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Sand Table Simulation Twin towers Project Cost Based on Project Management Research

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Abstract: By using the project management Sand Table tool, the article analyzed the project construction scheme. Considering the factors such as time, cost and resources, we selected the best one from alternatives. Finally, we got the cost of the project, which can be used by owners and contractors.

Keywords: Sand Table; Alternatives; Compare and Select; Cost

1. Introduction

Engineering cost is the money which contractors use to implement the contracted project and achieve quality standards. The cost is used for getting labor, materials, equipment, as well as for the payment of management fees and taxes according to regulations [1]. In engineering project bidding activities, in order to reduce the total investment of the project for owner and reduce the project construction cost, you need to master the project at the lowest cost. This can reduce the cost as much as possible when bidding the tender control price and pre-tender estimate, thereby reducing the tendering units of tender offer, to gain the initiative in the bidding. For the contractor to have the lowest cost of the project and the project construction of optimal solution, in the bidding stage, if bid times is the same price, you can earn more profit; If fixed his profit space, can reduce their bid price quotations, so as to greatly increase the success rate of his bid. Project at the lowest cost price to give the owner and the contractor the huge help, the owner and the contractor also has a pressing need to cost price. Therefore, for the study of the engineering project cost is of great significance.

2. Research approaches

The current engineering basically has the following several kinds of method to calculate the cost price, on the market at present the main is by bill of quantities valuation mode, through the quota valuation in the form of the owner to use local norm, the tendering units to use the enterprise ration of the enterprise; Another is by simulation, plus project based on BIM, 5 d (3 d entity, time, WBS) relational database, establish data associated with the cost of time, space, the relationship between the process dimension, achieve actual cost efficient processing and data analysis. Another is through the sand table simulation, sand building in the virtual experiment of engineering cost research project on the environment, according to the existing market resources for the safety of the project, risk prevention inputs such as the rainy season, labor service export price, materials, heavy machinery leasing and transportation price of basic conditions of the project, the progress through the cross road map plan, make a planning scheme, the optimized project, it is concluded that the final result.

From students perspective, access to the general only list valuation and sand table simulation of these two kinds of pricing mode, this paper research to the problem from the Angle of sand table simulation can provide a very realistic simulation environment, with a fresh perspective for management improvement path, understanding and correct errors in the error, and will learn about the management ideas and methods of good practice and use in the practical work, also can experience the whole process from start to completion inspection and acceptance of the project. Sand table simulation is no longer a hollow concept and theory, but extremely precious practical experience and deep understanding and comprehension.

3. Principle of sand table experiment

3.1. Principle of traditional sand table

Sand was first used in military operations command, simulated topography and military intelligence; With the development of the sand table experiment, in recent years, gradually be applied to building development and layout, market and enterprise operation and management, the implementation of the project control, etc. Project management sand table is combined with the construction conditions, market environment and formulate the corresponding resource information, let participants experience project decision-making, project planning, financing, material procurement, engineering change and sub-

mitted to the settlement of a series of activities, through the intuitive sand table simulation project the whole process from start to completion of [2].

3.2. Project management principle of sand table

Modern project management sand table is borrowed from intuitive layout props to project director and project the main participants in the process of project implementation and mining talent development, communication and management, the innovation of the decision-making ability, better understand the sand table simulation form of project operation process. By simulating the whole process of management and operation, broaden the perspective of project management, strengthen the consciousness of market-oriented project decision. In the construction phase of the project manager as the core of the project cost control system, building engineering project cost management responsibility system.

The cost price (regardless of the financing situation), including labor, materials, mechanical fee, management fee and risk fee, temporary facilities construction fees and taxes. Among them, the artificial cost including labor shift into appearance fee, service fee, DaiGong fee; Cost of raw materials including raw materials, finished products materials, plastic materials transportation, rent. In the process of construction, can choose to purchase of raw materials or finished products materials, but if the purchase of raw materials, you need to build and raw materials warehouse leasing processing machinery for raw materials for processing, until the finished product. If buying finished product accumulation, also need to build the finished material warehouse. Machinery cost including transportation, machinery rental fees; Risk fee includes safety input and the rainy season, etc; Temporary facilities including raw material and finished product warehouses, templates, warehouse, service dormitory, etc.; Taxes per month to party a for base amount to calculate. To project completion, temporary facilities can be carried out in accordance with the 50% of its depreciation, in addition, if the time limit for a project in advance, to be able to get the reward, the two costs are constituted part of the income. Thus we can get the cost price calculation formula: the cost price = labor cost price + cost of raw materials, machinery fee, management fee and risk fee + temporary facilities construction fee + tax depreciation - reward in advance.

4. Case studies

4.1. Engineering data

- Project name: twin towers
- Time limit for a project requirements: 16 weeks
- A week early 100000 reward, the delay fines of up to 150000 a week
- Construction drawings is shown as Figure 1

Drawing description:

1) Each component contains three working procedure, column (D) (for sanding steel binding -concrete casting), beam (B) for (template, steel binding, concrete casting), two pillars after the concrete casting, the beam can be carried out at the top of the construction.

2) Special instructions:

a) D - 5-6 must be in B and D - 12 construction after the rear can be carried out;

b) D - 7-8 must be in B and D - 34 construction after the rear can be carried out;

c) D - 2, 3 D - after the construction can be B - 23 or BL - 23 construction;

d) After completion of concrete pouring, the template turnover materials can dismantle, the template must be dismantled and returned to the warehouse, then turnover or select exit. Template team need not consider ripping construction and maintenance.

Engineering change: steel finished product 12000 yuan/ton, small feed pump machine power 2 kw, large supply pump machine electricity 4 kw.

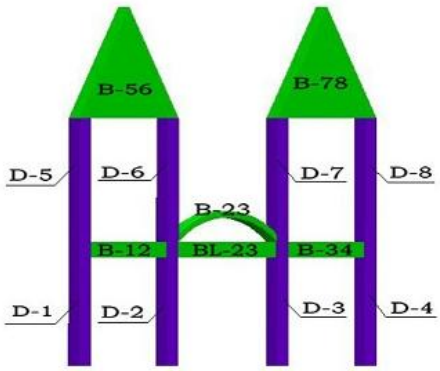

Figure 1. Construction drawings

4.2. Scheme comparison

Scheme 1:

The cost price= labor cost price + cost of raw materials, machinery fee, management fee and risk charge + temporary facilities construction fee plus encouragement for advance tax depreciation - = 346 + 306 + 60 + 32 + 12 + 10 + 21-5 + 0 = 782

The Project Description Table is shown as Table 1.

4.3. Project construction cost details

The Each Project Cost Details Table is shown as Table 2.

Table 1. Project Description Table

Scheme	Scheme Described
Scheme 1	Construction order: D - 1-2 D parallel construction, following D - 3 D - 4 parallel. In turn B- 12, B -34, BL - 23, B - 23 (5

	square meters template hang two weeks); D - 5. D - 6 water construction, at the same time D - 6 and 7 D - parallel construction (D - 7 construction sequence template hangs in a week), immediately D - 8, B - 56. B - 78 water construction DaiGong: DaiGong 2 weeks Labor dorm capacity: 4 team Service team usage: 10 team Time: 16 weeks Material purchasing plan: reinforced all buy raw materials, concrete to buy 20 cubic meters of finished products, 130 cubic meters of raw material.
Scheme 2	Construction order: D - 1-2 D parallel construction, immediately D - 3. D - 4 parallel template suspends a week (5 square meters). In turn - 12 B, BL - 23, - 34 B, B - 23 (10 square meters template hang two weeks); D - 5. D - 6 parallel construction, immediately D - 7 D - 8 parallel construction, then B - 56. B - 78 water construction DaiGong: No DaiGong Labor dorm capacity: 4 team Service team usage: 12 crew Time: 16 weeks Material purchasing plan: reinforced all buy raw materials, concrete to buy 40 cubic metres of finished products, 110 cubic meters of raw material.
Scheme 3	Construction order: D - 3 D - 4 parallel construction, just 2 D - D - 1 parallel template suspends a week (5 square meters). In turn - 34 B, BL - 23, B - 12, B - 23 (10 square meters template hang two weeks); D - 7-8 D parallel construction, immediately D - 6. 7 D - parallel construction, then B - 78. The B - 56 water construction DaiGong: No DaiGong Labor dorm capacity: 4 team Service team usage: 13 team Time: 16 weeks Material purchasing plan: reinforced all buy raw materials, concrete to buy 40 cubic metres of finished products, 110 cubic meters of raw material.
Scheme 4	Construction order:: D - 3 D - 4 parallel construction, immediately D - 1. D - 2 water construction. In turn - 34 B, BL - 23, B - 12, B - 23 (5 square meters template hang two weeks); D - 7-8 D water construction, immediately D - 6. 7 D - parallel construction, then B - 78. The B - 56 water construction DaiGong: DaiGong 5 weeks Labor dorm capacity: 5 team Service team usage: 9 team Time: 16 weeks Material purchasing plan: reinforced all buy raw materials, concrete to buy 30 cubic meters of finished product, 120 cubic meters of raw material.

Table 2. Each Project Cost Details Table

Scheme ($ten thousand)	**Plan 1**	**Plan 2**	**Plan 3**	**Plan 4**
Artificial cost	346	348	352	351
The cost of raw materials	306	320	317	306
Mechanical cost	60	55	53	53
The management fee	32	32	32	40
Risk charge	12	12	12	12
Set to build in the	10	9	10	10
Tax	21	21	21	21
Depreciation cost	- 5	-5	-5	-5
Time limit for a project in advance reward	0	0	0	0
Construction costs	782	792	792	788

4.4. The empirical result analysis

Can be seen from the table above, in the four schemes, the scheme of the lowest cost price, to determine the scheme for the optimal solution, it is concluded that the twin towers cost price is 7.82 million yuan, the construction period of 16 weeks.

From the given in the engineering data, the construction period of the project award for 100000 yuan in advance, so under the meet the time limit for a project, can not consider ahead of time, reduce the labor of dormitory and shift into the appearance, can make the material at the same time, templates, construction machinery, service team uniform resource allocation.

The project steel finished product price is 12000 yuan/ton, if you buy a finished product, reduces mechanical access fee, rent, saves the construction of the warehouse at the same time, integrated computation, so the reinforcement are buying finished product. So on material, template, the allocation of resources such as construction machinery, service team, to combine various aspects comprehensive consideration, do cost minimum.

From the plan a and plan contrast of two and three and four, in the construction schedule and labor class dorm,

count and DaiGong weeks in measuring service team and choose DaiGong, is more advantageous to reduce costs. From the plan one to four, in the comparison of the construction sequence is particularly important. In D - 1-2 D to 3 D, 4 D - the quantities of the same situation, consider two parallel combination of the two order, the order of the order is depends on tight after work, to make whole continuous construction progress plan, resource balance.

5. Conclusion

In this paper, the cost of the project decision-making research sand table simulation is introduced in this thought, in view of the construction project resolved the sandbox experiment principle of project management, and the specific engineering project, twin towers has carried on the simple case analysis, with future bidding and group project construction practice provides the help, help the owner or the contractor to achieve the maximization of interests, and further demonstrates the sand table simulation research on cost control effectively the feasibility in the process of the practice of the project. At the same time to sand the experimenter experience in project management roles and processes, to master the project management knowledge system, establishing project management system is of great help. But because of the complexity of the actual project and replication, application technology in this area is not very mature, to be fully applied to practical engineering projects, it remains to be our further research.

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