

The ABC Wind Power Station Construction Project Management Performance Study

15356-Project Performance Improvement

Yi Gao

11672096

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Abstract

At the present, there are too many academic researches concentrated on the corporation performance evaluation in China, but there is lack of researches consider about the construction project performance evaluation. Because of this, it is difficult for the managers to give correct evaluations in assess the construction projects even it may cause profit losses to the corporations by making the wrong decisions.

With the construction market competition intense more and more in the wind power station today, the developers also have more and more requests to the construction corporations, especially to the constructing quality, safety and environment protection. Because of this, it is a critical problem which is the performance evaluation of wind power construction project to be paid more and more attention by the publics.

The study analyzed the market environment for the wind power station developers and did some researches and analyses. By integrating the characteristics of the construction project performance evaluation and the wind power station projects, it made a performance analysis for the ABC wind power station based on the project quality, schedule, cost and other part of project management. Then there are some project performance improvement suggestions in the next for the wind power station construction projects.

Key words: Project performance management, wind power station construction project, performance evaluation, construction management, project performance improvement

1. Introduction

With the economy developing fast, the competition in the market of power stations is also getting more intense. The developers ask more from the contractors especially on the area of quality, safety, environment protection and so on. Because of this, the performance evaluation in the wind power station construction projects is paid more and more attention by the developers. The wind power station developers have explored much on the performance evaluation and then they established their own performance evaluation system. But some of the systems are not perfect enough, there are some problems in the systems such as the evaluation standard is not clear, the indicator choosing method is not scientific, the evaluators are lack of experience and so on.

According to this, it requires to have a full image of evaluating the wind power station construction project in order to evaluate the project objectively and comprehensively. This evaluation, on the one hand it is good for the corporations to catch the various projects in the aspects of technology and management of the strength and the social, economic, service oriented, is advantageous to the construction enterprises in accordance with the advantage of project resource allocation and classified guidance (Cao 2003), on the other hand it is good to the corporations to understand the shortages and fortes of their corporations and then it is able to make the leaders to adjust the strategies and improve their abilities (Shan 2005). At the same time, it is able to form a conducive to macroeconomic regulation and control of the incentive mechanism, become a kind of power to promote the development of competition especially to the wind power developing corporations (Guo 2012).

Construction projects are the main resources of profit to a construction corporation. Project management team is directly the effective team of the construction corporation .It is a complex management Long life cycle organization (Xu 1999). When facing the more and more competed market, it is the main problem for the construction corporation manager which is to improve their performance and profit by construction project performance management. At present, the performance management is one of the most important management methods for the corporations to get more profit. Performance management based on the establishment of the corporation strategic target decomposition performance evaluation, performance results for corporation daily management activities, to motivate employees continuously improve performance, from the surface to reach the company's strategy and goals (Ray 2004). The project performance system is a critical method for the corporations to improve their management level and some relevant indicators.

2. The Theories of the Performance Evaluation

2.1 Project management performance evaluation theory foundation

Project performance evaluation refers to a construction corporation in project construction process using the mathematical method and management theory, adopt the index system of a specific reference to a unified evaluation criterion according to certain procedures, through quantitative qualitative analysis on the project in a certain period and the whole life cycle of management benefit and management performance, to make objective and fair and accurate comprehensive judgment. Then the corporation is able to evaluate the work of a project management team. The purpose is to confirm that the project department work achievement, and improve the workings of a project department, in order to improve the work efficiency and management efficiency. Some of the researchers in China have pointed some evaluating method. Feng Lixia (2010) pointed the construction project performance drivers' evaluation structure. Chen Shijin (2009) pointed that the corporation is able to evaluate the performance from the progress, safety, quality, cost and organization management. Wang Yan (2007) pointed that the corporation is able to evaluate the performance from cost, quality, progress, payment, site safety and contracts.

2.2 Management by objectives

Management by objectives refers to the top of the organization, according to the need of the situation facing the organization and work out a certain period of time to achieve the overall goal of organization management activity Then layers of implementation and asked for subordinate departments and each employee executives, according to the higher targets and guarantee measures to form a system of target, then finish the goal as the basis of each department or individual performance (Yin 2003).

2.3 Key Performance Indicators

Key Performance Indicators (KPI) is an effective tool of breaking down the target in an organization. KPI is made of operation, finance and organization. When making a KPI, people need to consider about the target of the corporation, individual visions and connected the clients' requirements. KPI should not be too much, it is required to be controlled, calculated detailed. When making the KPI, it needs to follow the principle of SMART. S is specific, M is measurable, A is attainable, R is realistic and T is time-bound.

In the study, I made the evaluation system from the followings according to the KPI method and the real situation of construction management.

1. Cost effective management indicators. Includes cost management etc.
2. Science and technology quality management. Includes quality management etc.
3. Other basis management indicators. Includes engineering management etc.

2.4 Evaluation process theory

The evaluation process includes seven parts which are ensuring the evaluation target, getting the evaluating information, establishing the evaluation indicators, making the evaluation

standard, choosing evaluation method, judgment and analysis report. The establishing, making and choosing are the core and also the main point in this study.

1. Establishing the evaluation indicators

Performance evaluation system concerns about the evaluation objects and the relevant sections of company goals, known as the KPIs. These KPIs embodied on the evaluation index of the financial aspects of key performance indicators (KPI) have, such as profits and capital control indicators. How to KPI accurately reflected in the specific measure is an important issue in the performance evaluation system design.

2. Making the evaluation standard

Evaluation standard is a standard measure of evaluation objects. Each evaluation indicator has a specific standard. From the point of the relationship between the evaluation objects and environment, evaluation standard on behalf of the environment on the requirements of the evaluation objects. Therefore, it is objective as the change of environment, environmental requirement for evaluation objects are also changing. Therefore, the evaluation standard can sometimes vary according to the environment of the evaluation objects

3. Choosing the evaluating method

At present evaluation method has dozens to hundreds of, such as analytic hierarchy process (ahp), the efficacy coefficient method, the optimal power method, fuzzy evaluation method and comprehensive index method, data envelopment analysis, cluster analysis and so on. But each kind of evaluation method include two aspects: one is to solve not commensurability between evaluation index assignment problem that standardization, the other is to build an evaluation function to weigh the comprehensive utility or overall level of evaluation objects. This study will adopt the DEA method according to the real situation of the ABC wind power station construction system.

3. The Performance Evaluation System of the ABC Wind Power Construction Project

3.1 The performance evaluation system of ABC wind power station construction project

Establish the ABC wind power station construction project performance evaluation system according to the project quality, project schedule, project management and the funds management. The detail is in the table 3-1.

3.1.1 The evaluation of project quality

Quality management system is the quality control program internal a corporation. It was established based on a various systems in the corporation. It is to strength the quality management activities in design, produce, check, sale, using and the whole process of project management.

Construction quality pass rate = $\text{Passing subprojects/all subprojects} * 100\%$

Construction quality distinction rate = $\text{Distinction subprojects/ all subprojects} * 100\%$

Accident rate, it is to reflect whether there is an accident happened and the loss situation.

Monitoring, it is to evaluate the project performance of Project Management Corporation according to the situation of project management situations.

3.1.2 The evaluation of project schedule

Wind power station construction project of the actual duration control within the scope of the contract duration control, schedule control effect is good. Otherwise, the control is poor.

Rate of completing as requests = $\text{Planned schedule/actual schedule} * 100\%$

Rate of rebuild, it reflects the developers' satisfaction of the project construction management and construction quality and so on.

Time advanced rate = $\text{(Planned duration – actual duration)/ planned duration} * 100\%$

3.1.3 The evaluation of project management

Safety control management. It is able to evaluate according to whether the project management corporation establishes a perfect safety control plan, monitors the construction corporation establish a safety system, establish an environment protection plan and so on.

Organizational structure and human resources. Organizational structure is able to evaluate the performance according to whether the management team of the project management corporation is perfect and so on. The human resource is to evaluate the project management corporation (PMC) performance according to the abilities of the project management team and so on.

Environment project. It is to evaluate the effect of operating the project which the project leads the positive or negative effect to the environment.

Contracts. Default is less means the PMC control effect is better.

3.1.4 The evaluation of project funds management

Cost management. The indicator is to evaluate the cost control situation according to calculate the cost and function of each unit and then compare it with similar project in order to evaluate the cost situation. .

Fund efficiency. Fund efficiency is the financial target of maximizing the corporation profit.

Table 4.1 the Performance Evaluation System of the ABC Wind Power Construction Project

Target level	Principle level	Indicator level
The Performance Evaluation System of the ABC Wind Power Construction Project	Project Quality	Quality Management System
		Construction quality pass rate
		Construction quality distinction rate
		Accident rate
		Monitoring
	Project Schedule	Rate of completing as requests
		Project time
		Rate of rebuild
		Time advanced rate
	Project management	Safety control management
		Organization structure
The Performance Evaluation System of the ABC Wind Power Construction Project	Project management	Environment protect
		Contract
	Funds management	Cost management
		Fund efficiency

3.2 The main applying characteristics and indicator choosing principle of DEA

The choosing principles of DEA input and output indicators

According to the researches, to choose the DEA indicators, we should follow the next four principles

1. Purposiveness. Selecting evaluation indicators should consider implementing evaluation purpose, and can fully reflect the evaluation purpose.
2. Cleanness. It needs to consider about the number of evaluation indicators. A large number of input and output indicators will lead to effective DMU number increase, thereby reducing the DEA method of evaluation function, the evaluation index should be purpose for lean as far as possible.
3. Relatedness. It needs to consider the connection between the input indicator and output indicator. The choices are logically related, rather than numerical related indicators.
4. Diversity. In a large, evaluation target usually have different sides, it needs to consider the diversity of input and output indicator system.

The four basic principles are good method to choose the DEA indicator system. The purposiveness is the most basic principle, but if you only consider about it, there will be too many indicators. Cleanness is to coordinate with purposiveness. Relatedness and diversity give the coordinating method and are helpful to establish the indicator system.

4. The application of Performance Evaluation System of the ABC Wind Power Construction Project

4.1 The application

According to the principles of choosing the DEA input and output indicators, the evaluation indicators of the ABC wind power station construction project are the followings,

Table 4-1 Input and Output indicators

Input indicators	Quality Management System
	Monitoring
	Time advanced rate
	Safety control management
	Environment protect
	Contract
	Cost management
	Organization structure
Output indicators	Construction quality pass rate
	Construction quality distinction rate
	Accident rate
	Rate of completing as requests
	Rate of rebuild
	Fund efficiency

According to the data, the ABC wind power station construction project performance evaluation indicators information is the following in table 4-2

Table 4-2 Performance evaluation indicators information

Target level	Principle level	Indicator level	Construction Corporations			
			A	B	C	D
The Performance Evaluation System of the ABC Wind Power Construction Project	Project Quality	Quality Management System	0.95	0.93	0.90	0.90
		Construction quality pass rate	100%	100%	100%	100%
		Construction quality distinction rate	98%	95%	94%	95%
		Accident rate	0	0	0	0
		Monitoring	0.95	0.93	0.95	0.93
	Project Schedule	Rate of completing as requests	88.5%	85.2%	85.7%	85.7%
		Rate of rebuild	0	0	0	0
		Time advanced rate	3%	2%	2%	2%
	Project management	Safety control management	2	1	1	1

Continued table

The Performance Evaluation System of the ABC Wind Power Construction Project	Project management	Organization structure	0.94	0.90	0.90	0.91
	Project management	Environment protect	0.98	0.98	0.98	0.98
		Contract	0.99	0.99	0.98	0.98
	Funds management	Cost management	0.95	0.94	0.93	0.93
Fund efficiency		0.91	0.92	0.92	0.92	

According to the calculating, the result is the following in table 4-3

Construction Corporations	DEA Score	Position
A	103.27%	1
B	101.10%	3
C	94.98%	4
D	101.93%	2

According to the result, among the four construction corporations in the ABC wind power station construction project, the best corporation is A, the second is D, the third is C, the fourth is C. At the same time, as the DEA score is over 100%, it means the cost and the profit is good.

4.2 The reason analysis of performance differences

4.2.1 Construction quality

Construction engineering is a very complicated process and there are many factors to affect the project quality. Therefore, it is necessary to improve the ability of managers, engineers and relevant people in order to guarantee the quality of construction engineering. And also the corporations need to improve the quality management system of materials and engineering techniques. According to these two methods, it is able to improve the performance.

4.2.2 Different human resource quality makes the performance difference

The employees are the core in productivity. They are key determinants of technological progress. Although there are many project management teams in China, the performance of project management is not very good. It shows an image that there are too many people in project management but lack of high professional talents. It means that project management teams need high professional talents to improve the performance instead of more teams.

4.3 Suggestions of performance improvement

As a kind of excellent performance evaluation method, DEA can not only evaluate the samples, but also give suggestions of improving the performance according to the result of evaluation. It is able to compare the inefficient sample and efficient sample. From this vision, it is able to decrease the cost and increase the profit of a corporation with DEA method.

4.3.1 Improve the construction quality

Establish quality assurance management agencies and define procedures and quality responsibility of the corresponding. It is able to guarantee under the quality monitoring system to ensure product quality standards through the first-class quality management activities. Establish and improve a project quality management system which is led by the project manager. Checking the system of the construction quality inspection, and shall be responsible to inspect the results of evaluation. At the same time, it requires to have a good deal with the relationship with construction supervisor of the company and its subordinate departments well.

4.3.2 Control the project schedule

Firstly, it requires improving the management team, selecting well-experienced and professional people to make up the project management team. The need to perform the function command abides by the contract at the scene and be responsible to the developer, obey the supervision, coordination of construction to ensure construction tasks completed on schedule. Secondly, it requires to make a reasonable arrangements and implement short-term network planning control to the construction of regional blocks are divided into four parallel operation, each area using flow operation phases network planning, determine the stage focus, strictly arranged according to the plan of network to construct. At last, the corporations can also implement internal contracting responsibility system for the people who participate in the project. It is able to utmost to activate the worker's enthusiasm and creativity.

4.3.3 Funds management

To improve the construction cost management, it means to ensure the construction cost reasonable and control it efficiently. The target is not only to control the investment in a reasonable estimate but also control the investment profit in using the investment, human resources and materials. With the economy developed, the construction cost management is also facing many new problems, it is necessary to make it into a systematic, standardized and legalized way.

1. Feasibility analysis

The environmental situation of construction projects are very complicated especially affected by the geographic environment and climate. Because of this, the construction corporations need to analyze the situation deeply.

2. Cost management in the whole process

Construction corporations in the process of bidding to the construction unit to pay bid bond, the financial sector to establish a bid bond subsidiary ledger, and on the date of the deposit amount on every deal and the debtor accomplish know fairly well. Financial department to get in touch with market management department, within the time stipulated in the tender documents to carry out the personnel management department is responsible for the collection so that enterprises can recover in time deposit

4.3.4 Construction safety management

Safety management is one of the most important activities in the construction project to a construction corporation (Cong 2003). The safety management is also one of the successful

factors to the destiny of a construction corporation. A safety working environment can bring social reputation and economic benefits to corporations. Otherwise it will bring huge losses to the corporations. Firstly, do the safety education and training of the worker's safety education should be a compulsory course, and should have planned long-term and systemic. Safety education should be planned by the enterprise human resources department in worker unified education training plan. Secondly, do a good job of hazard identification and control is a comprehensive corporation safety production work one of the important work. The hazards identified accurately and timely and effective control of hazard identification and control is a prior control, effective control of safe production only in advance to avoid and reduce the happening of the accident.

5. Conclusion

The study makes the ABC wind power station construction project performance evaluation system based on the project evaluation and the characteristics of wind power station project and much data of the project.

The main works of the study are

1. Introduce the performance evaluation theory. It is the basic knowledge of making the evaluation system of the ABC wind power station construction project.
2. Did many researches to understand the basic situations of the project. It is the realistic data of making the system.
3. Make the performance evaluation system for the ABC wind power station construction project according to the researches, performance evaluation principle and the characteristics of the ABC wind power station construction system.
4. Using the DEA evaluating method into the project and then establishing the performance evaluation system. It is a good experience to use the system in other relevant projects.

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