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Research on Dynamic Cost Management During Construction of Real Estate Project Construction Stage

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Abstract: From the perspective of real estate enterprise construction units, this paper will analyze the cost management problems in the construction process, and propose corresponding measures and improvement methods. Through the analysis of the situation of the project, a dynamic cost control system that matches it is established. Through the establishment of a dynamic cost control system, the cost deviation in the construction process can be remedied in a timely manner to ensure that the actual construction cost does not deviate from the target cost. At the same time, the cost analysis of the engineering and technical solutions provided by the project should be carried out, and the basic labor, materials, machinery costs and measure costs in the construction cost should be controlled under the premise of ensuring construction quality and safety. This article focuses on achieving target costs, starting with project cost containment solutions and safeguards, respectively. The purpose of the research is to establish a dynamic cost control system that can establish real estate enterprises in the construction process, and when applied to the actual construction process, provide a relatively scientific and effective theoretical basis for real estate enterprises, so as to continuously accumulate mature cost control management experience.

Keywords: Real estate enterprises, Dynamic cost control, Cost control solutions, Cost control guarantees.

1. Introduction

Target Cost Management Theory Management Master Drucker published the famous "Practice of Management" in the 60s of the last century[1]. Drucker in his book "Management: Tasks, Responsibilities, Practices" [2], further elaborated that "the goals of the enterprise or organization should be as specific and quantifiable as possible", believing that to determine the management of the enterprise, the work and work trends should be decomposed, provided that the goals are detailed and clear, so after the goals are clear and detailed, the work and trends of the management will not be easily disturbed and shaken by the outside world. Only on the basis of the same overall goal and the gradual realization of the detailed sub-goals will the final goal of the enterprise be completed. Target cost management aims to achieve the expected target profit of the project, should formulate different goals at different stages of the project, combine the characteristics of the project itself and adopt scientific and appropriate analysis methods to achieve the goals of customer satisfaction and corporate profitability [3]. This theory directly explains the essence of cost management, and pushes target cost management from the theoretical research level to practical application practice.

This paper combines the earned value analysis method to take the target cost as the benchmark to find the problems in cost control in time, find their causes, correct the deviation in time, and control the deviation of cost in the construction process.

2. Establish A Dynamic Management System for Construction Process Costs

In the cost control of the project, it is necessary to formulate a dynamic cost management system suitable for the project itself according to its actual situation and the content of the contract, and use the cost management system to carry out dynamic cost control during the construction process. In the course of cost control, the contract should be used as the basis for control and determine the cost control content according to the contract content. The target cost should be used as the target of cost control. In the dynamic management of costs in the construction process, visas and changes related to the construction progress and construction quality that occur during the construction process should be a key point of control. In the construction process, the construction cost will deviate from the target cost, at this time, the cause of the deviation should be analyzed and corrected in time. When carrying out dynamic cost correction, avoid the deviation of construction cost as much as possible in advance, achieve the effect of prevention in advance, complete the cycle process of dynamic cost control of "plan-implement-record-correct-replan", and correct the deviation of actual construction cost.

3. Earned Value Analysis Controls Construction Process Costs

3.1. Project data collection

Before the project is tendered, the bill of quantities will be prepared according to the construction drawings, and then the bidding control price will be determined according to the market development and various considerations. The assessment of the construction unit shall be carried out at the bidding control price to determine the suitable construction unit. The bill of quantities compiled by the construction unit includes labor costs, material costs, management costs, machinery costs, profits and other costs estimated based on uncontrollable risks. The data is derived from the excerpt of the partial contract price, construction work cost and construction sub-item bill of quantities valuation table of project J. Table 1 shows the contract price summary table, Table 2 shows the construction project cost summary table, and Table 3 shows the construction project sub-item bill of

quantities valuation table.

Table 1. Summary of Contract Prices

Number	Unit project name	Amount (RMB)
1	Construction Engineering	2712405.73
2	Decoration and renovation work	2075927.27
3	Water Supply and Drainage Engineering	546921.27
4	Electrical Engineering	938155.52
5	Heating Engineering	765624.77
6	Ventilation Engineering	56460.24
7	Total	7095494.80

Table 2. Summary table of construction costs

Number	Expense name	Fee amount (RMB)
1	Total valuation of the bill of quantities for sub-items	2474461.00
2	A for the material part	-1238525.00
3	Total valuation of the list of action items	0.00
4	Total valuation of other items	0.00
5	Fees	148764.00
6	Labor cost part	65682.00
7	On-site funding component	21903.00
8	Business management component	61185.00
9	Taxes	89186.00
Total		1622656.00

Table 3. Construction project sub-item bill of quantities valuation table

Number	Project name	Unit of measure	Quantity of work	Amount (RMB)	
				Comprehensive unit price	Convergence
1	Manually digging the foundation earth 1. Soil category: silt, silty clay; 2. Basic category: raft foundation; 3. Transportation distance: determined by the bidder;	m^3	69	55.47	3827.43
2	Soil (stone) backfill 1. Part: fat tank backfill; 2.2:8 stone sand layered backfill, compaction coefficient not less than 0.94. Distance: Bidders set their own.	m^3	476.25	77.28	36804.6
3	Hollow brick walls, block walls 1. Wall thickness: 100mm 2. Brick variety and strength grade: aerated concrete block 3. Mortar strength grade: M5 mixed mortar.	m^3	244.19	355.77	86875.48
4	Concrete and reinforced concrete works 1. Bottom plate thickness: 600mm; 2. Concrete strength grade: C35; 3. Concrete mix material requirements: ready mix concrete; 4. Concrete impermeability grade: S8.	m^3	326.17	461.2	150429.60
5	Rectangular column 1. Column section size: 300×300; 2. Concrete strength grade: C35; 3. Concrete mix material requirements: ready mix concrete.	m^3	0.71	458.83	325.77
6	Rectangular beam 1. Beam section size: 200×400; 2. Concrete strength grade: C35; 3. Concrete mix material requirements: ready mix concrete.	m^3	0.61	435.97	265.94
7	Straight walls 1. Wall thickness: 250mm; 2. Concrete strength grade: C35; 3. Concrete mix material requirements: ready mix concrete.	m^3	28.55	447.39	447.39
8	Total				291301.81

In the actual construction process, the actual project cost will change with the market price, and the change value for this part should be added to the contract, that is, the cost deviation coefficient should be added. The factors to be considered for this deviation coefficient should include the long construction period, many construction processes, and

certain market price fluctuations in labor, materials, etc.

According to other construction experience of the project company, after joint research and review by the project department and the cost department, it was determined that the cost deviation coefficient CV was 3%. The cost control deviation target calculation method is: cost deviation control target = contract price * cost deviation coefficient. The cost deviation control targets of J project are shown in Table 4.

Table 4. J project cost deviation control target

Number	Project name	Amount (RMB)	Cost deviation degree CV% control target
1	Construction	2712405.73	81372.17
2	Decoration works	2075927.27	62277.82
3	Water supply and drainage works	546921.27	16407.64
4	Electrical Engineering	938155.52	28144.67
5	Heating works	765624.77	22968.74
6	Ventilation works	56460.24	1693.807
7	total	7095454.80	212864.8

3.2. The earned value method analyzes project costs

After collecting the data, the earned value analysis method is used to analyze the project cost.

Three data concepts are involved in the analysis, namely BCWS, BCWP and ACWP. BCWS – Project Budgeted Cost, BCWP – Budgeted Cost of Project Completed, ACWP – Actual Cost of Project Completed. The estimated completion cost of the project is used as the basis for calculation, the actual completed cost is obtained from the finance department, and the completed work budget cost is determined by the actual completed construction period and budget expenditure. The amount of work already completed is calculated based on the projected expenditure [4].

The cost deviation and schedule deviation are calculated by the earned value method, and the planned cost, actual cost and budget cost of the project are calculated, as shown in Figure 1, point A is an example of the contract price, and point H is the target price of the project cost control.

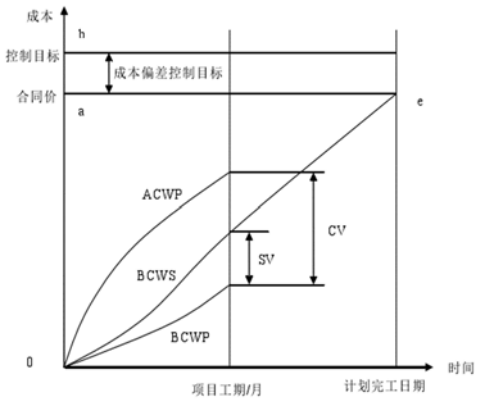

Figure 1. Schematic diagram of earned value method construction synchronization cost control

Cost Deviation (CV) = Estimated Expenditure on Completed Projects (BCWP) – Expense Expenditure (ACWP) for the actual amount completed.

Schedule deviation (SV) = Budgeted cost of work completed (BCWP) - Budgeted cost of planned work (BCWS).

Cost Performance Index (CPI) = Budgeted Cost of Work Completed (BCWP) / Cost Expenditure Actual Completed (ACWP)

Schedule Performance Indicator (SPI) = Budgeted Cost of Work Completed (BCWP) / Budgeted Cost of Planned Work (BCWS)

Cost Performance Index (CV%) = Cost Deviation (CV) / Budgeted Cost of Work Completed (BCWP)

Schedule Performance Index (SV%) = Schedule Deviation (SV) / Budgeted Cost of Work Completed (BCWP)

For example, to calculate the construction cost of Project J in a certain month for analysis, the cost of the actual amount completed in July ACWP is shown in Table 5; The budgeted costs of planned work for July are shown in Table 6; The earned value EVs in July are shown in Table 7; The analysis table of cost deviation and schedule deviation for July is shown in Table 8.

Table 5. Actual Volume Expenses Completed ACWP in July

Number	Unit project name	The actual cost of the completed work
1	Construction	153582.75
2	Decoration works	118545.81
3	Water supply and drainage works	32450.96
4	Electrical Engineering	53232.45
5	Heating works	46767.91
6	Ventilation works	3034.87
7	total	407614.75

Table 6. Budgeted costs BCWS for planned work in July

Number	Unit project name	Proposed project budget cost BCWS	Cost deviation degree CV% control target
1	Construction	150685.04	4521.67
2	Decoration works	115328.40	3455.88
3	Water supply and drainage works	30382.79	912.54
4	Electrical Engineering	52117.70	1564.59
5	Heating works	42530.71	1275.04
6	Ventilation works	3135.68	93.10
7	total	394180.32	11822.82

Table 7. Earned EV in July

Number	Unit project name	Actual cost of completed work ACWP	Proposed project budget cost BCWS	Earned Value EV
1	Construction	153582.75	150685.04	157675.97
2	Decoration works	118545.81	115328.40	103784.67
3	Water supply and drainage works	32450.96	30382.79	35533.36
4	Electrical Engineering	53232.45	52117.70	56755.32
5	Heating works	46767.91	42530.71	47434.65
6	Ventilation works	3034.87	3135.68	3079.49
7	total	407614.8	394180.3	404263.5

Table 8. July cost deviation and schedule deviation analysis table

Number	The name of the item	Actual cost of completed work ACWP	Proposed project budget cost BCWS	Completed project budget cost BCWP	Earned Value EV	CV	SV	CPI	SPI
1	Construction	153582.75	150685.04	157675.97	4606.45	7504.16	1.03	1.05	2.91
2	Decoration works	118545.81	115328.4	103784.67	-14224.62	-11007.21	0.88	0.90	-13.64
3	Water supply and drainage works	32450.96	30382.79	35533.36	2923.86	4992.03	1.09	1.16	8.27
4	Electrical Engineering	53232.45	52117.7	56755.32	3725.20	4839.95	1.07	1.09	6.54
5	Heating works	46767.91	42530.71	47434.65	468.69	4705.89	1.01	1.11	1.41
6	Ventilation works	3034.87	3135.68	3079.49	31.36	-69.45	1.01	0.98	1.02
7	total	407614.8	394180.3	404263.5	-2469.06	10965.37	0.99	1.03	-0.83

3.3. Cost deviation reasons

Based on the above data, cost control in July can be analyzed. From the total part of the table, it can be seen that the cost deviation in July was -2469.06 yuan, indicating that the cost was overrun, the cost exceeded 0.99%, and the cost deviation percentage was 0.83%. Among them, the sub-project that caused the deviation was the decoration project, with a deviation of 14224.62 yuan. The reason for the deviation of this sub-project is that the door of the materials supplied by A did not arrive at the site in time, resulting in the slow installation progress; Visa and claim events on site, resulting in increased costs; The process is not interspersed in time, the tacit understanding between various types of work is not enough, and the progress restricts each other; A certain amount of safety measures and machinery costs are added to the site.

3.4. Evaluation of the effect of dynamic control of earned value method

Through the above corrective measures for cost deviation, it is applied to the cost analysis in August and September in a timely manner, and Table 9-Table 11 is the cost deviation and schedule deviation analysis table for August, September and October, respectively.

Table 9. August cost deviation and schedule deviation analysis table

Number	The name of the item	Actual cost of completed work ACWP	Proposed project budget cost BCWS	Completed project budget cost BCWP	CV	SV	CPI	SPI	CV%
1	Construction	150813.23	145724.78	153355.37	2542.14	7630.59	1.02	1.05	1.66
2	Decoration works	119114.87	114763.36	109247.00	-9867.87	-5516.36	0.92	0.95	-9.03
3	Water supply and drainage works	31805.88	29776.09	34822.71	3016.83	5046.62	1.09	1.17	8.66
4	Electrical Engineering	52167.82	53076.31	55618.23	3450.41	2541.92	1.07	1.04	6.20
5	Heating works	45834.53	44683.02	46488.92	654.39	1805.90	1.01	1.04	1.41
6	Ventilation works	2856.15	2678.95	2295.92	-566.23	-383.03	0.80	0.86	-24.40
7	total	402592.48	390702.51	401828.15	-764.33	11125.64	1.00	1.03	-0.19

Table 10. September cost deviation and schedule deviation analysis table

Number	The name of the item	Actual cost of completed work ACWP	Proposed project budget cost BCWS	Completed project budget cost BCWP	CV	SV	CPI	SPI	CV%
1	Construction	154891.23	152350.24	155897.54	1006.31	3547.3	1.01	1.02	0.65
2	Decoration works	88035.47	88522.31	88228.24	192.77	-294.07	1.00	1.00	0.22
3	Water supply and drainage works	32475.25	31253.23	32562.21	86.96	1308.98	1.00	1.04	0.27
4	Electrical Engineering	51238.12	51235.21	51854.23	616.11	619.02	1.01	1.01	1.19
5	Heating works	42885.21	41523.63	43212.54	327.33	1688.91	1.01	1.04	0.76
6	Ventilation works	4453.28	4576.96	4612.51	159.23	35.55	1.04	1.01	3.45
7	total	373978.56	369461.58	376367.27	2388.71	6905.69	1.07	1.11	0.64

Table 11. October cost deviation and schedule deviation analysis table

Number	The name of the item	Actual cost of completed work ACWP	Proposed project budget cost BCWS	Completed project budget cost BCWP	CV	SV	CPI	SPI	CV%
1	Construction	156512.12	154623.75	156628.37	116.25	2004.62	1.00	1.01	0.07
2	Decoration works	132052.86	133785.37	130266.12	-1786.74	-3519.25	0.99	0.97	-1.37
3	Water supply and drainage works	31802.88	30775.09	32825.71	1022.83	2050.62	1.03	1.07	3.12
4	Electrical Engineering	52165.82	51072.31	52823.71	657.89	1751.4	1.01	1.03	1.25
5	Heating works	45834.53	41685.02	45884.92	50.39	4199.9	1.00	1.10	0.11
6	Ventilation works	4355.26	4236.12	4291.92	-63.34	55.8	0.99	1.01	-1.48
7	total	422723.47	416177.66	422720.05	-2.72	6543.09	1.07	1.11	-0.05

The application diagram of the earned value method is drawn from the previous three tables, as shown in Figure 2.

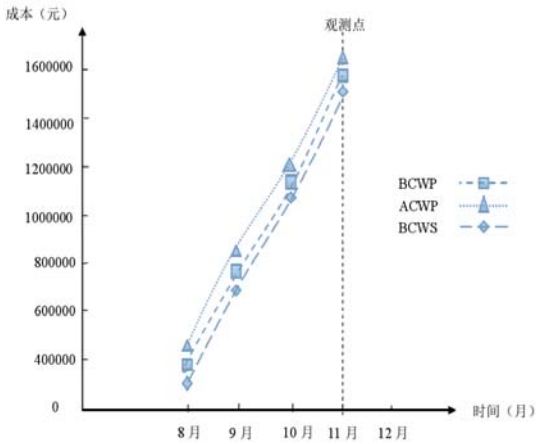

Figure 2. Schematic diagram of the application of earned value method

4. Take Corrective Measures

Make a material demand plan in advance, issue a production schedule, follow the installation progress of materials, and completely solve the problem of slow entry of A materials, so as to avoid slow entry of materials and lag in production. For the existing schedule lag problem, make up for it by increasing the number of construction personnel to catch up with the schedule. Project J has formed a complete management model in terms of material management, as follows, set up a material collection list, and marked the storage amount, collection time and collection amount of materials. Regularly check the material storage, consumption and loss, and timely grasp the storage of construction materials and reduce low-cost losses. For materials that can be reused, timely registration and secondary use are carried out to reduce the cost of use. Understand the storage of various construction materials, and formulate material supply and demand plans on this basis. The management of project materials should pay attention to on-site control. After the

material enters the site, the placement position is placed to avoid secondary handling.

Visas generated on the spot need to be reviewed for necessity, and visas with a large cost overrun should be strengthened, and visas that do not exceed the target cost can be appropriately approved. There are also cases of economic claims during the construction process, which are usually initiated by the owner and are part of the construction costs. For such claims, you can resort to law, prepare for the claim during the construction process, and retain the corresponding information, including the daily issuance of contact lists, fines, correspondence, etc., which is related to whether the target cost can be achieved. Common claims are:

claims arising from the contractor's breach of contract;

Claims arising from force majeure on site construction;

Claims arising from engineering changes, including changes in construction processes, replacement of construction materials, etc.;

Changes in labor costs, machinery costs, material costs, etc. due to changes in the price level of market materials, resulting in changes in construction costs, these problems can lead to economic claims;

Claims arising from delays in payment of construction costs.

For the running-in problem of various types of personnel, it is necessary for relevant management personnel to allocate their respective working surfaces in advance to avoid matters that affect the progress due to problems in the work surface, and at the same time do a good job in pre-construction training of related types of work, so as to implement the main points of the construction process and reduce the construction run-in between various types of work. The handover and division of the working surface during the construction process is clear, which is conducive to the development of cross-construction.

During the construction phase of the project, the cost of safety measures and machinery is non-reducible. The standardized safety measures fee can be calculated according to the centralized procurement price, and in the actual construction process, it will be supplemented by leasing, secondary use, etc. according to the actual missing part, which can reduce the cost to a certain extent.

The selection of construction machinery is determined according to the construction characteristics of the project, construction progress, etc. Machinery costs account for a relatively large proportion of project measure costs, so the control of construction machinery costs affects cost control. The price of the company's independently owned mechanical shift includes the cost of daily maintenance, installation, dismantling, electricity, and transportation[5].

5. Conclusion

This paper mainly analyzes the establishment of a cost management system in the construction process of Project J, which is constantly updated and improved based on the cost management problems that occur in the construction process, and carries out construction cost management in a dynamic manner. The dynamic cost management of the project uses the earned value method as an effective tool, and the time limit is one month, and the cost is checked at the end of each month to determine whether the actual construction cost and the target cost have deviated. In the process of continuous cost deviation correction, problems in cost management can be found, and then cost control can be continuously improved.

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