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Prioritizing Project Performance Criteria within Client Perspective

Arazi Idrus, Mahmoud Sodangi and Mohamad Haq Husin
Civil Engineering Department, Universiti Teknologi PETRONAS, Bandar Seri Iskandar, 31750 Tronoh, Perak Darul Ridzuan, Malaysia

Abstract: Successful performance in a construction project helps to deliver good products to the client. At present, there is no standard approach used by clients to evaluate project performance as project success carries different definitions to different people. Some used the traditional project performance measures of cost, quality and time while others used additional non-traditional measures such as the environment, health and safety, level of technology and contractor planning. The purpose of this study is to identify and rank the actual criteria used by local clients in current practice to measure the performance of a construction project during construction as well as upon completion. The ranking is based on the relative importance of the criteria as perceived by project performance decision makers working for clients' organizations within the Malaysian construction industry using their accumulated experience and judgment. The objective of this study was investigated through a postal questionnaire which covered a selected sample of the study. Data were analyzed using mean, variance, frequency and severity index analyses. The results of this paper show that Quality of finished project, Construction cost and Construction time were the three most important criteria considered crucial by the respondents for evaluating project performance from current practice in Malaysia. The paper provides supportive practical solution for project performance decision makers working for clients' organizations within the Malaysian construction industry to enhance and improve their practices in measuring their clients' project performance so that their clients would enjoy higher satisfaction levels from their projects. More so, the paper would serve as a guide to contractors by helping them to understand that Quality of finished project, Construction cost and Construction time are the criteria given high priority by clients in measuring the performance of a construction project.

Key words: Construction, cost, project, quality, satisfaction, time

INTRODUCTION

The Malaysian construction industry plays a key role in contributing to the country's economic development process which is both growth-initiating and growth-dependent (Abdullah, 2004). The industry establishes buildings and infrastructure works required for socio economic development which contribute to the overall economic growth. The industry also provides works for many people ranging from professionals such as architects, engineers and surveyors to main contractors, subcontractors, suppliers and ultimately manual labourers who are employed by these contractors. Therefore, the construction industry is one of the key industries in Malaysia. The concept of a successful construction project is wide in scope and project success means different things to different people. Project management is about the process of planning, organizing and controlling of company resources to achieve specific goals and objectives. While some project managers consider timely completion, cost of total expenditure of project as well as the quality of the construction, others suggest that success is something which is more complex and more than the three aspects.

Idrus and Sodangi (2010) asserted that the term 'performance' can also take on different meanings depending on the context in which it is being used. Performance basically measures effectiveness (doing the right thing) and efficiency (doing the right thing right). Sinclair and Zairi (1995) and Mbugua *et al*., (1999) defined performance measurement as an organized way of assessing the inputs and outputs in manufacturing operations or construction activity and acts as a tool for continuous improvements. In every construction project, project management cannot succeed unless the project manager is willing to employ a good effective system approach to project management by analyzing those variables that lead to success and failure in a project. Today, the concept of project performance is being developed in many ways as criteria for evaluating the success of a project. Different types of project management would come out with different types of

Corresponding Author: Mahmoud Sodangi, Civil Engineering Department, Universiti Teknologi PETRONAS, Bandar Seri Iskandar, 31750 Tronoh, Perak Darul Ridzuan, Malaysia

outcome and it depends on the project organizations to choose what would be the most excellent for their construction business to survive and perform in the future. Therefore, it is necessary to understand what criteria clients employ in real practice to evaluate the performance of their construction projects. This result will be useful in no small measure in helping all parties to improve project performance and achieve a successful project construction.

LITERATURE REVIEW

Going by previous studies undertaken by researchers, it was found out that, there are various types of criteria which are considered in evaluating the construction project performance. These researchers have their own perspectives and came out with different types of criteria which were either based on literature review or case study. Generally, there is no standard approach or guideline in evaluating construction project performance. In the early 1990s, at project level, success was measured by the project duration, monetary cost and project performance. Time, cost and quality are the basic criteria to project success known as the 'iron triangle' as it was always included in any project performance evaluation. According to Love and Holt (2000) in a research on Construction Business Performance Measurement, the criteria to measure the construction performance in United Kingdom (UK) construction industry was explained. Also, they discussed on the differences found in construction performance measurement between Stakeholder Perspective Measurement (SPM) and Business Performance Measurement (BPM). They pointed out that BPM is a myopic thinking (narrow-minded) that should be rejected as it is focusing in short term, being project-specific, profit-oriented and neglecting broader 'stakeholder' problems. This method of measurement only meets clients' objectives and goals without considering the nature of their business environment, structure of organization and level of technology employed. On the other hand, the SPM practice considers the three perspectives of the firm which are; stakeholders' entity where they take account on interest of customers and shareholders; it is a goal-oriented (profit centred) and as a system that is involved in resource garnering, conversion and exchange with environment. Chan and Chan (2004) explained on the development of Key Performance Indicator (KPI) to develop a benchmark for measuring the performance of a construction project. They further pointed out that there is no unanimous agreement reached as project success carries different meaning or objective to different people. The criteria of project success are constantly being improved by the researches.

Abdul Rashid *et al*., (2006) discussed on the different procurement systems available and the effect of the different procurement systems on the project performance. Generally the types of procurement system available are traditional system, design and build and management contracting. Speaking further, project procurement is an organized process or procedure for client to obtain or acquire construction product. It is defined as 'the degree of achievement of certain effort or undertaking which relates to prescribed goals or objective of project parameter. The ranges from traditional to many variation of 'fast-tracking' product. It is defined as 'the degree of achievement of certain effort or undertaking which relates to prescribed goals or objective of project parameter. The ranges from traditional to many variation of 'fast-tracking' system have brought changes to the process and procedure of project delivery and also the aspects of management and organization in term of role, responsibility and authority. The Traditional Procurement System has been identified as slowest project delivery approach and is more preferable as it provides better design and construction control by the client since the pre-contract stage is longer. For the cost, this system provides more price certainty to the client as the design and the complete working drawing is fully developed prior to tendering. In terms of quality, it provides high degree of

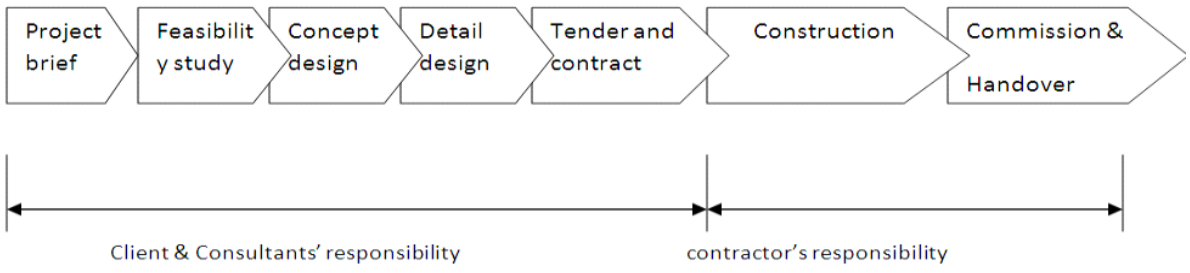

Fig. 1: The linear or sequential process of the Traditional Procurement System (Abdul Rashid *et al*., 2006)

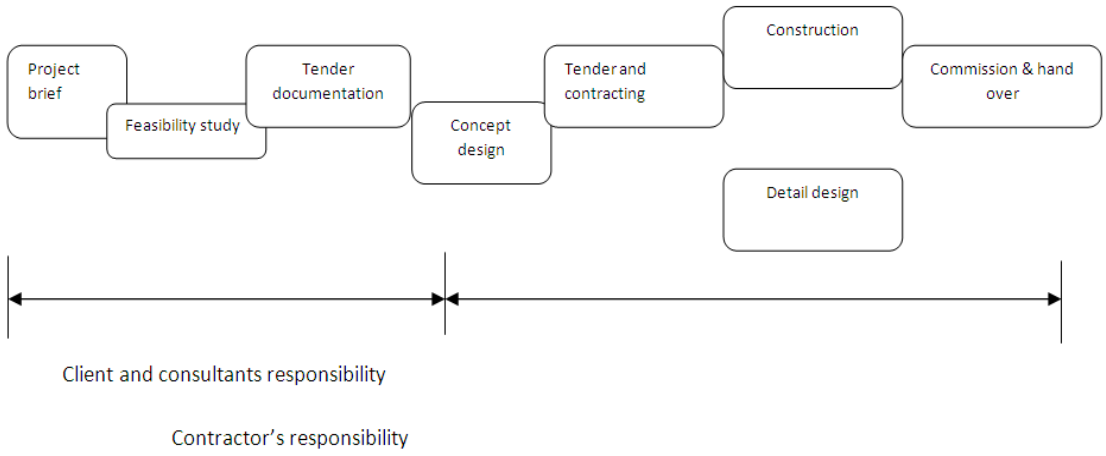

Fig. 2: The integrated process of project designing and construction in design and build procurement system (Abdul Rashid *et al*., 2006)

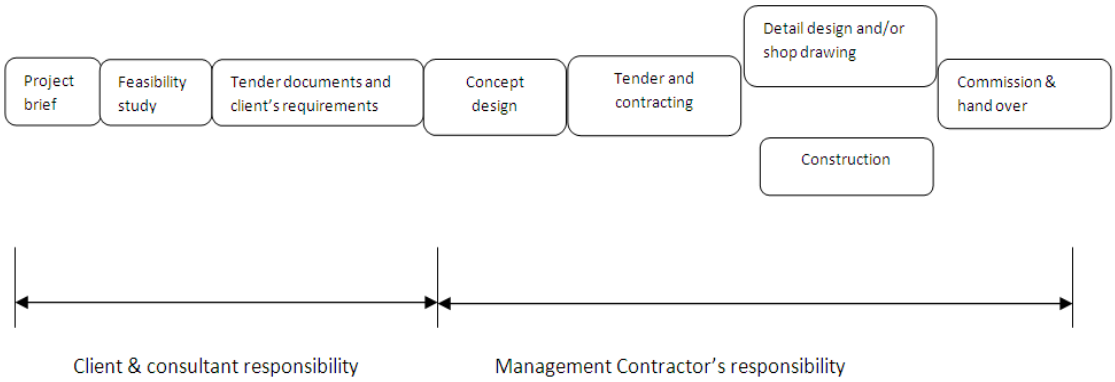

Fig. 3: The process of project designing and construction in the management contracting and professional construction management procurement system (Abdul Rashid *et al*., 2006)

quality and functional standard as it allow the building owner to combine best design management between contractors and consultant. For the Design and Build and Turnkey Procurement systems, it is a fast-tracking where design and construction are integrated. The detail design and construction run in parallel and concurrently with each other. For the cost, it is fixed at the tender stage and is subject to design changes. Cost saving may be made as contractor applies his knowledge to simplify both design and work. The quality is much compacted and there is coherent work program as contractor utilizes integration of design and construction knowledge. For Management Contracting and Professional Construction Management Systems, the time is shorter than other systems as it allows for more efficient and effective coordination of work, material, manpower and plants. The cost seems to be lower than in other systems as it is the sum of prices quoted by the package contractor. In terms of quality, it is more proficient and effective in ensuring high quality of works. Therefore, this information tells that all factors should be considered before selecting the most appropriate procurement system to meet the objective and target of the project. Figure 1, 2 and 3 show the simplified process for the three types of procurement system discussed herein.

Love and Holt (2000) in a research entitled thepropagation of rework benchmark metrics for construction aimed at developing a series of benchmark metrics for the causes and cots of rework. The research suggested that most organizations should learn to accept the rework as part of their operation as they have not realized the rework will affect the performance of a successful project. A case study approach was used to develop a series of benchmark metrics for the causes and cots of rework. The result was obtained from two construction projects which were done by same contractor but using different types of procurement methods. From the findings of both projects; on the design part, the rework occurs when the activities and materials order are

Table 1: List of criteria for measuring project performance based on past studies

	Previous study			
Criteria to measure project performance	Songer and Molenaar (1997)	Kumaraswamy and Thorpe (1996)	Lim and Mohammed (1999)	Chanand Chan (2004)
Cost/financial performance	√	√	√	√
Project duration	√	√	√	√
Quality	√	√	√	√
Client and project manager satisfaction	√		√	
User expectation and satisfaction	√		√	√
Friendliness of environment		√	√	√
Health and safety		√	√	√
Quality of workmanship	√	√		
Utility/ Functionality		√	√	
Meet specification	√			
Minimize construction aggravation	√			
Commercial profitable				√
Transfer of technology		√		
Speed of construction				√

not the same to the original contract which make it difficult for project to finish on expected time. On the construction side, one of the factors that cause rework is a simple mistake by the worker such as installing a door incorrectly. Lack of standardization during the painting, tilting and concrete placing also cause rework activities to overcome the poor quality of project. Recognizing the benchmark metrics for the cost of rework can be potential goal for the construction industry but there is a limitation application to the project types presented. An initial measure can be used as effectiveness benchmarks for comparing project as it provide useful comparative data which is important for client organization.

Othman (2006) in a research entitled Forging Main and Sub-Contractor Relationship for Successful projects' discussed on the coordination from all parties involved to achieve a successful construction project. Having a good connection and collaboration between the parties e.g. client, main contractor, sub contractor involved is the essential in order to accomplish the project objectives and avoid disputes escalate into legal actions. These can be achieved by having a good communication channels, instilling a paradigm shift in main contractor and sub-contractor relationship and a creation of good managing system.

Base on the literature review, each researcher has different perception and opinion on the evaluation of project performance in the construction industry. Table 1 shows list of criteria used by some researchers based on their perception of project performance evaluation.

METHODOLOGY

A literature review on the evaluation of project performance suggested a combined list of criteria used by clients when evaluating project performance (Kumaraswamy and Thorpe, 1996; Songer and Molenaar, 1997; Lim and Mohamed, 1999; Holt, 1997; Love and Holt, 2000; Chan and Chan, 2004; Othman, 2006; Abdul Rashid *et al*., 2006). Based on this review and information from Clients in Malaysian construction industry; a list of 11criteria were found to be significantly and substantially used in current practice to measure the performance of a construction project during construction as well as upon completion. In construction management researches, questionnaires are mostly used to collect factual and perceptive responses. Fellows and Liu (1997); Naoum (1998) and Enshassi *et al*. (2010) argued that the questionnaire is a widely used approach for descriptive and analytical surveys to find out the facts, opinions and views of respondents. A postal questionnaire was chosen for the survey in view of its relatively low cost and the fact that respondents are given sufficient time to complete the questionnaire to elicit well thought out responses. The development of the questionnaire is done in such a way that each question would be clearly phrased to avoid ambiguity and checked for expression, objectivity and relevance to the problem being investigated (Leedy, 1989; Foddy, 1993; Idrus, 2001). It was paramount that the perception of the clients obtained from this survey would be as representative as possible. The lists of the respondents were obtained from the directory of Real Estate and Housing Developers Association Malaysia (REHDA) and project managers in Public Works Department (JKR) of each state. The sample respondents were located in Peninsular Malaysia. The sample was selected using the systematic sampling procedure (Idrus, 2001). In this procedure, the Clients' list was arranged in alphabetical order and sampled at regular intervals after a random start. The sample interval is the ratio N/n where N and n represent the population and desired sample size respectively.

The size of samples is governed by factors such as (Idrus, 2001):

- The confidence level needed that the sampled data would be representative of the total population
- The margin of error that can be tolerated for any estimates of the population parameters from the sample i.e. the sampling error

- The time allocated for conducting the survey and the cost incurred.

However, sample size is also determined by the significance of the survey results to the research as a whole (Idrus, 2001). In order to address the objective of this paper, a minimum sample size of 30 (Idrus, 2001) was taken as the minimum set for the survey. Nevertheless, to allow for non-response, the sample size was increased to 90. The questionnaires were distributed to project performance decision makers working for clients' organizations within the Malaysian construction industry. In administering the questionnaires, respondents were asked to rate the level of importance of a list of criteria used by clients in current practice to measure the performance of a construction project during construction as well as upon completion in Malaysia. The rating was based on a 5-point Likert scale where 1 = Very Low, 2 = Low, 3 = Moderate, 4 = High and 5 = Very High.

RESULTS AND DISCUSSION

Of the original sample of questionnaires, 38(42%) were returned fully completed and the number exceeded the minimum specified above. Compared with other similar surveys in the areas of construction management, e.g., 21% by et al., Proverbs *et al*. (1999), 30-40% by Aibinu and Jagboro (2002), 27% by Idrus, (2001), the response rate obtained (42%) is considered to be good. The data collected from the survey were ordinal because the distances between any two numbers (ratings) assigned in the Likert scale are not known.

Company Information: Figure 4 shows the respondents' company business. Majority (45%) of the respondents' company businesses are residential projects while only 10% are infrastructure projects. This is because provision of infrastructure is solely the government's responsibility. Figure 5 shows respondents Company's experience in construction. 50% of the respondents' companies have more than 20 years experience in construction project. This indicates that the companies have sound knowledge of dealing with project performance. Figure 6 shows Respondents Company's turnover. From the respondents' information, 97% of the respondents' companies have turnover of more than RM 500,000. This indicates that most of these companies have been involved in mega projects in Malaysia.

Respondents' information: Figure 7 shows the various designations of the respondents in their respective organizations. 50% of the respondents are project manager and these are professionals who are highly experienced in dealing with project performance evaluation. This adds validity to the responses obtained in this survey. Figure 8 shows the experience of

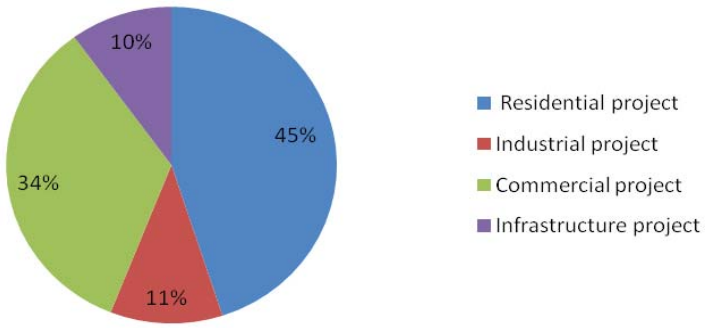

Fig. 4: Respondents' company business

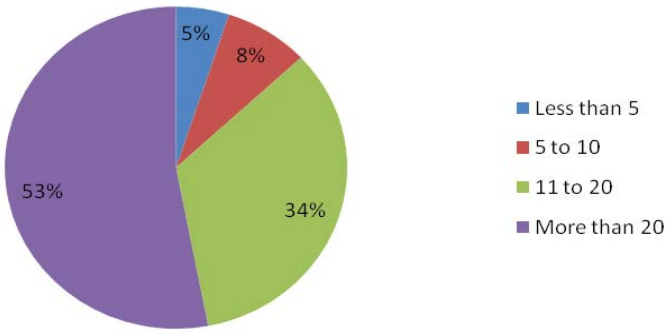

Fig. 5: Respondents company's experience in construction

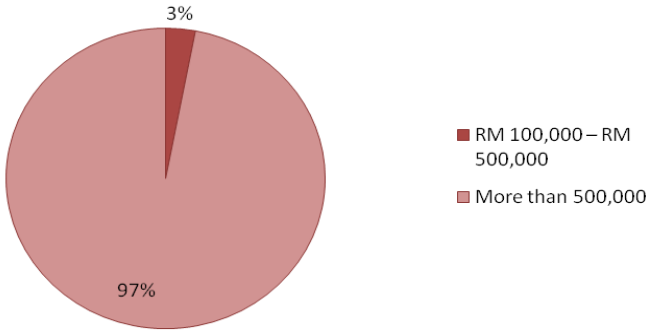

Fig. 6: Respondents company's Turnover

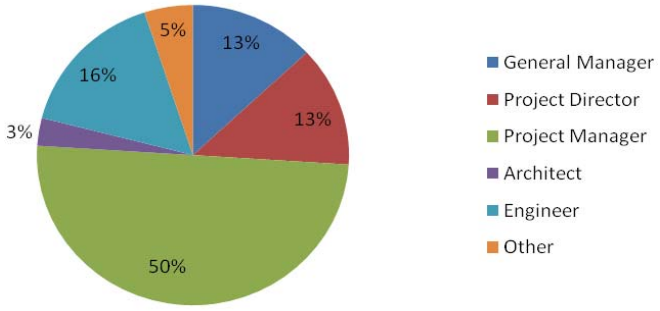

Fig. 7: Respondent's designation

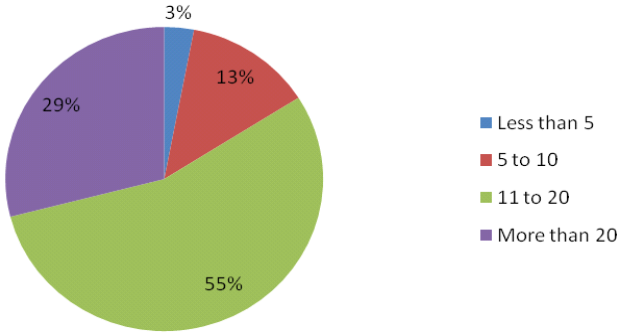

Fig. 8: Respondents' experience in construction

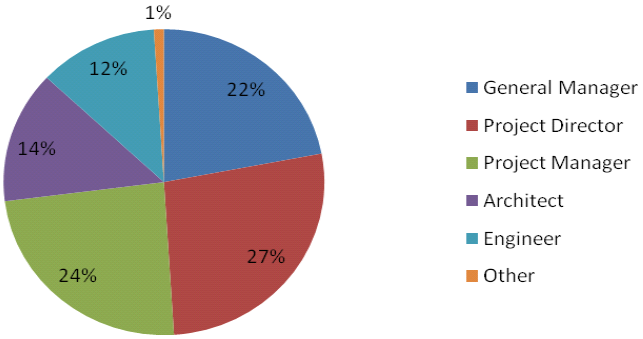

Fig. 9: Composition of project performance decision makers

Table 2: Ranking based on mean and variance analyses

	Analysis			
Contractor performance criteria	Mean	Ranking	Variance	Ranking
Construction cost	4.60526	2	0.40754	4
Construction time	4.50000	3	0.47297	6
Quality of finished project	4.63158	1	0.23898	1
Occupational health and safety	3.92105	5	0.45306	5
Level of technology	3.39474	11	0.62376	10
Environment friendliness	3.65789	9	0.55548	8
Construction flexibility	3.65789	9	0.50142	7
Labour dependency	3.89474	6	0.74538	11
Quality of coordination by construction team	4.18421	4	0.37055	3
Contractor's project management	3.76316	7	0.56401	9
Contractor's capacity of manpower	3.73684	8	0.36131	2

respondents in construction. Over 80% of the respondents have over 10 years working experiences. Their high level of experience is considered valuable for this study. Figure 9 shows the composition of project performance decision makers. Project directors have the highest proportion of project performance decision makers (27%) followed closely by project managers (24%) and general managers (22%). Considering the expertise of these respondents and their perception of project performance evaluation, the validity of the findings in this survey cannot be questioned.

Analysis using mean and variance: Analysis using mean and variance is one of the methods used to determine the level of importance for each criterion. The higher the mean value, the higher the importance level of criteria. The same concept was applied for the variance but the results indicate an inverse proportion in the sense that a higher variance value signifies that the criteria has a lower level of importance. Based on the results, the author was able to come up with a comparison based on both analyses. The ranking results to determine the level of importance for each criterion were not equal and it is represented in Table 2. The results concluded that the mean and variance methods cannot be applied as the results are not equal and consistent in both analyses. Further method of analysis should be applied in order to come out with more accurate results based on ordinal nature of the data obtained from the survey. The use of parametric statistics (means, standard deviations, variance etc.) to analyze such data would not produce meaningful results and non-parametric procedures should therefore be adopted (Siegel, 1956; Siegel and Castellan, 1988 and Johnson and Bhattacharyya, 1996). The non-parametric procedures adopted for this study were frequency and severity index analyses.

Analysis using severity index: Relative index ranking technique is a non-parametric technique widely used by construction management researchers for analysing structured questionnaire response data involving ordinal measurement of attitudes (Olomolaiye *et al*., 1987; Holt, 1997; Idrus, 2001; Egemenn and Mohamed, 2006). One form of this technique is the severity index analysis (Elhag and Boussabaine, 1999; Al-Hammad, 2000; Ballal, 2000) which uses weighted percentage scores to compare the relative importance of the criteria under study. The frequency analysis was first carried out to determine the frequency of responses which were then used to calculate severity indices by means of the formula:

$$\text{Severity Index (I)} = [\sum a_i \,.\, x_i] \,/\, [\, 5 \sum x_i \,] \times 100\%$$

x_i = variable expressing the frequency of the response for i
i = 1, 2, 3, 4, 5 as illustrated below
x5 = frequency of the 'very high extend' response and corresponding to a5 = 5
x4 = frequency of the 'high' response and corresponding to a4 = 4
x3 = frequency of the 'moderate' response and corresponding to a3 = 3
x2 = frequency of the 'low' response and corresponding to a2 = 2
x1 = frequency of the 'very low, response and corresponding to a1 = 1

The Severity Index would enable the author to prioritize the criteria in the study. Criteria with highest severity index (%) will be ranked topmost while criteria with the least severity index (%) will be ranked at the bottom. The five-point scale was transformed to relative importance indices for each criterion, using the above method to obtain the ranks of the different criteria. These ranking enabled the researcher to cross-compare the relative importance of the criteria as perceived by the respondents. However, the mean and standard deviation of each individual criterion are not appropriate statistics to evaluate the overall rankings because they do not reflect any relationship between them. As such, all the numerical scores of the identified criteria were transformed to severity indices (in percentages) to determine the relative ranking of the criteria.

From the results obtained in Tables 3 and 4 and Fig. 10, the three most important criteria for evaluating

Table 3: Analysis of project performance criteria using severity index method

Variable (frequency of response) description	1 Very low	2 low	3 Moderate	4 High	5 Very high	Total	Mean	Category (based on (Abd Madjid and McCaffer, 1998)	Severity index for ranking (%) (based on Abdulmohsen Al Hammad and Sadi Assaf, 1996)	Ranking
Construction cost	0	0	3	9	26	38	3.6053	Very high	90.1315790	2
Construction time	0	0	4	11	23	38	3.5000	Very high	87.5000000	3
Quality of finish project	0	0	0	14	24	38	3.6316	High	90.7894737	1
Occupational health and safety	0	0	10	21	7	38	2.9211	High	73.0263158	5
Level of technology	1	4	12	21	0	38	2.3947	High	59.8684211	11
Environment friendliness	0	2	13	19	4	38	2.6579	High	66.4473684	9
Contractor'sflexibility	0	2	12	21	3	38	2.6579	High	66.4473684	9
Labour dependency	0	3	7	19	9	38	2.8947	High	72.3684211	6
Quality of coordination by construction team	0	0	4	23	11	38	3.1842	Very high	79.6052632	4
Contractor's project management	0	2	10	21	5	38	2.7632	high	69.0789474	7
Contractor's capacity of manpower	0	0	13	23	2	38	2.7105	High	67.7631579	8
Total	1	13	88	202	114					
Mean	0.09091	1.18	8	18.36	10.3636					
Variance	0.09091	2.16	21.2	23.25	90.4545					

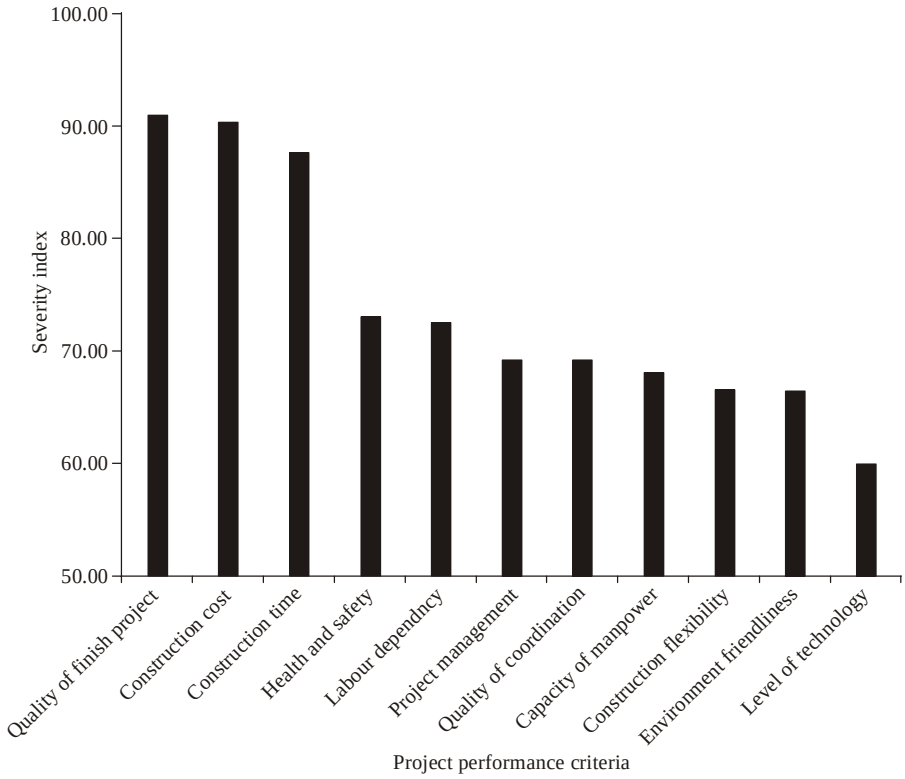

Fig. 10: Severity index of contractor performance in construction

project performance from current practice in Malaysia are Quality of finished project (90.89%), Construction cost (90.13%) and Construction time (87.50%). Construction quality is defined as the ability of completed projects and processes to conform to established requirements of the client and the end-users and these requirements are established characteristic of the product, processes and services as specified in the contractual agreement (Willis and Willis, 1996). Quality of the completed project is an important factor in meeting clients' and end-users' satisfaction. Poor quality of the completed projects is one of the reasons causing high clients' and end-users' dissatisfaction with completed building projects. In order to satisfy clients and end-users, the quality of the

Table 4: Summary level of importance for project performance criteria

Description	Severity index (%)	Ranking
Quality of finish project	90.79	1
Construction cost	90.14	2
Construction time	87.50	3
Occupational health and safety	73.03	4
Labour dependency	72.37	5
Contractor's project management	69.08	6
Quality of coordination by construction team	69.08	6
Contractor's capacity of manpower	67.76	8
Construction flexibility	66.45	9
Environment friendliness	66.45	9
Level of technology	59.87	11

completed project must meet their expectations. The level of their satisfaction is an indicator of project success. End-users are those who work, live or spend most of their time in completed facility. It is important that the completed project meets the end-users expectations and satisfaction as well.

Construction cost is another important measure of project performance and determinant of client satisfaction. Clients generally prefer projects that would be completed on time, within budget and of the desired quality. Cost is defined as the degree to which the general conditions promote the completion of a project within the estimated budget (Bubshait and Almohawis, 1994). It is the overall cost expended on a project from inception to completion, which includes any costs that arise due to variations, modification during construction period and the cost arising from the legal claims, such as litigation and arbitration. Ali and Kamaruzzaman (2010) pointed out that cost is one the critical factors closely monitored by clients throughout the project management life cycle and it is being regarded as one of the most critical parameters of a project and the driving force of project success. What clients fear most is cost overrun; it is a common occurrence and most projects in Malaysian construction industry face this problem. It occurs when the final cost of the project exceeds the original estimated cost. it is mostly caused by inaccurate or poor estimation of original cost, inflation of project costs, fluctuation in price of raw materials, construction cost under estimation, poor project management, unforeseen site conditions, mistake in design among others (Ali and Kamaruzzaman, 2010).

Construction time refers to the duration for completing the project. It is scheduled to enable the completed facility to be used by a date determined by the client's future plans (Hatush and Skitmore, 1997). The effectiveness of a project measures the extent to which targets of time and cost were met from the inception to completion. Chan (1997) defined construction time as the absolute time that is calculated as the number of days/weeks from start on site to practical completion of the project. The unique nature of construction projects is one of the main reasons why most construction projects suffer delay which cause overruns to the project completion date. It is important for all the parties involved to be adequately prepared to ensure proper contract compliance and the quick award of the appropriate extensions of time. Proper management of construction time helps to avert claims for extension of time and liquidated and ascertained damages (LAD). Completing construction projects on time is an indication of efficiency though the construction process is subject to many unpredictable factors, which result from many sources. These sources include the performance of parties, resources availability, environmental conditions, involvement of other parties, and contractual relations. However, it rarely happens that a construction project is completed within the specified time.

CONCLUSION

The dynamic nature of the construction industry makes the concept of project success to remain ambiguously defined in the Malaysian construction industry. The objective of every project is success and project success is an off shoot of project performance. Identifying the performance measurement criteria as well as knowing the level of importance for each of the criterion is important to achieve the most favourable and desired outcome for both clients and contractors. The results of this paper show that Quality of finished project, Construction cost and Construction time were the three most important criteria considered crucial by the respondents for evaluating project performance from current practice in Malaysia. The paper would help clients in the Malaysian construction industry to understand which criteria, in their order of priority, should be given more attention that would lead to successful completion of the project. The paper provides supportive practical solution for project performance decision makers working for clients' organizations within the Malaysian construction industry to enhance and improve their practices in measuring project performance so that their clients would enjoy higher satisfaction levels from their projects. More so, the paper would serve as a guide to contractors by helping them to understand that Quality of finished project, Construction cost and Construction time are the criteria given high priority by clients in measuring the performance of a construction project.

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