:2048/xpl/articleDetails.jsp?tp=&arnumber=4737639 [Accessed on 28 February 2013].

Cao, Q. and Hoffman, J. (2011). A case study approach for developing a project performance evaluation system. *International Journal of Project Management*, 29(2): 155–164.

Cooperative Housing Foundation. (2011). *Palestinian Community Assistance Program Report*. Gaza, Palestine: Cooperative Housing Foundation.

Elattar, S. (2009). Towards developing an improved methodology for evaluating performance and achieving success in construction projects. *Scientific Research and Essay Journal*, 4(6): 549–554.

Enshassi, A., Mohamed, S., Abu Mustafa, Z. and Mayer, P.E. (2007). Factors affecting labour productivity in building projects in the Gaza Strip. *Journal of Civil Engineering and Management*, 13(4): 245–254.

Fan, D. and Sun, A. (2010). Research on evaluation methods of projects. *Proceedings: Second Pacific-Asia Conference on Circuits, Communications and System*. Available at: http://ieeexplore.ieee.org.library.neu.edu.tr:2048/xpl/articleDetails.jsp?tp=&arnumber=5626892 [Accessed on 20 February 2013].

Fang, D. and Wu, H. (2013). Development of a safety culture interaction (SCI) model for construction projects. *Safety Science*, 57: 138–149.

Frimpong, Y., Oluwoye, J. and Crawford, L. (2003). Causes of delay and cost overruns in construction of groundwater projects in a developing countries: Ghana as a case study. *International Journal of Project Management*, 21(5): 321–326.

Guangshu, X. and Ershi, Q. (2009). *Study on the Index System of Performance Evaluation of Engineering Projects*. Available at: http://ieeexplore.ieee.org.library.neu.edu.tr:2048/xpl/articleDetails.jsp?tp=&arnumber=5344456 [Accessed on 2 March 2013].

He, Y. and Mi, Z. (2009). Quality function deployment method and its application in engineering project performance evaluation. *International Conference on Electronic Commerce and Business Intelligence*. Available at: http://ieeexplore.ieee.org.library.neu.edu.tr:2048/xpl/articleDetails.jsp?tp=&arnumber=5189514 [Accessed on 2 March 2013].

Li, C. and Li, H. (2009). *Developing a Model to Evaluate the Safety Management Performance of Construction Projects*. Available at: http://ieeexplore.ieee.org.library.neu.edu.tr:2048/xpl/articleDetails.jsp?tp=&arnumber=5304613 [Accessed on 17 March 2013].

Li, S. and Xiong, Q. (2011). The structure of engineering project evaluation system: Model and analysis. *Systems Engineering Procedia*, 2: 352–357.

Mahamid, I. and Bruland, A. (2012). Cost deviation in road construction projects: The case of Palestine. *Australasian Journal of Construction Economics and Building*, 12(1): 58–71.

Meng, X. (2012). The effect of relationship management on project performance in construction. *International Journal of Project Management*, 30(2): 188–198.

Naoum, S. (2007). Dissertation Research and Writing for Construction Students. Oxford: Butterworth-Heinemann.

Olsson, N., Krane, H., Rolstadas, A. and Veiseth, M. (2010). Influence of reference points in ex post evaluations of rail infrastructure projects. *Journal of the World Conference on Transport Research Society*, 17(4): 251–258.

Scottish Capital. (2012). *Investment Manual: Project Evaluation Guide*. Available at: www.scim.scot.nhs.uk [Accessed on 8 March 2013].

Son, T., Park, Y., Kim, C. and Chou, J. (2012). Toward an understanding of construction professionals' acceptance of mobile computing devices in South Korea: An extension of the technology acceptance model. *Automation in Construction*, 28: 82–90.

Wang, W., Wang, Z., Wang, S. and Qu, G. (2012). Application of AHP evaluation method in project management of residential construction in China. *International Conference on Ecology, Waste Recycling and Environment: Advances in Biomedical Engineering*, 7: 190–195.

Wen-zhhou, Y. and Jia, N. (2007). A study on the performance evaluation of construction project integrated management. *Proceedings: International Conference on Management Science and Engineering*. China, 20–22 August.

World Bank. (2012). *Economic Monitoring Report to the Ad Hoc Liaison Committee*. Washington DC: World Bank.

Xian, R., Lingling, M. and Ping, L. (2009). Project evaluation with time, cost and quality considerations. *International Conference on Fuzzy Systems and Knowledge Discovery*. Vol. 25. Taipei, China: Institute of Electrical and Electronics Engineers, 316–319.

Xu, Y. and Yeh, C. (2011). Evaluating the performance effectiveness and efficiency of projects. *Proceedings: Conference on Industrial Electronics and Applications*. Australia, 1 November.

Yangyang, L. and Ting, W. (2011). *Study on Grid Engineering Construction Project Owner's Risk Evaluation under PMC Model*. Available at: http://ieeexplore.ieee.org.library.neu.edu.tr:2048/xpl/articleDetails.jsp?tp=&arnumber=6011105 [Accessed on 10 March 2013].

Cheng, Y. and Fan, X. (2010). The study of DEA method in performance evaluation of project human resource management. *Proceedings: International Conference on Management Science and Engineering*. Australia, 24–26 November.