PERFORMANCE MEASUREMENT OF PLATFORM CONTRACTORS BY A GAS EXPLORATION COMPANY

By
SUPANEE PHATTANANURACH

A Final Report of the Six-Credit Course
SCM 2202 Graduate Project

Submitted in Partial Fulfillment of the Requirements for the Degree of
MASTER OF SCIENCE IN SUPPLY CHAIN MANAGEMENT

Martin de Tours School of Management
Assumption University
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Master of Science in Supply Chain Management

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Declaration of Authorship Form

I, Supanee Phattananurach

declare that this thesis/project and the work presented in it are my own and have been generated by me as the result of my own original research.

Title of project: PERFORMANCE MEASUREMENT OF PLATFORM CONTRACTORS BY A GAS EXPLORATION COMPANY

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ABSTRACT

In making decisions about whether or not to repeat the award of a contract to an existing contractor, this oil and gas exploration company needs to review a contractor's overall performance. To achieve this, an objective Contractor Performance Measurement framework is a prerequisite, as the company must identify what they need to measure. Without any existing implementation of contractor performance measurement, it will be difficult for the company to compare the performance between all existing contractors, and it will be unable to identify the differences in strengths and weaknesses of those existing contractors. Hence, to accomplish the end result of having projects done with the least cost, in the shortest time and with the best quality, contractor performance must be properly monitored and measured.

In this research, the importance of contractor performance measurement criteria is examined through a questionnaire survey of engineers in the construction department of this Oil and Gas Company. The results of the questionnaire survey are used to develop a contractor performance measurement framework and a contractor performance measurement form suitable for use in the company under study; by ranking the relative importance index of the main factor and sub-factors. Then, the relative importance index of each main factor and its corresponding sub-factors are used as an importance score, which when combined with a weighted score produce a Contractor Performance Score. From the research, health and safety was found to be the most important criterion, followed by quality of work, timeliness of performance, cost control, commitment to company's satisfaction, management effectiveness, contractor's responsiveness, and management of subcontractors. After that, the aggregate of each sub-factor was calculated, and difference levels of performance among contractors were found. Through this analytical framework, Contractor Performance Measurement scores can be computed which would help the construction team to recognize and compare the performance of existing contractors more clearly.

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I would like to show my sincere gratitude to all those who made this graduate project possible. First of all, one of the most important tasks in every good study is critical evaluation and feedback, which was performed by my advisor, Asst. Prof Dr. Nucharee Supatn. I am very thankful to my advisor for investing her precious time to discuss and criticize this study, and to explain how to think when it comes to problems. All this, made the tasks very interesting and challenging, and also provided me the opportunity to remove any flaws and weaknesses.

I appreciate the efforts of all the senior management and colleagues of the firm under study. They so openly and warmly welcomed me to discussions about my project, and completed the questionnaires on time.

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Supanee Phattananurach
Assumption University
January, 2011

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LIST OF ABBREVIATIONS

RII The Relative Importance Index

RMF Relative Importance Index of Main Factor

RSF Relative Importance Index of Sub-Factor

PI Performance Index

CHAPTER I

GENERALITIES OF THE STUDY

There has been widespread recognition of the term "Supply chain management" (SCM) since the 1980s (Harland, 1996), and is defined as the management of an entire chain, starting from the raw materials supply, then transformation into integrated goods and final products, before being distributed to the ultimate customers (Govindan , Kannan, & Haq, 2009).

Supply Chain Management (SCM) has provoked rethinking of old habits, and led to the improvement of traditional manufacturing practices. Following the success of SCM in manufacturing, construction industries have tried to utilize the concept and its methodology with a view to achieving similar success. Although the concept has been embraced elsewhere, SCM has been slower in being employed in the construction industry (Akintoye, Mcintosh, & Fitzgerald, 2000). This could, perhaps, be due to the unique context in which SCM collaboration must be applied (Akintoye, et al., 2000).

However, it is possible to apply the concept of a supply chain to the description of Construction SCM according to the definition of a supply chain by Christopher (1992) who states that it is "the network of organizations that are involved, through upstream and downstream linkages, in the different processes and activities that produce value in the form of products and in the hand of ultimate customer". It has been proved that other industries, automotive and offshore, are able to gain benefits by applying SCM. Therefore, the construction industry is encouraged to do so as well (Fernie, Root, & Thorpe, 2000).

Construction is mostly customer driven because it is the client who takes the initiative to start the construction project. Akintoye, et al. (2000) stated that SCM within the construction industry can be divided into upstream and downstream. The upstream consists of the activities and tasks leading to preparation of the production on site

involving the main contractor who has the full responsibility for its completion and has a contract with the construction/design's client team. The downstream consists of the activities and tasks in the delivery of construction products involving construction suppliers, subcontractor and specialist contractors in relation to the main contractor.

Xiao and Proverb (2003) stated that a contractor is responsible for converting design into practical reality. Thus one of the critical factors that influences the success or failure of any construction project is Contractor Performance. Monitoring and controlling contractor performance on a regular basis can facilitate the reduction of undesirable shortfalls troubles because these can be identified and rectified prior to further losses or delays (Ng, Palaneeswaran, & Kumaraswamy, 2002). Consequently, the improvement of contractor performance leads to enlarged client satisfaction (Xiao & Proverb, 2003; Aje, Odusami, & Ogunsemi, 2009). Smallwood (1998) declared that the traditional project performance measurement that clients frequently used are Cost, Quality and Time. Furthermore, other factors that clients should also be concerned with in evaluating contractor performance are safety, health and environment (SHE) and project management of contractor/client relationships, as these non-traditional factor can affect cost, quality and time (Smallwood, 1998).

1.1 Background of the Study

Regarding the current situation of the world energy market, the requirement of natural energy by every country has expanded rapidly over the last 100 years. This has led to large increases of crude oil price, with an anticipated upward trend in future prices. However, referring to British Petroleum's Statistical Review of World Energy – June 2010, the daily production rate of crude oil in Thailand in year 2009 was 13.6 million tonnes per day whilst the consumption rate was 44.2 million tonnes per day. For natural gas, Thailand was able to produce 27.8 million tonnes oil equivalent per day with a consumption rate of 35.3 million tonnes oil equivalent. Because of the disparity between these production and consumption rates, the Thai government has issued a policy to promote the use of natural gas in its power plants and in the country's industry sector as well as the use of natural gas for vehicles (NGV), which will lower

the import level of crude oil since the amount of proved reserves of natural gas in Thailand is large compared to proved reserves of crude oil.

To increase the production rate of natural gas to fulfill the requirement of natural gas consumption of the country, oil and gas exploration and production companies, both Thai and foreign companies, need to construct and install a large number of natural gas production platforms, oil platforms, and pipelines in the Gulf of Thailand. Company "XYZ" is one of the oil and gas exploration and production companies in Thailand. The company was established in 1985. It has obtained concessions to explore and produce natural gas in several gas field located in the Gulf of Thailand. Apart from that, the company also expanded its investment oversea projects. With the increase in the amount of natural gas which the company was obliged to supply to its main client, the company's mother company, a number of new platforms is required every year to boost the production rate. For that reason, Company XYZ has to establish contracts with its contractors to construct and install platforms continually.

1.2 Statement of Problem

The aforementioned, Company XYZ has to negotiate a number of contracts with its contractors to construct and install new platforms in the Gulf of Thailand every year. Currently, there are three contractors in Thailand that XYZ has contracts with for constructing and installing platforms in the Gulf of Thailand. The cost of a platform is approximately 25 Million US dollars (MMUSD), on average, for a 1,200 tonnes platform. Company XYZ normally awards the contract to a contractor which is selected by a bidding process, to construct, transport, and install three to four platforms per contract. Subsequently the company has to enter into two-year contracts for 80 to 100 Million USD to construct three platforms for the construction phase.

Table 1.1: Historical data of platform construction contracts that Company XYZ has entered into during 2007 to 2009

Project Name	Contract Amount (USD)	No. of platform
Project 1	60,300,000	2
Project 2	85,000,000	3
Project 3	128,000,000	5
Project 4	90,024,445	3
Project 5	89,000,422	3
Project 6	90,453,600	3
Project 7	100,760,000	4
Total Amount	**643,538,467**	**23**

Source: Company XYZ's data

From Table 1.1, during the past 3 years, Company XYZ has spent about 643,538,467 USD to construct 23 platforms in the Gulf of Thailand. This can be considered as a huge expenditure by the company. Nonetheless, the problems that the company has repeatedly found concern the performance of conducting the construction work by its contractors.

The problem of the delay in construction is the most common for the company. Most of the time, the company's contractors are not able to finish their work or install platforms on time. This leads to the problem of project delay and budget overrun. Since the company has to maintain its resources, e.g. workforce, supply barges, drilling rigs, other contractors' personnel/tasks, the tardiness in time caused by the delay will create some extra costs to the company.

Quality of work is another problem found in the construction contracts. Company XYZ's contractors, every so often; carry out their works with levels of quality which do not meet project requirements. For example, at the beginning of a project, the company will give its contractor the specifications of materials to be purchased. But the contractor may not be able to purchase the materials that meet the company's requirement hence it finds substitute materials instead. The substitute materials may not prove that their quality is the same as the company's requirements.

There are other problems apart from the two main problems mentioned above, such as low-level responsibility of work by contractors, and low-level of ability to solve problems. These all lead to delay in the project schedule and extra cost incurred by the company. And with the high value of platform construction contracts, the delay and cost incurred are considered as having massive impacts on the company. Even though the problems occurred repeatedly, Company XYZ lacks a systematic contractor's performance appraisal tool to evaluate contractors' performance after the contracts is completed. Therefore, the contractors with low-level performance were awarded with repeat contracts. The current in-use performance appraisal is conducted in an ad-hoc manner and is unable to properly identify the performance level of each contractor. The company has no database or sufficient information of past performance to be incorporated into the contractor selection process. This setback will occur again and again, if those same contractors are contracted in future projects.

Therefore the research problem of this study is:

"What are the main criteria that affect contractor's performance and how to evaluate performance of existing platform construction contractors in order to be a reference for future project?"

1.3 Research Objectives

This research is aimed to attain two objectives which are as follows:

1. To determine the relevant performance measurement criteria
2. To develop a performance measurement system for platform construction contractors of Company XYZ.

1.4 Scope of the research

The aim of this research is to investigate the critical factors which are important in measuring contractors' performance from a client's perspective, and to measure

performance of three existing platform construction contractors which have been awarded contracts by Company XYZ during 2007 to 2009.

1.5 Significance of the research

This research will benefit the construction team who responsible for operating future projects. Contractor performance evaluation will be systematized ensuring that the appraisal result is accurate and reliable. The evaluation result can be used as the reference to assist the construction team to recognize strengths and weaknesses of existing contractors. The performance score of each contractor will be identified which can also be used as supplemental information for contractor selection during the bidding process. Lastly, if, in the future, there is an increase in the number of potential wellhead platform construction contractors, the performance evaluation form resulting from this research can also be applied to those new contractors.

1.6 Definition of terms

Contractor: A firm that is in contract with the owner for the construction of a project.

Offshore: The geographic area that lies seaward of the coastline.

Platform: An immobile offshore structure from which development wells are drilled and brought into production.

Cost overrun: The actual cost that exceeds the estimated cost in completion of a product.

Specification: The documents that present the requirement of the owner, through the design team/consultant to the construction contractor, for completion of the job under budget, quality and time specifications as stated in contract.

Schedule delay: The duration of project completion which takes far longer than the project planned schedule (Chan and Kumaraswamy, 1996).

Quality of work: Requirements of owner/designer and regulatory agencies which contractors have to comply with (Arditi and Gunaydin, 1997).

Health and Safety Management: Systematized procedures for identifying workplace hazards and also training of personnel in accident prevention, accident response, and emergency preparedness.

Contractor responsiveness: The ability to complete and identify the quality of problem-solving and suitability of action plans.

Management effectiveness: The ability of a contractor in assessing the integration and coordination of all activities the client needs in order to execute the contract.

Cost control: The effectiveness of a contractor in controlling, predicting and managing the contract budget.

Discipline Engineer: An engineer from a specific engineering background working in different positions in a construction project team, i.e. process engineer, mechanical engineer, electrical engineer, instrument engineer, pipeline engineer, and structural engineer.

CHAPTER II

REVIEW OF RELATED LITERATURE

Critical factors that affect a contractor's performance in platform construction are reviewed in this chapter. The content of the chapter can be categorized into three parts. The meaning and the importance of performance measurement are focused in the first part. In the second part, the researcher presents the theory and concept of the performance measurement criteria, which are health and safety, quality of work, cost control, timeliness of performance, management effectiveness, management of subcontractor, contractor's responsiveness and commitment to the company's satisfaction: all are important in measuring a contractor's performance. All performance evaluation criteria are then summarized, and the conceptual framework is proposed in the last part of the chapter.

2.1 Performance Measurement

Performance Measurement is defined as the process of quantifying the efficiency and effectiveness of action (Neely, Mills, Platts, Gregory, and Richards, 1996). Nassar (2009) has defined contractor performance as the capability of contractors that delivers the quality of projects to clients. Beausoliel (2010) stated that obtaining the information of previous performance for use in source selection is the purpose in measuring contractor performance. The result of the evaluation can be used in future award decisions and also provoke the contractor to improve its performance. In addition, past performance data can be used to predict contractor future performance (Straight, 1999). Currently, delivering the end-results to client is not adequate in measuring contractors' performance; all aspects of contract execution should be included in measuring as well. Contractors' performance measurement should be executed after the job is completed and should be applied to contracts of more than one year duration.

The traditional performance measurement criteria are based on quality of product or service, timeliness, cost control and business relations (Eriksson and Westerberg, 2010). The first three assessments are concerned with how well the contractor compiled with the specific contractual requirement .For business relationship, it relates to the working relationship between the contractor and the client's team, and the management by a contractor in delivering products or services. Each assessment factor contains specific element, as in the following details:

Quality of works and services: This assessment includes a contractor's performances that complies with contractual specifications and also provides good workmanship.

Timeliness: This assessment is of the reliability of a contractor in adherence to contract schedules such as milestones or providing reports on time as required.

Cost control: The third measurement is concerned with a contractor's performance regarding forecasting cost, controlling costs, submitting reasonable prices regarding proposed changes, and providing accurate and complete billings.

Business relations: This assessment is about the contractors' management relationship and practices, that include both the external relations between contractor and client and internal relations between theirs owns staff and subcontractors.

Without an appropriate method to measure contractors' performance, clients may risk selecting an unqualified firm. Thus, monitoring and controlling of contractors' performance should be performed on a regular basis in order to evade any undesirables and to enable identification and rectification of harm without further losses or delays. The reliable data of a past contractor's performance would be helpful for decision making in selecting a proper contractor in future project. Moreover, documenting and archiving performance data could be useful for future reference, such as for settling disputes on claims, and in maintenance and repair works. However, in order to collect, analyze and manage the performance appraisal report effectively, the performance related data should be acquired from various sources,

such as persons' involvement in a project's team (including engineers, manager, consultants, contractors, subcontractors) to ensure that all contractor's performance is reported correctly and dynamically (Ng et al., 2002).The more accurate the past performance information, the more practical the information will be when applied to further project decisions (Beausoliel, 2010).

2.2 Contractor Performance Evaluation Criteria

Assaf, Al-Hammad, and Ubaid (1996) studied factors that affect a contractors' performance, based on a study of Royal Commission Project in the Eastern Province of Saudi Arabia. The respondents were 36 Saudi and joint venture firms. The research was conducted by collecting evaluation reports of contractors' performance after finishing the project, and the researcher had also developed a questionnaire together with a scoring system, and analyzed the data by using a multiple regression model. The data was gathered by interviews and discussion with the project owner and contractors' representative in order to elicit the relative importance factors that affect contractors' performance.

From Table 2.1, it was found that field inspection and supervision, planning and scheduling and contractor quality of work, were important as the first three issues of contractor performance measurement. Assaf, et al. (1996) explained the term of field inspection and supervision as being a contractor's response in inspection of the operating work; thus, a contractor should have a qualified control team with primary responsibilities in verifying and ensuring that all work meets the owner requirement in order to eliminate additional cost due to re-work activities. Accurate planning and scheduling by av contractor can indicate their performance, showing how well systematized and professional they are. Qualified workmanship and materials are important in measuring performance because if the workmanship and materials are unqualified, the overall quality of work will be unsatisfactory (Assaf, et al., 1996).

Table 2.1 Performance measure ranking

Rank	Performance measure	Importance index (%)
1	Field inspection and supervision	95.65
2	Planning and scheduling	89.71
3	Contractor quality of work	88.23
4	Material procurement and logistics	86.76
5	Knowledge of contract requirement	83.82
6	Availability of needed manpower	77.94
7	Home office support	77.94
8	Safety and regulations	77.94
9	Material procurement and logistics	77.94
10	Management co-operation with project supervisors	75.00
11	Management of subcontractors	67.65
12	Processing changes	61.76
13	Preparing shop drawings	52.94
14	Preparing as-built, O-and-M manuals	44.12

Source: Assaf et al. (1996)

Enshassi, Mohamed, and Abushaban (2009) researched the perception of owners, contractors and consultants towards factors affecting construction projects in the Gaza Strip, Palestine, by using a questionnaire survey. 120 questionnaires were distributed to owners (25), consultants (35) and contractors (60). 88 questionnaires were returned, which is an overall return rate equal to 73%. The respondents were experienced construction project managers, site engineers/office engineers, and organization managers. The respondents were requested to specify the level of importance by using a five-point Likert scale (1 = not important and 5 = extremely important). These were composed of 10 factors and 63 sub factors (see Appendix A).

Table 2.2 Summary of relative importance index and its rank

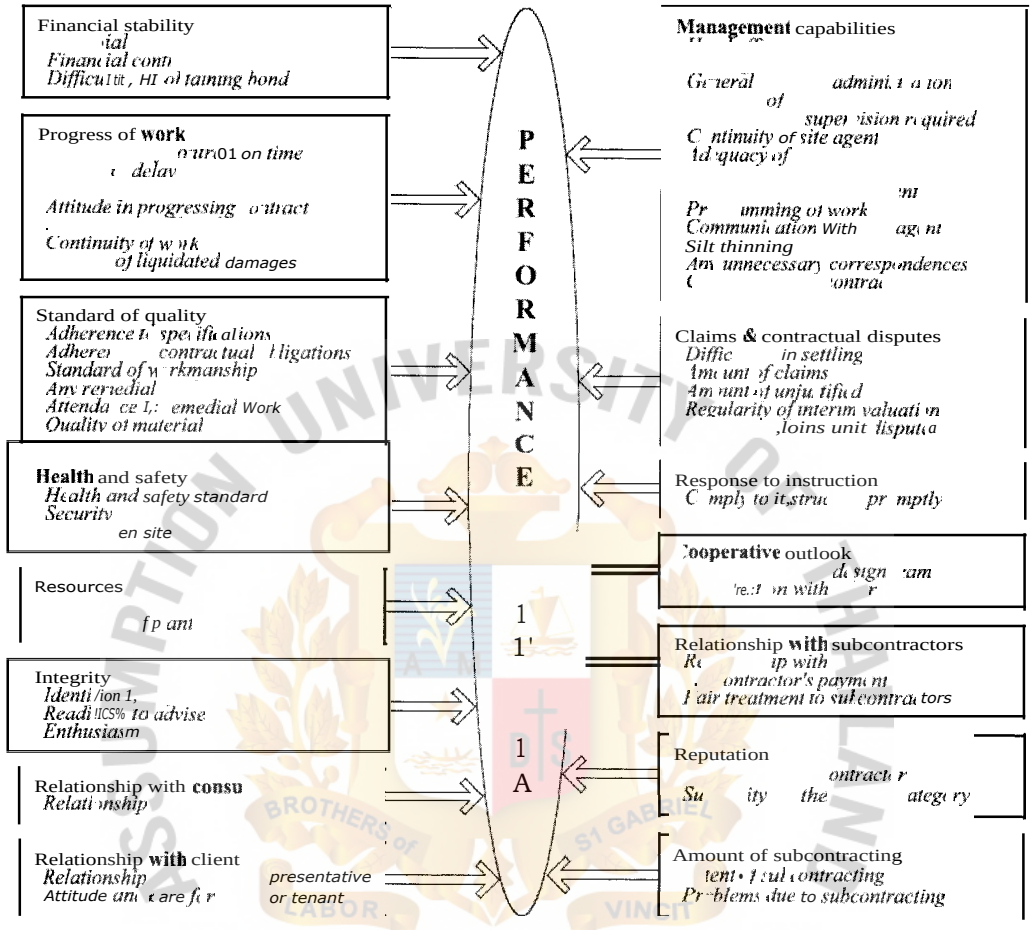
Performance groups	Owner		Consultant		Contractor	
	Relative importance index	Rank	Relative importance index	Rank	Relative importance index	Rank
Cost	0.679	8	0.724	5	0.726	7
Time	0.753	4	0.757	3	0.769	5
Quality	0.792	2	0.787	1	0.794	3
Productivity	0.736	5	0.718	6	0.747	6
Client satisfaction	0.734	6	0.765	2	0.779	4
Regular and community satisfaction	0.668	9	0.680	9	0.646	10
People	0.759	3	0.712	7	0.812	1
Health and safety	0.698	7	0.686	8	0.699	8
Innovation and learning	0.821	1	0.744	4	0.804	2
Environment	0.629	10	0.586	10	0.66	9

Source: Enshassi et al. (2009)

As indicated in Table 2.2, Innovation and learning was the most important group for owners because learning from experience and training the human resources with skills required by the project, strongly affects project performance (Enshassi et al., 2009). The people group was the most important for contractors, because qualified workers could lead to success in construction projects in terms of diminishing cost, increased productivity and the job completed on time. Quality is the most important factor that affects construction projects for consultants, as consultants observed that quality of equipment and raw materials in a project, and availability of personnel with high qualifications, strongly affect the quality performance of a project (Enshassi et al., 2009).

Ng, et al. (2002) suggested that firms should monitor the contractors' performance as a standard basic necessity in order to avoid further failure or delays .The researcher studied the e-reporting system for contractors' performance appraisal and identified the influence factors and sub-factors, as shown in Figure 2.1

Figure 2.1 Performance criteria and their sub-criteria



Source: Ng et al. (2002)

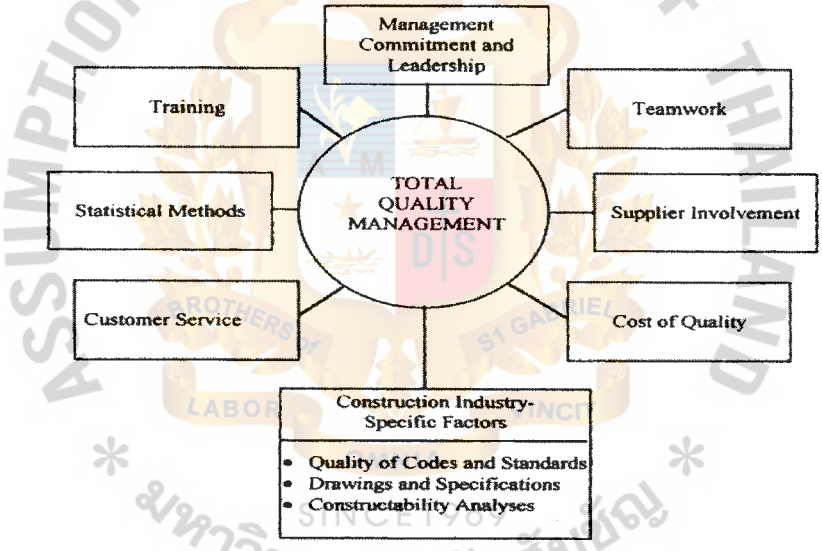
Straight (1999) declared that type of performance information should include the standards of good workmanship and a contractor's record of conforming to specifications, restrictions and estimation costs in any previously performed cost-reimbursement contracts, adherence to contract schedules, reasonable and cooperative behavior, commitment to customer satisfaction, and business-like concern for the customer's interest.

2.2.1 Quality of Work

Arditi and Gunaydin (1997) defined quality as a requirement of the owner/designer and regulatory agencies which contractors have to compile with. Requirements can be declared in the conditions required of end results, or in a detailed description of what

is to be done, and it can be common or complicated also. However, quality is obtained if the stated requirement is adequate and if the project complies with the terms in the contract. Concepts of "quality" are critical to the construction industry especially in the competitive world today. Because there is not much time or resource to waste and also re-do activities, and delays are unacceptable, the principle of total quality management has been applied in the construction industry (Arditi and Gunaydin, 1997).The researcher indicated factors that affected total quality management, as in Figure 2.2

Figure 2.2 Elements of total quality management in construction process



Source: Arditi & Gunaydin. (1997)

Xiao and Proverbs (2002) had researched contractor performance in three different countries (Japan, UK and USA) by comparing and evaluating contractor quality performance. Several quality criteria had been applied in the research, including defects in finished products, client satisfaction, defect liability periods and time called upon during defect liability periods. Butcher and Sheehan (2009) explored the concept that most construction customers desire zero defect at the handover point. As a contractor is responsible for completing the job, therefore quality of work is an important factor in measuring performance. Unqualified contractor's staff and bad

quality of materials can lead to diminished customer satisfaction. Thus, certifying a contractor's conformation to the standard can lead to improved contractor performance by using quality control (Assaf et al., 1996).

2.2.2 Commitment to the Company's Satisfaction

Garbarino and Johnson (1999) defined commitment as an enduring desire to maintain a valued relationship. Straight (1999) stated that in measuring the performance of a contractor, the adherence to contract requirements should be balanced by the satisfaction of the client.

2.2.3 Timeliness of Performance

As construction in large industrial projects involves multifaceted procedure, thus, accuracy in scheduling project activities is the vital factor to avoid delay during the construction phase (Wickramatillake, Koh, Gunasekaran and Arunachalam, 2007). Due to the economic implication, the critical factor that affects both clients and contractors is construction time. Hence, delays lead to a rising in construction cost and diminishing quality, therefore, contractor should maintain a stable, well-trained qualified workmanship and establish long-term relationships with their subcontractors (Xiao and Proverbs, 2003). According to Xiao and Proverbs (2002) completing the project on time can be used to measure contractor performances, which reflects the ability in organizing the project. Xiao and Proverbs (2002) had researched contractor performance in three different countries (Japan, UK and USA) by comparing and evaluating contractor time performance based on a questionnaire survey. Questionnaires were distributed to contractors of the Building Contractors Society in Japan, UK and USA, then using Anova technique to analyze and comparing contractors' performance between the three countries. In the survey, respondents were asked to estimate the construction time, time certainty, extent of delay, working hours of labor, planning and monitoring, human resources, and clients' satisfaction. Apart from that, Chan and Kumaraswamy (1997) found that the critical factor that lead to project delays were poor site management and supervision, and improper project planning and scheduling. Butcher and Sheehan (2009) suggested that a contractor

needs to keep the customer informed in case the project is delivered prior to the commitment date, which is viewed as an outstanding performance.

2.2.4 Management of Subcontractor

A subcontractor is one who take a portion. Ko, Cheung and Wu (2006) identified that construction is an industry that operates through subcontractors. About 85% of all construction works is handled by subcontractors (Mbachu, 2008). As one portion of a prime contractor's contract is responsibility to subcontractors, hence the ability to deliver the project in time, with quality, and under budget, depends largely on a subcontractor's performance (Mbachu, 2008). Hence, the relationship between the main contractor and their sub contractor is one vital factor that a client should be concerned with in measuring a contractor's performance (Hoban & Francis, 2003; Assaf, et al., 1996).

2.2.5 Safety and Health

However, some researcher defined that safety is a critical measurement for successful construction projects (Youngsoo, Seunghee, Young-suk, & Chansik, 2007; Jannadi & Bu-khamsin, 2001). This is because the construction industry is a most risky industry hence; monitoring and controlling safety in the construction period is one of the critical criteria for contractor measurement.

Jannadi and Bu-Khamsin (2001) studied safety factors that affect the contractor's performance by using a questionnaire survey and formal interviews with safety key personnel in the large volume construction industry, which is composed of industrial construction, general building construction, refinery project construction, utilities construction and highway construction. 28 questionnaires were distributed among the industrial construction contractors. 25 questionnaires were returned, which represents an overall return rate of 89%. A total of 20 main factors (see Table 2.3) and 85sub-factors (see Appendix B) were identified as the major factors influencing the safety performance of construction contractors. The respondents were requested to specify the level of importance by using a five-point Likert scale (0 = no impact and 4 = very high impact).

From the result, it is concluded that management involvement is the most important criterion that affects construction contractor safety performance, followed by personal protective equipment and emergency/disaster planning & preparation.

Table 2.3 Main influencing factors affecting safety performance of contractor

Main factors affecting safety performance
1. Site planning and housekeeping
2. Welfare facilities
3. Emergency/disaster planning and preparation
4. Signs, signals and barricades
5. Materials handling, storage and use
6. Welding and cutting
7. Concrete and concrete formworks
8. Crane and lifting equipment
9. Chemical handling
10. Electrical equipment
11. Handling, transportation and disposal of hazardous material and waste
12. Personal protective equipment
13. Fire prevention
14. Transportation
15. Excavation, trenching and shoring
16. Scaffolding and ladders
17. Hand and power tools
18. Mechanical equipment
19. Ionizing radiation
20. Management involvement

Source: Jannadi & Bu-Khamsin. (2001)

2.2.6 Cost Control

Xiao and Proverbs (2002) identified that one of the vital measurable indicators of contractor performance is construction cost, and the top priorities that concern construction clients are cost and cost certainty. Currently, cost certainty is becoming

crucial in measuring contractors' performance. In general, nearly all construction projects are able to meet the company's requirements, but not many of them are finished on time and within budget. Moreover the cost of construction of two out of three of the investigated projects goes beyond cost estimates. Hence, it is recommended that high-level of focusing is required on cost certainty. Cost certainty is considered to be manageable by most people (Barnes, 1988). Contractors with high cost certainty are superior in cost estimating and controlling (Xiao and Proverbs, 2002). As customers have to manage their funding, therefore contractor who are well organized in predictability of cost was stated as an important factor in measuring performance (Butcher & Sheehan, 2009).

2.2.7 Contractor's Responsiveness

Solis (2010) stated that lack of appropriate planning may lead to deficiencies in contractor personnel available to execute key tasks, which could affect contractor responsiveness.

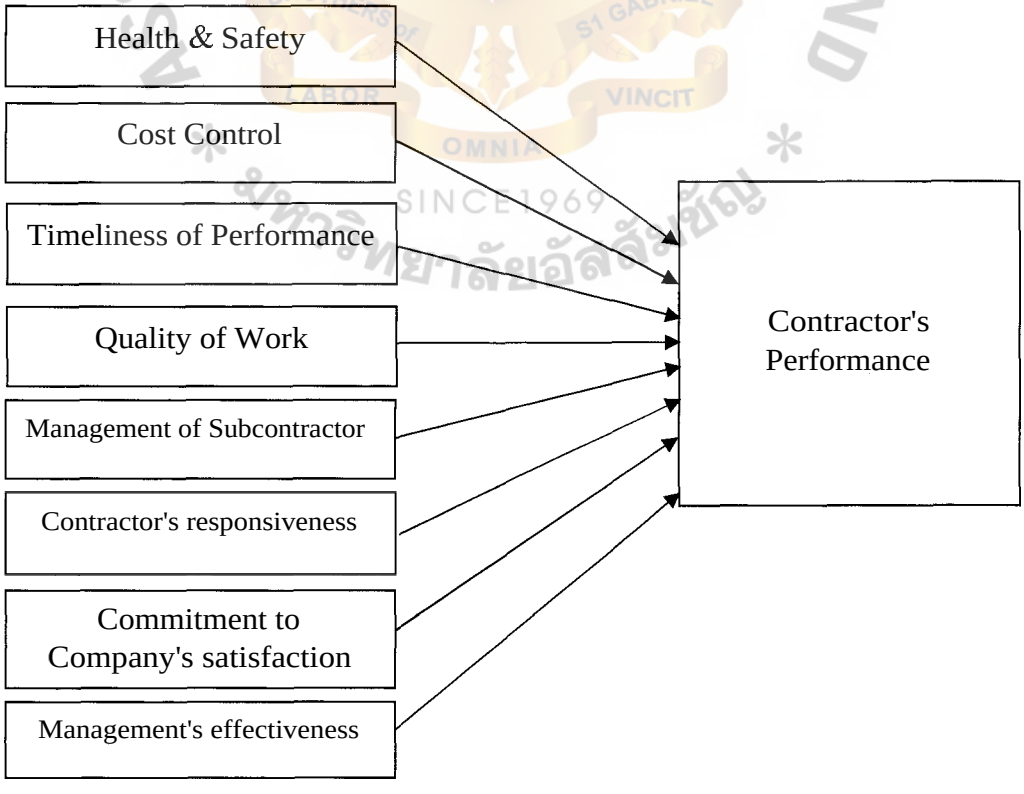
2.2.8 Management Effectiveness

Yeung, Chan and Chan (2008) found that there it was important for top management to attend meeting with clients. Having the right people in the meeting at top management level could increase the contractor's performance level, as this was a key factor in formulating outstanding performance in order to line up themselves to deliver what the customer needs from their service; while having the wrong people in a meeting could lead to poor contractor performance (Butcher and Sheehan, 2009). Sufficient cooperation between client and contractor representatives can lead to enhanced customer satisfaction as the problem can be solved on time and also avoid project delay. Inefficient contractor cooperation could affect the contractor's performance score and also diminish the possibility of being awarded contracts in future projects (Assaf, et al., 1996)

2.3 Research Framework

According to the previous studies, it can be summarized that contractor performance measurement is a method which consists of cost, time, quality, client satisfaction, health and safety, management of subcontractor, contractor responsiveness, and management effectiveness in order to enable measurement of contractor performance and to achieve selection of proper contractors in future projects. Based on prior reviewed related literature, the most important indicators which will be investigated in this research are Health and Safety, Quality of work, Cost control, Timeliness of performance, Management effectiveness, Management of subcontractor, Contractor's responsiveness. and Client's satisfaction. The researcher will examine the effects of these 8 main factors and 32 sub factors on platform construction contractors' performance. As such, the research framework for contractor performance measurement can be proposed in Figure 2.3.

Figure 2.3 Research Frameworks on Contractor Performance Measurement



2.4 Summary

According to the related literature, it was found that many researchers had studied significant factors which affect contractor performance, by researching the perception between owner, contractors and consultants in the construction industry. However, some researchers studied multi-factors while other researchers focused on details of only one or two significant factors. The significant factors of this research have been applied by reviewing literature that relates to the large volume construction industry which is composed of industrial construction, general building construction, refinery project construction, utilities construction and highway construction.

Based on the previous literature review and historical studies, Table 2.4 shows a summary of the main criteria affecting the performance of a contractor (and their references).

Table 2.4 Summary of the main criteria affecting the performance of contractor and their reference

Main Criteria	Health & Safety	Cost Control	Timeliness of Performance	Quality of Work	Management of Subcontractor	Contractor's responsiveness	Commitment to Company's satisfaction	Management of effectiveness
Barnes, (1988)		√						
Assaf et al., (1996)	√		√	√	√			√
Arditi et al., (1997)				√			√	
Chan & Kumaraswamy, (1997)			√					
Gabarino & Johnson, (1999)							√	
Straight, (1999)			√	√			√	√
Jannadi & Bu-khamsin, 2001	√							
Ng et al., (2002)	√	√	√	√	√	√	√	
Xiao & Proverbs, (2002)			√	√				
Hoban & Francis, (2003)					√			
Xiao & Proverbs, (2003)			√					
Ko et al., (2006)					√			
Wickramatillake et al., (2007)			√					
Youngsoo et al., (2007)	√							
Mbachu, (2008)					√			
Yeung et al., (2008)								√
Butcher & Sheehan, (2009)		√	√					√
Enhassi et al., (2009)	√	√	√	√			√	
Solis, (2010)						√		

CHAPTER III

RESEARCH METHODOLOGY

This research aims to study and measure the performance of three main contractors for offshore platform construction work for the XYZ Company, and also investigates the factor criteria that influence contractor performance by using a questionnaire in order to analyze and select the proper criteria that comply with company requirements.

According to Straight (1999), a survey form (Questionnaire) can be used to gather the data from respondents regarding the measurement of contractors' past performance factors. This chapter will describe how this research was conducted by utilizing which research method.

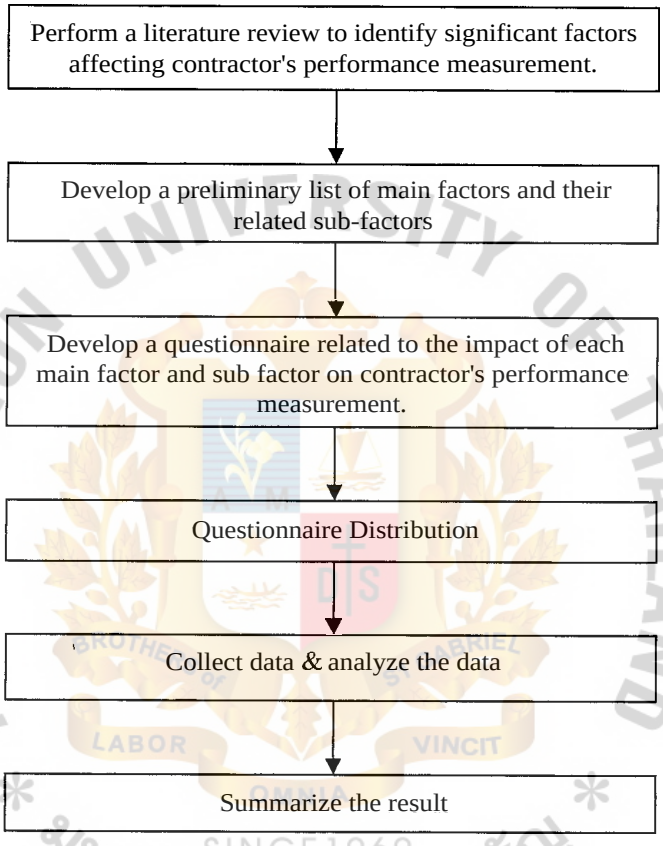
3.1 Research Methodology

The researcher has used a questionnaire as the study tool to evaluate contractor performance by applying the criteria from previous researches as mentioned in chapter 2 of this report. As a research technique, a survey research is a technique to gather information from a sample of the target population by using a questionnaire. This technique is commonly applied because it is quick, inexpensive, efficient, and accurate as a means of collecting data about the target population. The research will be conducted as shown in Figure 3.1

Literature reviews are conducted for the purpose of exploring factors contributing to contractor performance measurement, and also includes expert recommendations. Eight main factors and thirty-two sub-factors were listed as the importance factors. The 32 sub-factors had been grouped under eight major categories which consist of Health and Safety, Quality of work, Cost Control, Timeliness of Performance,

Management Effectiveness, Management of Subcontractor, Contractor's Responsiveness and Client's Satisfaction.

Figure 3.1 Research Methodology



3.2 Key Performance Evaluators

The key informants are project managers, project engineers, cost controllers/planners, discipline engineers and construction site representatives who are involved with the platform contractors, as they have practical experiences in platform construction projects and are used to prior dealings with those three contractors. There are 35 key evaluators who have worked in the Platform Construction Department which consist of 1 Project Execution Manager, 1 Project Service Manager, 5 Project Engineers, 4 Construction Site Representatives, 3 Cost Controller/ Planning and 21 Discipline Engineers.

3.3 Data Gathering

Questionnaires were sent via email to the 35 key evaluators who are working in the Platform Construction Department at XYZ Company. The objective and the importance of this research was clearly explained to each evaluator by the researcher via a phone-call or face to face in order to avoid misunderstanding and bias before completing the questionnaire. Also, questionnaires were distributed to key evaluators individually in order to avoid the contagion effect. Questionnaires were distributed and collected in the period of November 15 till November 30. Respondents, who submitted later than November 30, were reminded by phone to complete the form.

3.4 Research Instruments/Questionnaire

Part I: Respondents' information profiles

In the first part, the occupation and work experience in the3 offshore construction field was asked by using close-ended questions.

Part II: Factor affecting platform construction contractor's performance

The questionnaire in part 2 consists of two sections. In the first section, respondents were asked for the importance level of the contractors' performance measurement factors. Respondents were requested to specify an appropriate rating on the level of importance by using a five-point Likert scale (1 = not important and 5 = extremely important) for evaluating the relative importance of each factors on the contractors' performance measurement criteria based on the respondent's experience in platform construction projects. The second section focuses on prioritizing by rank ordering, in which 1 represents the most important criterion while 8 represent the least important criterion

Part III: Contractors' performance

The questionnaire in Part III was developed for contractor measuring purposes. Each contractor's name was identified on the form.

3.5 Statistical Treatment of Data

According to the first objective, the Relative Importance Index was applied in this research to determine the relative importance of the factors that affect the contractors' performance, from the respondent's point of views, and also to determine the most important performance factors of platform construction project in XYZ Company. Egemen and Mohamed (2005) stated that the Relative Importance Index technique had been used extensively in construction research for measuring attitude, which was the perceived level of importance in this research. The data collected from the questionnaire survey were analyzed according to the Mean Ranking technique (MR).The mean ranking of main factors was computed by the formula below (Ng, Cheng, and Skitmore, 2005).

$$MR_{m_i} \quad \frac{\text{x r}}{} \qquad 1 < MR < 8$$

Where:

f = the frequency of responses to each rating for each main factor

r = the ranking given to each main factor by the respondents

N = the total number of responses concerning that factor

The MR was then used to determine the Relative Importance Index of each main factor by using the formula below (Ng, et al., 2005);

The Relatives Importance Index of Main factors (RMF)

$$RMF_j = {}^{\nabla}_{MRJ}$$

Where:

RMFj = the relative importance index (RII) of j th main factor

MRj = the mean ranking of j th main factor

Then, the Relative Importance Index of sub-factor was calculated by using the formula for the sub-factors relative importance index, as below (Enshassi, et al., 2009,

Assaf, et al., 1996). In order to establish the importance of each sub factor, the mean score (MS) was computed in the following formula:

$$MS_{sub\text{-}factor} = \frac{\sum f \times s}{N} (1 \leqslant MS \leqslant 5).$$

Where:

f = the frequency of response to each rating for each sub-factor

s = the score given to each sub-factor by the respondents

N = the total number of responses concerning that sub-factor.

Then, the Relative Importance Index of each sub-factor (RSF) was calculated as follows:

$$RSF_{ij} = \frac{MS_{ij}}{MS_{ij}}$$

Where:

RSFij = the relative importance index of *i* th sub-factor under *j* th main factor

MSij = the mean score of *i* th sub-factor under *j* th main factor

Main factors were ranked based on the RMF score. The performance index can be elicited by combining the Relative Importance Index of each sub-factor and main factor with the weight score. The performance index shows the score of each performance criterion in accordance with the actual performance of a contractor. The performance index of this research was analyzed by using the following formula (Ng, et al., 2005).

$$PIij = \frac{PWx\ RSFij\ x\ RMFj}{5} \text{ x } 100$$

Where:

Phj = the performance score of ith sub-factor under jth main factor.

PW = the weight score of contractor performance; 1= Poor Performance,

2 = Fair Performance, 3 = Good Performance, 4 = Excellent Performance,

5 = Outstanding Performance.

RSFij = the relative importance of ith sub-factor under jth main factor

RMFj = the relative importance of each jth main factor

5 = the highest weight score

With the measurement forms, an evaluator can easily record the actual contractor performance based on the five rating types of "Poor", "Fair", "Good", "Excellent", and "Outstanding". The measurement forms can be determined to measure the performance of a contractor. Sub-factor scores of each contractor are summed up for calculating the overall of each contractor's performance score. The score is used to define strengths and weaknesses and also to compare the performance of each contractor (which will be described in Chapter IV.

3.6 Summary

This chapter has discussed the methodology to achieve the objectives of this research. Related literature had been reviewed to determine the relevant performance measurement criteria. Eight main factors are considered in the questionnaire and Relative Importance Index (RII) is used to determine the most important significant criteria based on perceptions of key performance evaluators in XYZ Company. Then, The Relative Importance Index of main factors and sub-factors are used as a weight score for the performance index calculation to measure the performance of three platform construction contractors which had been awarded contracts during 2007-2009.

CHAPTER IV

PRESENTATION AND CRITICAL DISCUSSION OF RESULTS

In this chapter, three parts of research findings; Descriptive Information, Criterion scoring and Contractor performance, are presented. Details of each part are as follows:

4.1 Descriptive Information

4.1.1 Sample profiles

Thirty-five questionnaires were distributed to key evaluators as planned. The respondents are those who work in the platform construction department in XYZ Company. The sample was composed of one Project Manager, six Project Engineers, four Construction Site Representatives, three Cost Controllers/Planners and twenty-one Discipline Engineers. All thirty-five questionnaires were returned, an overall return rate equal to 100 percent. The detail is summarized in Table 4.1.

Table 4.1: Job Position of the Respondents

Position	**Numbers**	**Percentage**
Project Manager	**1**	**2.9**
Project Engineer	**6**	**17.1**
Construction Site Representative	**4**	**11.4**
Cost Controller and Planner	**3**	**8.6**
Discipline Engineer	**21**	**60**
Total	**35**	**100**

Twenty-six out of thirty-five respondents were male and nine of them were female. Most key evaluators (57.1%) hold a Master Degree while the remainder (42.9%) hold a Bachelor Degree. The length of respondent experience at the XYZ Company varied from less than 5 years to more than 15 years, as showed in Table 4.2.

Table 4.2 Years of Experience of the Respondents in Platform Construction Projects

Years of Experience	Number	Percentage
Less than 5 years	**13**	37.1
5-10 years	**9**	25.7
10-15 years	**8**	22.9
More than 15 years	**5**	14.3
Total	**35**	100

4.1.2 Reliability of the Research Tool

This section presents the results of the reliability analysis of the questionnaires. The reliability of an instrument is the degree of consistency which measures the attribute which it is supposed to be measuring. Nunnally (1978) mentioned that the variables are considered to be acceptable and reliable when Cronbach's Alpha test is more than or equal to 0.7. However, Moss, Prosser, and Costello (1998) suggested that an alpha score of 0.6 was generally acceptable for the new developed scores.

According to the first result, the reliability of Management Effectiveness and Commitment to the Company's Satisfaction, were 0.692 and 0.611 respectively. Hence the questionnaire content for those two variables was revised by deleting some items in order to make the questionnaire tool more reliable. After revising the questionnaire, the reliability result of those two variables improved to 0.704 and 0.806 respectively.

As indicated in Table 4.3, the reliability test outcome of research instrument shows that all variables are greater than 0.6. Therefore, all questions are consistent and reliable in being applied as the research instrument in this study. In this manner, it can be said that the questionnaire is valid and reliable.

Table 4.3 Chronbach's Alpha test for each factor of the questionnaire

Main factor	***Cronbach's** Alpha test*
Health and Safety	0.754
Cost control	0.772
Timeliness of performance	0.743
Quality of work	0.731
Management effectiveness	0.704
Management of subcontractors	0.670
Contractor's Responsiveness	0.712
Commitment to the Company's Satisfaction	0.806

4.2 Criterion scoring

4.2.1 The Relative Importance Index of Main Factors (RMF)

The result of mean ranking (MR) of 8 main factors i presented as Table 4.4. The mean ranking has been calculated by the followeing formula:

$$\mathbf{MR} \qquad \frac{\qquad}{\qquad} \qquad 1 < MR < 8$$

Where:

f = the frequency of responses to each rating for each main factor

r = the ranking given to each main factor by the respondents

N = the total number of responses concerning that factor

Table 4.4 Mean Ranking (MR) and Standard Deviation of 8 main factors

Main Factor	Mean Ranking (MR)
Health & Safety	2.20
Quality of work	2.77
Cost Control	4.06
Timeliness of Performance	3.09
Management Effectiveness	5.77
Management of Subcontractors	7.11
Contractor's Responsiveness	5.91
Commitment to the Company's Satisfaction	5.09

According to the mean ranking result as shown in Table 4.4, the least score of mean ranking, which was health and safety, was represented as the highest important criterion, while the highest score of mean ranking, which was management of subcontractor, was represented as the least important criterion. Those mean rankings (MR) were then converted as a weight score of main factors for calculating contractor performance actual score by using the Relative Importance Index of Main Factors (RMF) formula, as below.

$$RMF_j \quad \Sigma_{i=}^{N} \frac{MRI}{MRJ}$$

Where:

RMFj = the relative importance index (RII) of j th main factor

MRj = the mean ranking of j th main factor

Table 4.5: The Relative Importance Index of Main Factors (RMF) and their Rank

Main factors	***RMF***	*Rank*
Health & Safety	0.2201	1
Quality of work	0.1747	2
Timeliness of Performance	0.1569	3
Cost Control	0.1193	4
Commitment to the Company's Satisfaction	0.0952	5
Management Effectiveness	0.0839	6
Contractor's Responsiveness	0.0819	7
Management of Subcontractors	0.0681	8

According to the results as shown in Table 4.5, it can be concluded that Health and Safety was the most importance factor for contractor's performance measurement in XYZ Company as it had been ranked in the first rank among all factors, with a Relative Importance Index of Main Factors (RMF) equal to 0.2201. Quality was the second rank with RMF equal to 0.1747 and Timeliness of Performance was the third rank with RMF equal to 0.1569. Cost was in the fourth rank which its RMF equal to 0.1193, followed by Commitment to the Company's Satisfaction with its RMF equal to 0.0952. Next, Management Effectiveness has its RMF equal to 0.0839, then Contractor's Responsiveness was ranked in the seventh position with RMF equal to 0.0819. The least important factor for measuring contractor performance in XYZ Company was Management of Subcontractors, its RMF being equal to 0.0681.

All of those RMF scores were used as one a weight score in calculating the contractor performance index, because the actual score of each contractor originated from the weight score of main factor and its related sub-factor. Hence the Relative Importance Index of Sub-Factors (RSF) is now discussed next.

4.2.2 The Relative Importance Index of Sub-Factors (RSF)

The result of mean score (MS), standard deviation and relative importance index of each sub-factor is presented as Table 4.6. The mean score (MS) was used to calculate the Relative Importance Index of Sub-Factors (RSF). Then, RSF scores and thier

corresponding main factor were used as the weight score to produce ther contractor performance index. The formulation of mean score (MS) and Relative Importance Index of Sub-Factor (RSF) are presented below:

$$MS_{factor} = \frac{\sum f \times s}{N} \quad (1$$

Where:

f = the frequency of responses to each rating for each sub-factor

s = the score given to each sub-factor by the respondents

N = the total number of responses concerning that factor

While the Relative Importance Index of each sub-factor (RSF) was calculated as follows:

$$RSFij = \frac{MSij}{\sum_{i=1}^{N} MS//}$$

Where:

RSFij is the relative importance of ith sub-factor under jth main factor

MSij the mean score of ith sub-factor under jth main factor

Referring to Table 4.6, the highest mean score (MS) is represented as the highest important sub-factor while the lowest mean score is represented as the least important sub-factor. From the result, it can be concluded that the performance of contractor in maintaining a low incident rate of safety violation had been rated the highest important. The ability in adhering to complete the task on the schedule date was in the second rank, followed in the second position rank by the completion of the project without any safety incidents. The sub factor of qualification in hiring, maintaining and replacing subcontractor was considered the lowest important. From the result of RSF scores, a weight score can be assigned to each sub-factor.

Table 4.6 the Mean Score (MS), Standard Deviation (SD) and the Relative Importance Index of Sub-Factors (RSF)

Main Factors/Sub-Factors	Mean Score (MS)	RSF
1. Health & Safety (RMF=0.2201)		
1.1 Contractor's Environment Safety & Health program compliance with contract requirements and protective of workers, the public, and the environment.	4.40	**0.2448**
1.2 Contractor maintained a low incident rate of safety violations.	4.60	**0.2560**
1.3 Contractor provided and complied with adequate safety training and plan.	4.43	**0.2464**
1.4 Contractor completed the project without any safety incidents.	4.54	**0.2528**
Total Score	17.97	1.0000
2. Quality of work (RMF=0.1747)		
2.1 Contractor provided well researched and clearly identified submissions that matched contract requirements (i.e. propose new vendor to bid list).	3.83	**0.1553**
2.2 Contractor corrected deficiencies in a timely manner and pursuant to their quality control plan.	4.17	**0.1692**
2.3 Contractor completed all work with good workmanship and in conformance with the specifications.	4.49	**0.1819**
2.4 Quality of equipments and raw materials in project.	4.26	**0.1727**
2.5 Contractor performed quality inspections and documented findings to ensure repeat failures didn't occur.	4.11	**0.1669**
2.6 Contractor adherence to suggested solutions and their initiative to implement solutions.	3.80	**0.1541**
Total Score	24.66	1.0000
3. Cost control (RMF=0.1193)		
3.1 Contractor adherence to deliverey at the contractual agreed- price.	4.26	**0.3522**

Table 4.6 the Mean Score (MS), Standard Deviation (SD) and the Relative Importance Index of Sub-Factors (RSF) (Continued)

Main Factors/Sub-Factors	Mean Score (MS)	RSF
3.2 Cost overrun and change proposals that contractor submitted to company are reasonably priced and contained all appropriate supporting documentation.	4.00	**0.3310**
3.3 Contractor adherence to anticipate, identify and control cost growth.	3.83	**0.3168**
Total Score	12.09	1.0000
4. Timeliness of performance (RMF=0.1569)		
4.1Contractor adherence to complete the contract on the scheduled date	**4.57***	**0.2219**
4.2 Contractor submitted the progress schedule and progress reports as required.	4.00	**0.1942**
4.3 Contractor successful in planning and proposing realistic schedules.	4.11	**0.1997**
4.4The tasks required under this effort were performed in a timely manner and in accordance with the performance schedule, deliverable schedule, and period of performance of the contract.	4.20	**0.2039**
4.5 Contractor provided timely resolution of all punch list items.	3.71	**0.1803**
Total Score	20.60	1.0000
5.Management effectiveness (RMF=0.0839)		
5.1 Contractor was reasonable and cooperative with client's project team in response to changes in technical direction and correcting errors	4.34	**0.2686**
5.2 Contractor presented information and correspondence in a clear, concise, and businesslike manner	3.86	**0.2385**
5.3Contractor provided management personnel that were experienced with technical and administrative abilities to meet contractual requirements.	3.94	**0.2438**
5.4 Contractor utilized an effective project management system that included planning, budgeting, status tracking, reporting, baseline management, critical path analysis, and work breakdown structure	4.03	**0.2491**
Total Score	16.17	1.0000

Table 4.6 the Mean Score (MS), Standard Deviation (SD) and the Relative Importance Index of Sub-Factors (RSF) (Continued)

Main Factors/Sub-Factors	Mean Score (MS)	RSF
6.Management of subcontractors (RMF=0.0681)		
6.1 Contractor hired quality subcontractors and effectively managed and coordinated their work.	3.97	**0.5187**
6.2 Contractor hired, maintained and replaced as necessary qualified personnel and subcontractors/suppliers.	3.69	**0.4813**
Total Score	7.66	1.0000
7. Contractor's Responsiveness (RMF=0.0819)		
7.1 Contractor acted promptly to resolve problems, ensuring compliance with contract requirements and safety regulations.	4.34	**0.2648**
7.2 Contractor was reasonable and cooperated to resolve problems, attended meetings as needed and maintained communication with the company to keep the project on schedule or minimize the delay.	4.20	**0.2561**
7.3 Contractor identified problems as they occurred, suggested approaches to the problems; displayed initiative to solve problems and performed as a Team Member.	4.09	**0.2491**
7.4 Contractor responded to warranty issues within the time frames specified in the contract.	3.77	**0.2300**
Total Score	16.40	1.0000
8. Commitment to company's Satisfaction (RMF=0.0952)		
8.1 The contractor is able to successfully comply with the contract requirement.	4.51	**0.5016**
8.2 Overall performance of contractor.	4.49	**0.4984**
Total Score	9.00	1.0000

4.3 Contractor Performance

The RII of each sub-factor and its corresponding main factor were combined with the weight score to form a performance score of each contractor's assessment, composed of Health and Safety, Quality of work, Cost Control, Timeliness of Performance, Management Effectiveness, Management of Subcontractor, Contractor's Responsiveness and Commitment to the Company's Satisfaction. The construction team could use the resulting score for each goal to obtain an overall category score

and an overall performance score. With this method, the evaluation result can be used as the reference to assist a construction team to compare strengths and weaknesses of existing contractors in each assessment clearly, and enable it to consider which are the points of concern in each contractor's performance.

4.3.1 The difference in assigning full scores for each criterion

The Relative Importance Index of each sub-factor and its corresponding main factor could be gained by combining with the weight score to form a performance index. The performance index represents the score that could be assigned to each contractor performance measurement factor. The performance index was

$$PIij = \frac{PWx\_RSFij\_\_RMFj\_}{5} \frac{PWx\_RSFij\_x\ RMFj\_}{5} \times 100$$

Where;

PIij is the performance index of i th sub-factor under j th main factor

PW is the weighted score of different performance; 1 poor, 2 fair, 3 good, 4 Excellent and 5 Outstanding.

For example, as "Maintaining the low incident rate of safety violation" is a sub-factor under Health and Safety" main factor, therefore RMF is equal to "0.2201" and RSF is equal to "0.2448"; the weighted score for outstanding performance is "5". The Performance index can be computed as follows:

$$PI_{\text{Maintaining the low incident rate of safety violation}} = \frac{5*0.2448*0.2201}{5} * 100$$

$$= 5.3880$$

Having calculated all potential index values that could be given to the sub-factors under each of the performance scenarios (i.e. from "poor" to "outstanding"), evaluation forms can be formulated to measure the performance of a contractor. With the assessment forms (in Appendix E), an evaluator can simply record the actual performance of a contractor based on the five rating categories of "5 Outstanding",

"4 Excellent", "3 Good"," 2 Fair" and "1 Poor" computed by summing up the scores of all sub-factors.

As in Appendix E, the full score of each criterion was computed by summing up the highest performance score of each sub-factor. However the full score of each main factor was unequal, due to the fact that the importance of each main factor and sub factor were dissimilar. Hence, the total score of each main factor were varied, depending on the importance of that factor as concluded in Table 4.7.

Table 4.7 Highest score of each main factor

Main factors	Score
Health & Safety	22.0069
Quality of work	17.4694
Timeliness of Performance	15.6901
Cost Control	11.9333
Commitment to the Company's Satisfaction	9.5199
Management Effectiveness	8.3888
Contractor's Responsiveness	8.1862
Management of Subcontractors	6.8054

Table 4.7 shows that Health and Safety got the highest score 22.0069 because it was the most important factor in measuring contractor performance. Quality was the second important factor which got the highest score 17.4694, and Timeliness was the third important, its highest score equal to 15.6901, followed by Cost Control, Commitment to the Company's Satisfaction, Management Effectiveness, and Contractor's Responsiveness. Management of Subcontractor was the least important, its score was found to be the lowest among all 8 factors.

As the numbers of sub-factor's item in each criterion were unequal, therefore all raw scores shown in Appendix E are divided by the number of question in each criterion in order to make the same standard for all criteria. Therefore, the highest score of each main criterion are changed, as shown in Table 4.8

Table 4.8 Highest score of each main factor after dividing the number of sub-factor's question

Main factors	No. of question	Highest Score
Health & Safety	4	5.50
Quality of work	6	2.91
Timeliness of Performance	5	3.14
Cost Control	3	3.98
Commitment to the Company's Satisfaction	2	4.76
Management Effectiveness	4	2.10
Contractor's Responsiveness	4	2.05
Management of Subcontractors	2	3.40

4.3.2 Contractor's Performance Score of Each Criterion

The actual performance score in each sub factor was derived from the performance index formula which was assigned by key evaluators. In this section, average scores of each contractor in each criterion from 35 key evaluators are reported.

4.3.2.1. Health and Safety

The summary result in Table 4.9 showed that Contractor **CCC** received a performance score of 4.00 which was higher than the3 average performance score that is equal to 3.60 points, followed by Contractor **AAA** with a score of 3.90 points, and contractor **BBB** with 2.91 points.

Table 4.9 Health and Safety Performance Scores

No.	Factors Indicator	Contractor's Performance Scores			Average Health and Safety Score
		AAA	BBB	CCC	
1	**Health & Safety**				
1.1	Environment, Health & Safety program compliance with contract requirements	0.95	0.75	1.02	*0.90*
1.2	Maintaining low incident rate of safety violations.	1.02	0.72	1.05	*0.93*
1.3	Compiling with adequate safety training and plan.	0.97	0.82	0.98	*0.92*
1.4	Completion the project without any safety incidents.	0.96	0.62	0.96	*0.85*
	Performance score	**3.90**	**2.91**	**4.00**	*3.60*

Remark: The highest score in health and safety was equals to 5.50 points

4.3.2.2. Quality of Work

According to the result in Table 4.10, it was found that the average score of this criterion was equal to 1.88 points. It showed that the performance score of Contractor CCC was the highest with the result of 2.08 points. Contractor AAA was ranked second with a score of 1.97 points, followed by Contractor BBB with a score of 1.59 points which is lower than the average score.

Table 4.10 Quality of Work Performance Scores

No.	Factors Indicator	Contractor's Performance Score			Average Quality of Work Score
		AAA	BBB	CCC	
2	**Quality of Work**				
2.1	Well researched and clearly identified submittals that matched contract requirements	0.31	0.24	0.32	*0.29*
2.2	Correction of deficiencies in a timely manner and pursuant to the quality control plan.	0.33	0.27	0.35	*0.31*
2.3	Completed all work with good workmanship and in conformance with the specifications.	0.37	0.28	0.39	*0.35*
2.4	Quality of equipment and raw materials.	0.34	0.30	0.36	*0.34*
2.5	Performs quality inspections and documented findings to ensure repeat failures will not occur	0.34	0.26	0.36	*0.32*
2.6	Adherence to suggested solutions and their initiative to implement solutions	0.28	0.24	0.32	*0.28*
	Performance score	**1.97**	**1.59**	**2.08**	***1.88***

Remark: The highest score in quality of work was equals to 2.91 points

4.3.2.3. Timeliness of Performance

According to the result of Timeliness of Performance scores in Table 4.11, it was found that the performance of Contractor AAA and Contractor CCC were similar, since their performance scores were not much different. It shows that the average score was equal to 2.02 points, with Contractor CCC gaining the highest score of 2.20 points in this criterion. This was followed by Contractor AAA with a score of 2.18

points and next was Contractor BBB with the least score of 1.66 points among the three contractors.

Table 4.11 Timeliness of Performance Scores

No.	Factors Indicator	Contractor's Performance Score			Average Timeliness of Performance Score
		AAA	BBB	CCC	
3	**Timeliness of Performance**				
3.1	Adherence to complete the contract on the scheduled date.	0.53	0.32	0.52	*0.46*
3.2	Submission of progress schedule and progress reports as required.	0.44	0.38	0.44	*0.42*
3.3	Successful in planning and proposing realistic schedules.	0.43	0.31	0.43	*0.39*
3.4	Construction tasks are performed in a timely manner and in accordance with the performance schedule, deliverable schedule and period of performance of the contract.	0.44	0.36	0.43	*0.41*
3.5	Timely resolution of all punches list items.	0.36	0.28	0.38	*0.34*
	Performance score	**2.18**	**1.66**	**2.20**	*2.02*

Remark: The highest score in timeliness of performance was equal to 3.14 points

4.3.2.4 Cost Control

According to Table 4.12, when comparing the performance scores among three contractors, it was found that Contractor AAA and Contractor **BBB** had performance scores lower than the average score. Contractor CCC's performance was acceptable as its score was higher than the average score. The performance scores of Contractor AAA, BBB and CCC were 2.39, 2.30, and 2.59 respectively.

Table 4.12 Cost Control Performance Scores

No.	Factors Indicator	Contractor's Performance Score			Average Cost Control Score
		AAA	BBB	CCC	
4	**Cost Control**				
4.1	Adherence to delivery at the contractual agreed- price.	0.85	0.82	0.90	*0.85*
4.2	Cost overrun and change proposals that contractor submitted to company are reasonably priced and contained all appropriate supporting documentation.	0.78	0.77	0.89	*0.81*
4.3	Adherence to anticipate, identify and control cost growth.	0.76	0.72	0.81	*0.76*
	Performance score	**2.39**	**2.30**	**2.59**	*2.43*

Remark: The highest score in cost control was equal to 3.98 points

4.3.2.5 Commitment to the Company's Satisfaction

The summary in Table 4.13 shows that Contractor CCC had the highest satisfaction, with a total score of 3.48 compared to the average score of 3.04 points. In the second rank was Contractor AAA with a performance score of 3.22 points, and in the third rank was Contractor **BBB** with the lowest performance score of 2.42 points.

Table 4.13 Commitment to Company's Satisfaction Performance Scores

No.	Factors Indicator	Contractor's Performance Score			Average Commitment to Company's Satisfaction Score
		AAA	BBB	CCC	
5	**Commitment to the Company's Satisfaction**				
5.1	The contractor is able to successfully comply with the contract requirement.	1.57	1.27	1.69	*1.51*
5.2	Overall performance of contractor.	1.65	1.15	1.79	*1.53*
	Performance score	**3.22**	**2.42**	**3.48**	*3.04*

Remark: The highest score in Commitment to Company's Satisfaction was equal to 4.76 points

4.3.2.6 Management Effectiveness

The result in Table 4.14 shows that Contractor CCC had the highest score of 1.46 points, compared to the average score of 1.33 points. Contractor AAA had a performance score equal to 1.36 points, and Contractor BBB had a performance score1 of 17 points.

Table 4.14 Management Effectiveness Performance Scores

No.	Factors Indicator	Contractor's Performance Score			Average Management Effectiveness
		AAA	BBB	CCC	
6	**Management Effectiveness**				
6.1	Cooperative with client's project team in response to changes in technical direction and correcting errors.	0.37	0.32	0.39	0.36
6.2	Presented information and correspondence in a clear, concise, and businesslike manner	0.31	0.28	0.34	0.31
6.3	Providing management personnel who were experienced, with technical and administrative abilities to meet contractual requirements.	0.33	0.27	0.37	0.32
6.4	Utilize an effective project management system that included planning, budgeting, status tracking, reporting, baseline management, critical path analysis, and work breakdown structure	0.35	0.30	0.37	0.34
	Performance score	**1.36**	**1.17**	**1.46**	**1.33**

Remark: The highest score in management effectiveness was equal to 2.10 points

4.3.2.7 Contractor's Responsiveness

The result in Table 4.15 shows that Contractor BBB still had the lowest score of 1.10 points, compared to the average score of 1.29 points. Contractor CCC had the highest performance score of 1.42, followed by Contractor AAA with a performance score of 1.34 points.

Table 4.15 Contractor's Responsiveness Performance Scores

No.	Factors Indicator	Contractor's Performance Score			Average of Contractor's Responsiveness Score
		AAA	BBB	CCC	
7	**Contractor's Responsiveness**				
7.1	Resolving problems, ensuring compliance with contract requirements and safety regulations.	0.36	0.29	0.39	0.34
7.2	Attending meetings as needed and maintained communication with the company to keep the project on schedule or minimize the delay.	0.36	0.29	0.35	0.33
7.3	Identified problems, suggested approaches to the problems; displayed initiative to solve problems and performed as a Team	0.34	0.26	0.36	0.32
7.4	Responded to warranty issues within the time frames specified in the contract.	0.29	0.27	0.32	0.29
	Performance score	1.34	1.10	1.42	1.29

Remark: The highest score in contractor's responsiveness was equal to 2.05points

4.3.2.8 Management of Subcontractor

The result in Table 4.16 shows that Contractor CCC had the highest performance with a score of 2.34 points, compared to the average score of 2.08. In the second rank was Contractor AAA with a score of 2.15 points, and in the third rank was Contractor **BBB** with a score of 1.75 points which is lower than the average score.

Table 4.16 Management of Subcontractor Performance Scores

No.	Factors Indicator	Contractor's Performance Score			Average of Management of Subcontractor Score
		AAA	BBB	CCC	
8	**Management of Subcontractor**				
8.1	Hiring quality subcontractors and effectively managed and coordinated their work.	2.20	1.84	2.44	1.08
8.2	Hiring, maintaining and replacing as necessary qualified personnel and subcontractors/suppliers as necessary.	2.10	1.67	2.25	1.00
	Performance score	2.15	1.75	2.34	2.08

Remark: The highest score in management of subcontractor was equal to 3.40 points

4.3.3 Summary of the Contractor's Performance Score

The overall contractor's performance score was calculated by summing up all performance score of assessment criteria, as shown in Table 4.17. From Table 4.17, it was found that Contractor CCC and Contractor AAA had performance scores higher than the average score, while all Contractor BBB's performance scores were lower than the average scores. The ranking is as follows:

1. Contractor CCC had the highest performance score of 19.58 points
2. Contractor AAA had the second performance scores of 18.52 points
3. Contractor **BBB** had the lowest performance score of 14.92 points

From the end results, it has been summarized that Contractor CCC had strength in all areas compared with the others two contractors. Even though the performance score of Contractor CCC and Contractor AAA were not much different, it was noticeable that the performance score in the cost control criterion of Contractor AAA was weak, since its performance score in this assessment lower than average scores. While the performance score of Contractor BBB was low as its overall performance score was lower than the average score in all assessment criteria.

Table 4.17 Summary of Contractor's Performance scores

Indicator Factors	Contractor Performance 's Score in each assessment			Average Score
	CCC	AAA	**BBB**	
Health & Safety	4.00	3.90	2.91	3.60
Quality of work	2.08	1.97	1.59	1.88
Timeliness of Performance	2.20	2.18	1.66	2.02
Cost Control	2.59	2.39	2.30	2.43
Commitment to the Company's Satisfaction	3.48	3.22	2.42	3.04
Management Effectiveness	1.46	1.36	1.17	1.33
Contractor's Responsiveness	1.42	1.34	1.10	1.29
Management of Subcontractors	2.34	2.15	1.75	2.08
Overall Performance score*	19.58	18.52	14.92	17.67
Performance result	**Qualified**	**Qualified**	**Unqualified**	

Remarks: *Overall performance score was calculated by summing up all assessment criteria

The methodology in considering performance of three contractors which constructed platforms during 2007-2009 for XYZ Company were computed by finding the relative importance index of the main factors and their correlated sub-factors, then aggregating the result as a weight score for calculating contractor performance score of each sub-factor by using the performance index method.

The outcome showed that Contractor CCC was the best when compared with the average score among all three contractors, followed by Contractor AAA which had a performance score in the second rank, and Contractor **BBB** which had the lowest score of all three contractors.

These results would help XYZ Company to recognize the importance of measuring contractor performance, and then to identify the strengths to sustain and the weaknesses to improve. Moreover, those outcomes can be used as a guide in evaluating and selecting contractors in future projects.

CHAPTER V

SUMMARY FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

This research was conducted to study the significant criteria in measuring contractor performance for platform construction contractors, and also developed a contractor measurement system for XYZ Company, which has not been executed before. In this final chapter, conclusions and discussion of findings of this research will be described. Additionally, the recommendation for XYZ Company and further research will be suggested.

5.1 Conclusions

Accuracy in measuring contractor performance is of great importance especially in a huge investment industry such as of the oil and gas industry. Without a technique to evaluate contractors, the company may risk awarding repeat work to nonqualified firms. However, when developing a performance measurement it is important that a framework be chosen to align with what the company needs to measures. From the research, it can be summarized that the outcome of the most important factor in measuring contractor performance is different from other industries. Other construction industries will be concern more with the traditional criteria which consist of cost quality and time, while this research found that health and safety is the most important factor in XYZ Company. The oil and gas industry is unique because of the convergence of several hazardous factors, among these the potential for fire, explosion, transit accidents and blow-outs and the work stress that can result from these threats, plus the attendant priority of high reliability in operations, and the relative isolation of installations. The next important assessment followed the traditional indicators which consist of quality, time, and cost. Therefore these top four assessments should be used in measuring the performance of contractors. The important of commitment to company's satisfaction was ranked in fifth position. It is

important to measure clients' satisfaction after a project is completed, such as the overall performance of a contractor whether the contractor is able to comply with the contract or not. For management effectiveness, contractor responsiveness and management of sub-contractors were ranked as the least important factor, from which it can be concluded that those three factors were import but in moderation.

From the outcome, it could be concluded that all eight criteria were important in measuring contractor performance, but with different importance levels. Therefore, the system for measuring contractor performance should be designed by using a Relative Importance Index to calculate the weighted score of those main factors and sub-factors in order to calculate the contractor performance score by using a performance index (PI) formula.

Reference was made to the result of performance score comparison among three contractors. It was found that Contractor CCC had the highest score, followed by Contractor AAA and Contractor **BBB.** However, the total score after summing all the highest scores of all assessment criteria was equal to 27.84. Therefore it could be implied that there is a lot of room for improvement by those contractors to develop and rectify their weaknesses. This would increase their chances to win contracts in the future. On the other hand, the Company should give feedback to the contractors so that they would know their strengths and weaknesses. This will benefit the company in terms of increasing bidding competitiveness.

5.2 Discussion of Findings

From the findings, it can be concluded that Health and Safety was the most important factor for contractor performance measurement in XYZ Company, as it has been ranked first among all factors. This criterion is the most important factor which affects a contractor's performance measurement for XYZ Company. Since the oil and gas industry is considered high-risk, and any loss which occurs from an unsafe act or accident is high compared to other industries, therefore this business has to make the environment, health and safety as its highest priorities (Mearns & Yule, 2008). From

the survey, the variable that key evaluators perceived as having the most effect on contractor performance measurement is the ability to maintain a low incident rate of safety violation (see Appendix E). Moreover, Ugwu and Haupt (2007), observed that health and safety strongly affects the performance of construction projects which relates to accidents, injuries and fatalities at construction sites. This is due to the fact that construction is a relatively hazardous undertaking. Furthermore, delays caused by injuries and illnesses can present significant opportunity costs to owners (Hendrickson, 1998).

Quality has been ranked in the second position. The key evaluators observed that an ability to complete all work with good workmanship and in conformance with the specifications, strongly affects contractors performance. Availability of personnel with high experience and qualifications leads to better performance of quality, time, cost, and resource management of projects. Cheung, Suen, & Cheung (2004) are in agreement with the result of this research as this variable is very important because it strongly affects quality performance of construction projects. Moreover, quality of raw materials and equipment is the second most5 important in measuring contractor performance because maintenance work for offshore wellhead platform is costly and hard to do compared to common onshore plant. Failure in equipment or any small component of the platform may lead to production shutdown, long period of plant down-time, and large amounts of maintenance cost. This is also in line with Enshassi, et al., (2009) that quality of equipments and raw materials in a project and availability of personnel with high qualifications strongly affects the quality performance of a project. Enshassi, et al., (2009) also defined that this factor also affects the project performance and the degree of owners' satisfaction. Hendrickson (1998) declared that defects or failures in constructed facilities can result in very large costs consequently; good contractors should ensure that the job is done right the first time and that no major accidents occur on the project. Even with minor defects, re-construction may be required and capability in operations may be diminished, which are the result of cost increasing and project delays. Xiao and Proverbs (2002) stated that quality performance affects the cost performance of construction projects.

Timeliness of Performance has been ranked in third position. The most important variable under this factor that key evaluators perceived as importance in measuring timeliness of performance of contractor, is the ability in completing the contract by the scheduled date. This result is in line with Samson and Lema (2002) that time performance is affected by schedule stability of construction projects. The time group of factors strongly affects the performance of construction projects and can be one of the most important indicators to measure performance (Cheung et al., 2004). In XYZ Company, delay in construction will lead to large penalty costs incurred due to the fact that the company is unable to supply gas to its customers.

Cost Control has been ranked in the fourth position. From the survey, key evaluators perceived that the most importance variable in measuring contractor's performance is the adherence in delivering at the contractual price. In XYZ Company, projects are awarded to the lowest bidder, therefore it is important that the company must ensure that a contractor has high ability to deliver the project at the contractual price. Cost control is also related to changed orders; most project cost overruns occurred from change orders, so the company needs to focus on managing change orders. Iyer and Jha (2005) are in concurrence with our result, as cost is considered an important criterion for judgment of construction project performance. Xiao and Proverbs (2002) had pointed out the unreliability of cost estimation: most construction projects meet the required quality specifications but are not often are completed within budget and on time.

Commitment to the Company's Satisfaction was ranked in the fifth position. From the survey, the XYZ Company perceives that the ability of contractor in complying with the contract requirement successfully is the most importance variable under this factor. Egemen and Mohamed (2005) state that a client's desire for the best possible "value" from contractors, and are willing to continue working with the same contractors in future works if they are fully satisfied. Cheung, et al. (2004) remarked that client satisfaction moderately affects the performance of construction projects.

Management Effectiveness was ranked in the sixth position with RII equal to 0.0839. Key evaluators in XYZ Company perceived that the most important variable in measuring contractor's performance under this factor is the capability of being cooperative and reasonable with project's team in response to changes in technical direction and correcting errors.

Contractor's responsiveness was ranked in the seventh position with RII equal to 0.0819. From the result, it can be concluded that this factor is slightly important in measuring contractor performance for XYZ Company. In this factor, key evaluators perceived that the most important variable in measuring performance is for the Contractor to act promptly to resolve problems, ensuring compliance with contract requirements and safety regulations.

Management of subcontractors was been ranked in the eighth position. It can be concluded that this group is the least important factor for XYZ Company in measuring contractor performance. Management of subcontractor often relates to the quality of work, but, the contractors need to comply with the qualified subcontractor list provided by the company. Therefore, XYZ Company can be sure that the quality of these subcontractors is acceptable. Moreover, in the standard contract between XYZ Company and its contractor, the contractor has single liability, all damage or loss occurred will be the contractor's responsibility.

5.3 Recommendation for XYZ Company

The Contractor Performance problem is costly, often results in disputes and claims, and also affects the company's development. Therefore, the company must have a clear mission and vision to formulate, execute and measure performance of its contractors, on a regular basis. Therefore, it is important for XYZ Company to identify the strengths and weaknesses of performance in order to reinforce and improve. From the analysis, XYZ Company should be aware of the fact that the lowest bid does not always result in outstanding performance. From the research result, Contractor CCC and Contractor AAA were qualified for the test while

Contractor BBB got the lowest score in all assessment criteria. This research is a good step to improve strategic planning/selecting in order to develop future contractor selection in future projects. The use of this research finding could ensure that contractors are measured in performance, not only on the basis of traditional criteria which consist of cost, time and quality, but on their overall ability to meet the priority requirements of the company in the contractor work. Since the construction stage will take around two years, therefore XYZ Company should measure its contractor performance on a regular basis by measuring the performance annually. Additionally XYZ Company should have feedback and also publicize to existing contractors the criteria of the measurement regarding the contractor's performance, so it would develop competition between them which leads to improvement. By repeating this, a contractor would know its weaknesses and if they still want to get the repeat work, they would have to improve or eliminate those weaknesses. For the management team, these points could be used to evaluate and decide the selection of suitable contractors in future tendering, and also to determine whether the performances of existing contractors is getting better or not, where they have received repeat contracts. The performance measurement system from this research can also be applied to those new potential contractors in future.

5.4 Recommendation for Further Research

This research focused only on Platform Construction Contractors for XYZ Company. In the upstream of oil and gas companies, there are other critical functions for which contractors must be hired. Hence, this research could be used as a guideline for further research by applying its concepts and methodology to other functions such as maintenance contractors, drilling contractors, and modification contractors.

Apart from that, although this research has developed a system for measuring contractor performance, however their performance in their next project is unknown. Hence, methods for predicting contractor performance could be studied in further research.

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APPENDICES

APPENDIX A

Summary of relative importance index and rank for factors affecting the performance of construction projects

Table 1: Summary of relative importance index and rank for factors affecting the performance of construction projects

Performance factors	Owner		Consultant		Contractor	
	RII	Rank	RII	Rank	RII	Rank
(1) **Cost factors**						
Market share of organization	0.600	54	0.709	39	0.726	39
Liquidity of organization	0.729	31	0.842	5	0.839	10
Cash flow of project	0.812	13	0.800	11	0.848	9
Profit of project	0.694	38	0.776	14	0.739	38
Overhead percentage of project	0.647	48	0.687	49	0.662	47
Project design cost	0.500	63	0.688	43	0.582	63
Material and equipment cost	0.812	14	0.776	14	0.813	16
Project labor cost	0.741	27	0.744	22	0.739	37
Project overtime cost	0.588	58	0.600	59	0.617	55
Motivation cost	0.600	54	0.584	61	0.609	58
Cost of rework	0.588	58	0.672	51	0.587	62
Cost of variation orders	0.565	62	0.688	43	0.662	46
Waste rate of materials	0.650	46	0.624	57	0.639	51
Regular project budget update	0.638	50	0.742	24	0.743	35
Cost control system	0.725	33	0.728	28	0.765	32
Escalation of material prices	0.847	5	0.832	7	0.889	4
Differentiation of currency prices	0.788	18	0.808	9	0.874	5
(2) Time factors						
Site preparation time	0.682	42	0.664	53	0.596	61
Planned time for construction	0.753	26	0.760	18	0.765	30
Percentage of orders delivered late	0.694	40	0.768	17	0.774	29
Time needed to implement variation orders	0.706	35	0.704	40	0.693	43
Time needed to rectify defects	0.659	44	0.672	51	0.639	50
Average delay in claim approval	0.650	46	0.728	28	0.765	30
Average delay in regular payments	0.824	11	0.776	14	0.839	11
Unavailable of resources	0.871	3	0.858	2	0.904	3
Average delay because of closures leading to materials shortage	0.941	1	0.896	1	0.943	1
(3) Quality factors						
Conformance to specification	0.882	2	0.808	9	0.822	13
Unavailability of competent staff	0.859	4	0.848	3	0.865	6
Quality of equipment and raw materials	0.835	9	0.840	6	0.861	7
Quality assessment system in organization	0.796	35	0.712	35	0.743	34
Quality training/meeting	0.659	45	0.728	28	0.674	44
(4) Productivity factors						
Project complexity	0.729	31	0.712	35	0.761	33
Number of new projects/year	0.600	54	0.688	43	0.630	53
Management-labor relationship	0.776	22	0.688	43	0.796	22
Absenteeism rate through project	0.776	20	0.688	43	0.743	36
Sequencing or work according to schedule	0.800	17	0.816	8	0.804	20

Performance factors	Owner		Consultant		Contractor	
	RII	Rank	RII	Rank	RII	Rank
(5) Client satisfaction factors						
Information coordination between owner and project parties	0.729	29	0.792	12	0.809	19
Leadership skills for project management	0.835	7	0.848	3	0.904	2
Speed and reliability of service to owner	0.718	34	0.744	22	0.822	13
Number of disputes between owner and project parties	0.753	24	0.728	28	0.720	40
Number of rework incidents	0.635	51	0.712	35	0.627	54
(6) Regular and community satisfaction sectors						
Cost of compliance to regulators requirements	0.600	54	0.648	55	0.604	59
Number of non-compliance events	0.635	51	0.624	57	0.614	56
Quality and availability of regulator documentation	0.647	49	0.736	25	0.653	48
Site condition problems	0.788	18	0.712	35	0.707	41
(7) People factors						
Employee attitudes	0.682	41	0.728	28	0.795	23
Recruitment and competence development	0.753	24	0.688	43	0.809	17
Employees motivation	0.765	23	0.696	42	0.791	24
Belonging to work	0.835	9	0.736	25	0.849	8
(8) Health and safety factors						
Application of health and safety factors in organization	0.700	37	0.728	28	0.787	25
Project location is safe to reach	0.694	38	0.704	40	0.774	28
Reportable accidents rate in project	0.729	29	0.680	50	0.600	60
Assurance rate of project	0.671	43	0.632	56	0.635	52
(9) Innovation and learning factors						
Learning from owner experience and past history	0.847	5	0.752	20	0.818	15
Learning from best practice and experience of others	0.824	12	0.760	18	0.822	12
Work group	0.776	20	0.736	25	0.787	27
Review of failures and solving them	0.824	12	0.752	20	0.809	17
(10) Environment factors						
Air quality	0.588	58	0.592	60	0.671	45
Noise level	0.565	61	0.512	63	0.613	57
Wastes around the site	0.635	51	0.584	61	0.619	49
Climate condition	0.729	28	0.656	54	0.707	41

Source: Enshassi et al. (2009)

APPENDIX B

Safety mean impact and weight factors and sub-factors

Table 2: Safety mean impact and weight of factors and sub factors

No.	Description of factors and sub-factors	Mean impact	Weight
1.0	**Site planning and housekeeping**	2.63	0.039
1.1	Site layout	2.96	0.38
1.2	Site means of access	2.76	0.35
1.3	Site illumination	2.16	0.27
2.0	**Welfare facilities**	2.78	0.042
2.1	First aid facilities	3.52	0.25
2.2	Food and drinking water facilities	2.16	0.16
2.3	Ambulance	3.36	0.24
2.4	Showers and eyewash fountains	2.88	0.21
2.5	Smoking area/toolkit and washing facilities	2.00	0.14
3.0	**Emergency/disaster planning and preparation**	4.00	0.060
3.1	Emergency response organization/procedures	4.00	0.50
3.2	Emergency response training/drills	4.00	0.50
4.0	**Signs, signals and barricades**	3.31	0.049
4.1	General signs (danderm caution, traffic, and accident prevention tags)	3.28	0.25
4.2	Flag men/wearing garment (red or orange)	3.08	0.23
4.3	Signaling direction (as per ANSI)	3.44	0.26
4.4	crane and hoist signal (as per ANSI)	3.44	0.26
5.0	**Handling, storage and use of materials**	2.87	0.043
5.1	Aisles and driveways	2.56	0.22
5.2	Fence and access gates	2.36	0.21
5.3	Arrangement of materials	2.64	0.23
5.4	Fire protection equipment	3.92	0.34
6.0	**Welding and cutting**	3.16	0.047
6.1	Handling of cylinders	2.68	0.17
6.2	Daily inspection of equipment	2.80	0.18
6.3	Adequate ventilation	2.80	0.18
6.4	Grounding/fire guard	3.80	0.24
6.5	Personal protective equipment	3.72	0.23
7.0	**Concrete, and concrete framework**	3.10	0.047
7.1	Work platform/guardrails	2.72	0.17
7.2	Grounded electric vibrator	3.24	0.21
7.3	Experienced workmanship	3.40	0.22
7.4	Shoring sketches/drawings on site	2.76	0.18
7.5	Forms/adequate shoring for support	3.36	0.22
8.0	**Crane and lifting equipment**	3.71	0.056
8.1	Lift plan on site	3.72	0.20
8.2	Licensed operators	3.84	0.21
8.3	Safe working load indicator/inspection stickers	3.64	0.20
8.4	Safety latches (hooks)	3.76	0.20
8.5	Rigger training	3.60	0.19
9.0	**Chemical handling**	3.27	0.049

No.	Description of factors and sub-factors	Mean impact	Weight
9.1	Proper identification/wearing signs (Arabic/English)	3.84	0.33
9.2	Adequate storage/usage	2.56	0.30
9.3	Emergency treatment	3.40	0.37
10.0	**Electrical equipment**	3.40	0.051
10.1	Temporary installation precautions	3.12	0.23
10.2	Lockout/tagging/wearing signs	3.44	0.25
10.3	Initial inspection/tests	3.32	0.24
10.4	Testing of grounds	3.72	0.28
11.0	**Handling, transportation and disposal of hazardous material and waste**	3.05	0.046
11.1	Hazard identification plan	3.80	0.42
11.2	Waste management plan	3.00	0.33
11.3	Disposal sites/disposal documents	2.36	0.26
12.0	**Personal protective equipment**	4.00	0.060
12.1	Head/eye/face/hand/foot, and hearing protection	4.00	0.34
12.2	Fall restraining/arresting devices	4.00	0.33
12.3	Breathing apparatus	4.00	0.33
13.0	**Fire prevention**	3.50	0.052
13.1	Adequate fire extinguishers/locations	4.00	0.23
13.2	Control of ignition sources/fire watches	3.40	0.19
13.3	Storage of flammable liquids/ combustible materials	3.64	0.21
13.4	Fire extinguisher training/drills	3.44	0.20
13.5	Fire extinguisher regular maintenance	3.04	0.17
14.0	**Transportation**	3.22	0.048
14.1	Vehicle condition/regular maintenance	3.00	0.19
14.2	Passengers seating/seat belts enforcement	3.00	0.19
14.3	Motor vehicle regulation (Saudi Arabia Government)	3.08	0.19
14.4	First aid equipment/fire extinguishers	3.60	0.22
14.5	Driver training	3.44	0.21
15.0	**Excavation, trenching and shoring**	3.36	0.050
15.1	Cave-in protection (shoring/ trench boxes/ sloping/ benching)	3.32	0.33
15.2	Excavation plan on site	3.00	0.30
15.3	Access, exist and walkways	3.76	0.37
16.0	**Scaffolding and ladders**	3.77	0.056
16.1	Adequate components and fittings (frame numbers/ base & sole plates/ plumb & level/ planking)	3.76	0.25
16.2	Experienced workmanship	3.72	0.25
16.3	Scaffold access and proper loading	3.68	0.24
16.4	Adequate scaffolding stability (guardrails/ toe boards/ secured ties/ foundations and cross bracing)	3.92	0.26
17.0	**Hand and power tools**	2.56	0.038
17.1	Overall condition/daily inspection	2.80	0.37
17.2	Individual tools precaution	2.40	0.31
17.3	Selection/training	2.48	0.32
18.0	**Mechanical equipment**	3.36	0.050

No.	Description of factors and sub-factors	Mean impact	Weight
18.1	Qualified and certified operators	3.52	0.35
18.2	Machinery guards and safety protection devices	3.64	0.36
18.3	Regular inspections and strict maintenance schedules	2.92	0.29
19.0	Ionization radiation	3.82	0.057
19.1	Health hazard identification	4.00	0.21
19.2	Protection against radiation (distance, time and shielding)	3.96	0.21
19.3	Adequate training and safe handling	3.88	0.20
19.4	Intensive inspection of each shift	3.64	0.19
19.5	Shipping/ transportation/ storage areas	3.60	0.19
20.0	Management involvement	4.00	0.060
20.1	Initiate/ administer company's safety policy	4.00	0.10
20.2	Know and adhere to the requirements of workmen's regulations	4.00	0.09
20.3	Ensure qualified and well trained supervisors	4.00	0.09
20.4	Consider safety at tendering, planning & contract	4.00	0.09
20.5	Institute and adhere to loss prevention program	4.00	0.09
20.6	Fix accountability of safety	4.00	0.09
20.7	Set a good personal example	4.00	0.09
20.8	Prepare hazard identification plan	4.00	0.09
20.9	Prepare emergency evacuation procedures	4.00	0.09
20.10	Communicate & share safety program activities, experience and results with others	4.00	0.09
20.11	Safety motivation (group meetings, literatures, film shows, posters, bulletin boards, incentives)	4.00	0.09

Source: Jannadi et al. (2001)

APPENDIX C

Contractor's Performance Measurement Tool

CONTRACTOR PERFORMANCE EVALUATION IN XYZ COMPANY

This questionnaire has been developed as a tool for the study of important factors that affect platform construction contractors' performance and to evaluate the performance of three contractors in their work in order to identify strengths and weaknesses of each contractor's performance. However, contractors' actual names will not be mentioned in the report. The result of this questionnaire will be used for studies in "Master of Science in Supply Chain Management" of Assumption University.

Please complete the enclosed questionnaire as thoroughly as possible. Please note that complete confidentiality will be maintained. Your time and effort in providing this vital and important information is greatly appreciated.

Part I: RESPONDENT INFORMATION

1. What is your job position?

O Project Manager 0 Project Engineer

O Construction site representative 0 Cost Controller/Planning

O Discipline engineer

2. Education Level

O Bachelor degree °Master Degree ◯Ph.D

3. Age

0 25-30 years old 0 31-35 years old 036-40 years old

O More than 40 years old

4. Which of the following work experience in platform construction project applies to you?

O Less than 5 years 0 5 – 10 years O10 — 15 years °More than 15 years

5. Gender

0 Male 0 Female

Part II: FACTORS AFFECTING CONTRACTOR'S PERFORMANCE

Please specify the level of the importance of the following factors that contribute to the overall performance of the wellhead platform contractor, where:

1 = Not Important
2= Slightly Important
3=Moderately Important
4= Very Important
5 = Extremely Important

Please mark ✓ in the box that corresponds to your opinion.

Performance Indicators	Level of importance				
	Extremely important		Moderately important		Not important
	5	4	3	2	1
1. Health & Safety					
1.1 Contractor's Environment Safety & Health program compliance with contract requirements and protective of workers, public, and the environment.	5	4	3	2	1
1.2 Contractor maintains a low incident rate of safety violations.	5	4	3	2	1
1.3 Contractor provides and complies with adequate safety training and plan.	5	4	3	2	
1.4 Contractor completes the project without any safety incidents.					
2. Quality of work					
2.1Contractor provides well researched and clearly identified submittals that matched contract requirements (i.e. proposed new vendor to project team).	5	4	3	2	1
2.2 Contractor corrects deficiencies in a timely manner and pursuant to their quality control plan.	5	4	3	2	1
2.3 Contractor completes all work with good workmanship	5	4	3	2	1

Performance Indicators	Level of importance				
	Most important				Not important
	5	4	3	2	1
and in conformance with the specifications.					
2.4 Quality of equipments and raw materials in the project.	5	4	3	2	1
2.5 Contractor performs quality inspections and documents findings to ensure repeat failures will not occur.	5	4	3	2	1
2.6 Contractor adherence to suggested solutions and their initiative to implement solutions	5	4	3	2	1
3. Cost **control**					
3.1 Contractor adherence to deliver at the contractual agreed-price.	5	4	3	2	1
3.2 Cost overrun and change proposals that contractor submits to company are reasonably priced and contain all appropriate supporting documentation.	5	4	3	2	1
3.3 Contractor adherence to anticipate, identify and control cost growth.	5	4	3	2	1
4.Timeliness of performance					
4.1Contractor adherence to complete the contract on the scheduled date	5	4	3	2	1
4.2 Contractor submits the progress schedule and progress reports as required.	5	4	3	2	1
4.3 Contractor successful in planning and proposing realistic schedules.	5	4	3	2	1
4.4 The tasks required under this effort are performed in a timely manner and in accordance with the performance schedule, deliverable schedule and period of performance of the contract.	5	4	3	2	1
4.5 Contractor provides timely resolution of all punch list items.	5	4	3	2	1
5.Management effectiveness					
5.1 Contractor plans for initial implementation of the project and achieves operation of task requirements once the contract began.	5	4	3	2	1
5.2 Contractor is reasonable and cooperative with client project team in response to changes in technical direction and correcting errors.	5	4	3	2	1

Performance Indicators	Level of importance
5.3 Contractor presents information and correspondence in a clear,concise, and professional manner.	
5.4 Contractor provides management personnel that are experienced with technical and administrative abilities to meet contractual requirements.	
5.5 Contractor utilize an effective project management system that included planning, budgeting, status tracking, reporting, baseline management, critical path analysis, and work breakdown structure.	5 4 3 2 1
6.Management of subcontractors	
6.1 Contractor hires quality subcontractors and effectively manages and coordinate their work.	5 4 3 2 1
6.2 Contractor hires, maintains and replaces as necessary qualified personnel and subcontractors/suppliers.	5 4 3 2 1
7. Contractor's Responsiveness	
7.1 Contractor acts promptly to resolve problems, ensuring compliance with contract requirements and safety regulations.	
7.2 Contractor is reasonable and cooperates to resolve problems, attends meetings as needed and maintains communication with the company to keep the project on schedule or minimize the delay.	
7.3 Contractor identifies problems as they occurred, suggested approaches to the problems; displayed initiative to solve problems and performed as a Team Member.	5 4 3 2 1
7.4 Contractor responds to warranty issues within the time frames specified in the contract.	5 4 3 2 1
8. Commitment to the Company's Satisfaction	
8.1 The contractor is committed to company satisfaction.	5 4 3 2 1
8.2 The contractor is able to successfully comply with the contract requirement.	5 4 3 2 1
8.3 Overall performance of contractor.	5 4 3 2 1

Part II: FACTORS AFFECTING CONTRACTOR'S PERFORMANCE

Please rank the importance of the following criteria for platform construction contractor's performance appraisal.

Please fill in your rank order in the spaces provided, using the numbers 1 through 8. (1 represents the most important criterion while 8 represent the least important criterion)

_____ Health & Safety

_____ Quality of work/services

_____ Cost Control

_____ Timeliness of Performance

_____ Management Effectiveness

_____ Management of subcontractor

_____ Contractor's Responsiveness

_____ Commitment to the company's satisfaction

<u>Part III:</u> CONTRACTOR'S PERFORMACNE MEASUREMENT

Please rate the performance of the following Contractors from 1-5, where;

1 refers to "Poor" Performance
2 refers to "Fair" Performance
3 refers to "Good" Performance
4 refers to "Excellent" Performance and
5 refers to "Outstanding" Performance

by writing the number in the space corresponding to each contractor.

Contractor's performance	Contractor score		
	Contractor AAA	Contractor **BBB**	Contractor **CCC**
1. Health & Safety			
1.1 Contractor's Environment Safety & Health program compliance with contract requirements and protective of workers, public, and the environment.			
1.2 Contractor maintained a low incident rate of safety violations.			
1.3 Contractor provided and complied with adequate safety training and plan.			
1.4 Contractor completed the project without any safety incidents.			
2. Quality of work /services			
2.1 Contractor provided well researched and clearly identified submittals that matched contract requirements (i.e. proposed new vendor to bid list).			
2.2 Contractor corrected deficiencies in a timely manner and pursuant to their quality control plan.			
2.3 Contractor completed all work with good workmanship and in conformance with the specifications.			
2.4 Quality of equipments and raw materials in project			
2.5 Contractor performed quality inspections and documents findings to ensure repeat failures didn't occur.			
2.6 Contractor adherence to suggest solutions and their initiative to implement solutions.			
3. Cost control			
3.1 Contractor adherence to delivered at the contractual			

Contractor's performance	Contractor score Contractor AAA	Contractor BBB	Contractor CCC
agreed- price.			
3.2 Cost overrun and change proposals that contractor submitted to company are reasonably priced and contained all appropriate supporting documentation.			
3.3Ability to anticipate, identify and control cost growth.			
4.Timeliness of performance			
4.1Contractor adherence to complete the contract on the scheduled date			
4.2 Contractor submitted the progress schedule and progress reports as required.			
4.3Contractor successful in planning and proposing realistic schedules.			
4.4The tasks required under this effort were performed in a timely manner and in accordance with the performance schedule, deliverable schedule and period of performance of the contract.			
4.5Contractor provided timely resolution of all punch list items.			
5.Management effectiveness			
5.1 Contractor plan for initial implementation of the project and achieve operation of task requirements once the contract began.			
5.2 Contractor was reasonable and cooperative with client project's team in response to changes in technical direction and correcting errors			
5.3 Contractor presented information and correspondence in a clear, concise, and businesslike manner			
5.4 Contractor provides management personnel that were experienced with technical and administrative abilities to meet contractual requirements.			
5.5 Contractor utilize an effective project management system that included planning, budgeting, status tracking, reporting, baseline management, critical path analysis, and work breakdown structure.			
6.Management of subcontractors			
6.1Contractor hired quality subcontractors and effectively managed and coordinated their work.			

Contractor's performance	Contractor score Contractor AAA	Contractor **BBB**	Contractor **CCC**
6.2 Contractor hired, maintained and replaced as necessary qualified personnel and subcontractors/suppliers.			
7. Responsiveness			
7.1 Contractor acted promptly to resolve problems, ensuring compliance with contract requirements and safety regulations.			
7.2 Contractor was reasonable and cooperated to resolve problems, attended meetings as needed and maintained communication with the company to keep the project on schedule or minimize the delay.			
7.3 Contractor identified problems as they occurred, suggested approaches to the problems; displayed initiative to solve problems and performed as a Team Member.			
7.4 Contractor responded to warranty issues within the time frames specified in the contract.			
8. Commitment to the Company's Satisfaction			
8.1 The contractor is committed to company satisfaction.			
8.2 The contractor is able to successfully comply with the contract requirement.			

9. Please rate the level of your satisfaction on each contractors from 1-5 (1= very low to 5= very high))

	Contractor AAA	Contractor **BBB**	Contractor **CCC**
9.1 Overall performance of Contractor is satisfactory	_____	_____	_____
9.2 Contractor is recommended for next tendering.	_____	_____	_____
9.3 In the overall picture, you feel satisfied with the Contractor.	_____	_____	_____
9.4 You feel good whenever you deal with the Contractor.	_____	_____	_____

THANK YOU FOR YOUR TIME IN COMPLETING THIS QUESTIONNAIRE

APPENDIX D

Key Evaluators Demographic Factors

Education

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Bachelor Degree	15	42.9	42.9	42.9
	Master Degree	20	57.1	57.1	100.0
	Total	35	100.0	100.0	

Age

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	25-30 years	7	20.0	20.0	20.0
	31-35 years	13	37.1	37.1	57.1
	36-40 years	10	28.6	28.6	85.7
	More than 40	5	14.3	14.3	100.0
	Total	35	100.0	100.0	

Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	26	74.3	74.3	74.3
	Female	9	25.7	25.7	100.0
	Total	35	100.0	100.0	

APPENDIX E

Contractor's performance assessment form for **XYZ** Company

Table 3: Contractor's performance assessment form for XYZ Company

[illegible]	[illegible]	Outstanding	[illegible]	Good	[illegible]	[illegible]
1. Health & Safety	**0.2201**					
1.1 Contractor's Environment Safety & Health program compliance with contract requirements and protective of workers, public, and the environment.	0.2448	*5.388*	*4.3104*	*3.2328*	*2.1552*	*1.0776*
1.2 Contractor maintained a low incident rate of safety violations.	0.256	*5.6329*	*4.5063*	*3.3 798*	*2.2532*	*1.1266*
1.3 Contractor provided and complied with adequate safety training and plan.	0.2464	*5.423*	*4.3384*	*3.2538*	*2.1692*	*1.0846*
1.4 Contractor completed the project without any safety incidents.	0.2528	*5.563*	*4.4504*	*3.3378*	*2.2252*	*1.1126*
Total Score	**1**	**22.0069**	**17.6056**	**13.2042**	**8.8028**	**4.4014**
2. Quality of Work	**0.1747**					
2.1 Contractor provided well researched and clearly identified submittals that matched contract requirements (i.e. propose new vendor to bid list).	0.1553	*2.7125*	*2.17*	*1.62 75*	*1.085*	*0.5425*
2.2 Contractor corrected deficiencies in a timely manner and pursuant to their quality control plan.	0.1692	*2.9554*	*2.3 643*	*1.7733*	*1.1822*	*0.5911*
2.3 Contractor completed all work with good workmanship and in conformance with the specifications.	0.1819	*3.1 781*	*2.5425*	*1.9069*	*1.2 712*	*0.6356*

2.4 Quality of equipments and raw materials in project.	0.1727	3.0162	2.4129	1.8097	1.2065	0.6032
2.5 Contractor performed quality inspections and documents findings to ensure repeat failures did not occur.	0.1669	2.9149	2.332	1.749	1.166	0.583
2.6 Contractor adherence to suggest solutions and their initiative to implement solutions.	0.1541	2.6923	2.1538	1.6154	1.0769	0.5385
Total Score	**1**	**17.4694**	**13.9755**	**10.4817**	**6.9878**	**3.4939**
3. Cost Control	**0.1193**					
3.1 Contractor adherence to delivery at the contractual agreed-price.	0.3522	4.2035	3.3628	2.5221	1.6814	0.8407
3.2 Cost overrun and change proposals that contractor submitted to company are reasonably priced and contained all appropriate supporting documentation.	0.331	3.9496	3.1597	2.3697	1.5798	0.7899
3.3 Contractor adherence to anticipate, identify and control cost growth.	0.3168	3.7803	3.0242	2.2682	1.5121	0.7561
Total Score	**1**	**11.9333**	**9.5467**	**7.16**	**4.7733**	**2.3867**
*4. Timeliness of Per **ormance***	**0.1569**					
4.1Contractor adherence to complete the contract on the scheduled date	0.2219	3.4819	2.7855	2.0891	1.3927	0.6964

[illegible]	[illegible]	[illegible]	[illegible] Sco	[illegible]	[illegible]	[illegible]
4.2 Contractor submitted the progress schedule and progress reports as required.	0.1942	*3.0466*	*2.4373*	*1.828*	*1.2187*	*0.6093*
4.3 Contractor successful in planning and proposing realistic schedules.	0.1997	3.1337	*2.5069*	*1.8802*	*1.2535*	*0.6267*
4.4The tasks required under this effort were performed in a timely manner and in accordance with the performance schedule, deliverable schedule and period of performance of the contract.	0.2039	*3.199*	*2.5592*	*1.9194*	*1.2796*	*0.6398*
4.5 Contractor provided timely resolution of all punch list items.	0.1803	*2.829*	*2.2632*	*1.6974*	*1.1316*	*0.5658*
Total Score	1	15.6901	12.5521	9.4141	6.2761	3.138
S. meet Effectiveness	0.0839	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5.1 Contractor was reasonable and cooperative with client's project team in response to changes in technical direction and correcting errors	0.2686	2.2528	1.8023	1.3517	0.9011	0.4506
5.2 Contractor presented information and correspondence in a clear, concise, and businesslike manner	0.2385	2.0009	1.6007	1.2005	0.8003	0.4002

[redacted] 5.3 Contractor provides management personnel that were experienced with technical and administrative abilities to meet contractual requirements.	0.2438	2.0453	1.6363	1.2272	0.8181	0.4091
5.4 Contractor utilizes an effective project management system that included planning, budgeting, status tracking, reporting, baseline management, critical path analysis, and work breakdown structure	0.2491	2.0898	1.6718	1.2539	0.8359	0.418
Total Score	**1**	**8.3888**	**6.7110**	**5.0333**	**3.3555**	**1.6778**
6.Management of Subcontractors	0.0681	[redacted]				
6.1 Contractor hired quality subcontractors and effectively managed and coordinated their work.	0.5187	3.5296	2.8237	2.1178	1.4119	0.7059
6.2 Contractor hired, maintained and replaced as necessary qualified personnel and subcontractors/suppliers.	0.4813	*3.2757*	*2.6206*	*1.9654*	*1.3103*	*0.6551*
Total Score	**1**	**6.8054**	**5.4443**	**4.0832**	**2.7221**	**1.3611**
7. Contractor's Responsiveness	**0.0819**					
7.1 Contractor acted promptly to resolve problems, ensuring compliance with contract requirements and safety regulations.	0.2648	*2.1678*	*1.7342*	*1.3007*	*0.8671*	*0.4336*

7.2 Contractor was reasonable and cooperated to resolve problems, attended meetings as needed and maintained communication with the company to keep the project on schedule or minimize the delay.	0.2561	*2.0965*	*1.6772*	*1.2579*	*0.8386*	*0.4193*
7.3 Contractor identified problems as they occurred, suggested approaches to the problems; displayed initiative to solve problems and performed as a Team Member.	0.2491	*2.0394*	*1.6315*	*1.2236*	*0.8158*	*0.4079*
7.4 Contractor responded to warranty issues within the time frames specified in the contract.	*0.23*	*1.8825*	*1.506*	*1.1295*	*0.753*	*0.3765*
Total Score	**1**	**8.1862**	**6.5489**	**4.9117**	**3.2745**	**1.6372**
8. Commitment to the ***Com an 's Satis*** *action*	**0.0952**					
8.1 The contractor is able to successfully compile with the contract requirement.	0.5016	*4.775*	*3.82*	*2.865*	*1.91*	*0.955*
8.2 Overall performance of contractor.	0.4984	*4.7448*	*3.7959*	*2.8469*	*1.8979*	*0.949*
Total Score	**1**	**9.5199**	**7.6159**	**5.7119**	**3.8079**	**1.904**
Overall performance score		**100**	**80**	**60**	**40**	**20**

Source: Author

APPENDIX F

Contractor's performance assessment form divided by the number of sub-factor items for XYZ Company

Table 4: Contractor's performance assessment form divided by the number of sub-factor items for XYZ Company

[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
1. Health & Safety	**0.2201**					
1.1 Contractor's Environment Safety & Health program compliance with contract requirements and protective of workers, public, and the environment.	0.2448	*1.3470*	*1.0776*	*0.8082*	*0.5388*	*0.2694*
1.2 Contractor maintained a low incident rate of safety violations.	0.256	*1.4082*	*1.1266*	*0.8450*	*0.5633*	*0.2816*
1.3 Contractor provided and complied with adequate safety training and plan.	0.2464	*1.3558*	*1.0846*	*0.8135*	*0.5423*	*0.2712*
1.4 Contractor completed the project without any safety incidents.	0.2528	*1.3908*	*1.1126*	*0.8344*	*0.5563*	*0.2781*
Total Score	**1**	*5.5017*	*4.4014*	*3.3010*	*2.2007*	*1.1003*
2. Quality of Work	**0.1747**	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2.1 Contractor provided well researched and clearly identified submittals that matched contract requirements (i.e. propose new vendor to bid list).	0.1553	*0.4521*	*0.3617*	*0.2713*	*0.1808*	*0.0904*
2.2 Contractor corrected deficiencies in a timely manner and pursuant to their quality control plan.	0.1692	*0.4926*	*0.3941*	*0.2955*	*0.1970*	*0.0985*
2.3 Contractor completed all work with good workmanship and in conformance with the specifications.	0.1819	*0.5297*	*0.4238*	*0.3178*	*0.2119*	*0.1059*

[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2.4 Quality of equipments and raw materials in project.	0.1727	0.5027	0.4022	0.3016	0.2011	0.1005
2.5 Contractor performed quality inspections and documents findings to ensure repeat failures didn't occur.	0.1669	0.4858	0.3887	0.2915	0.1943	0.0972
2.6 Contractor adherence to suggest solutions and their initiative to implement solutions.	0.1541	0.4487	0.3590	0.2692	0.1795	0.0898
Total Score	**1.0000**	*2.9116*	*2.3293*	*1.7469*	*1.1646*	*0.5823*
3. Cost Control	**0.1193**					
3.1 Contractor adherence to delivered at the contractual agreed- price.	0.3522	1.4012	1.1209	0.8407	0.5605	0.2802
3.2 Cost overrun and change proposals that contractor submitted to company are reasonably priced and contained all appropriate supporting documentation.	0.3310	1.3165	1.0532	0.7899	0.5266	0.2633
3.3 Contractor adherence to anticipate, identify and control cost growth.	0.3168	1.2601	1.0081	0.7561	0.5040	0.2520
Total Score	**1.0000**	*3.9778*	*3.1822*	*2.3867*	*1.5911*	*0.7956*
4. Timeliness of Performance	**0.1569**					
4.1Contractor adherence to complete the contract on the scheduled date	0.2219	0.6964	0.5571	0.4178	0.2785	0.1393

[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
4.2 Contractor submitted the progress schedule and progress reports as required.	0.1942	*0.6093*	*0.4875*	*0.3656*	*0.2437*	*0.1219*
4.3 Contractor successful in planning and proposing realistic schedules.	0.1997	*0.6267*	*0.5014*	*0.3760*	*0.2507*	*0.1253*
4.4The tasks required under this effort were performed in a timely manner and in accordance with the performance schedule, deliverable schedule and period of performance of the contract.	0.2039	*0.6398*	*0.5118*	*0.3839*	*0.2559*	*0.1280*
4.5 Contractor provided timely resolution of all punch list items.	0.1803	*0.5658*	*0.4526*	*0.3395*	*0.2263*	*0.1132*
Total Score	**1**	*3.1380*	*2.5104*	*1.8828*	*1.2552*	*0.6276*
5.Management Effectiveness	0.0839					
5.1 Contractor was reasonable and cooperative with client project's team in response to changes in technical direction and correcting errors	0.2686	*0.5632*	*0.4506*	*0.3379*	*0.2253*	*0.1127*
5.2 Contractor presented information and correspondence in a clear, concise, and businesslike manner	0.2385	*0.5002*	*0.4002*	*0.3001*	*0.2001*	*0.1000*

[redacted]			[redacted]		[redacted]	[redacted]
5.3 Contractor provides management personnel that were experienced with technical and administrative abilities to meet contractual requirements.	0.2438	*0.5113*	*0.4091*	*0.3068*	*0.2045*	*0.1023*
5.4 Contractor utilize an effective project management system that included planning, budgeting, status tracking, reporting, baseline management, critical path analysis, and work breakdown structure	0.2491	*0.5225*	*0.4180*	*0.3135*	*0.2090*	*0.1045*
Total Score	**1**	*2.0972*	*1.6778*	*1.2583*	*0.8389*	*0.4194*
6.Management of Subcontractors	0.0681	[redacted]				
6.1 Contractor hired quality subcontractors and effectively managed and coordinated their work.	0.5187	*1.7648*	*1.4119*	*1.0589*	*0.7060*	*0.3530*
6.2 Contractor hired, maintained and replaced as necessary qualified personnel and subcontractors/suppliers.	0.4813	*1.6379*	*1.3103*	*0.9827*	*0.6552*	*0.3276*
Total Score	**1**	*3.4027*	*2.7221*	*2.0416*	*1.3611*	*0.6805*
*7. Contractor's Res,**onsiveness***	**0.0819**	[redacted]				
7.1 Contractor acted promptly to resolve problems, ensuring compliance with contract requirements and safety regulations.	0.2648	*0.5419*	*0.4336*	*0.3252*	*0.2168*	*0.1084*

[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
7.2 Contractor was reasonable and cooperated to resolve problems, attended meetings as needed and maintained communication with the company to keep the project on schedule or minimize the delay.	0.2561	*0.5241*	*0.4193*	*0.3145*	*0.2097*	*0.1048*
7.3 Contractor identified problems as they occurred, suggested approaches to the problems; displayed initiative to solve problems and performed as a Team Member.	0.2491	*0.5099*	*0.4079*	*0.3059*	*0.2040*	*0.1020*
7.4 Contractor responded to warranty issues within the time frames specified in the contract.	0.23	*0.4706*	*0.3765*	*0.2824*	*0.1883*	*0.0941*
Total Score	**1**	***2.0465***	***1.6372***	***1.2279***	***0.8186***	***0.4093***
8. Commitment to the Company's Satis action	**0.0952**	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
8.1 The contractor is able to successfully compile with the contract requirement.	0.5016	*2.3875*	*1.9100*	*1.4325*	*0.9550*	*0.4775*
8.2 Overall performance of contractor.	0.4984	*2.3724*	*1.8979*	*1.4235*	*0.9490*	*0.4745*
Total Score	**1**	***4.7599***	***3.8079***	***2.8560***	***1.9040***	***0.9520***
Overall performance score	[redacted]	**27.8355**	**22.2684**	**16.7013**	**11.1342**	**5.5671**

Source: Author