

Comparative Study between Budget and Real Cost Obtained: Case Study at a construction company in Canaa dos Carajás-PA

Antônio Miranda Coelho Neto¹, José Djair Casado de Assis Junior², Angelo Ricardo Balduino³.

¹Department of Civil and Environmental Engineering, Tocantinense Institute President Antonio Carlos, Porto Nacional, BRA
Email: mirandacanaa@hotmail.com

²Department of Architecture of Urbanismo, Tocantinense Institute President Antonio Carlos, Porto Nacional, BRA Email:
djairjunior@gmail.com

³Department of Environmental Sciences, Federal Institute of Tocantins, Porto Nacional, BRA Email: angelo@ifto.edu.br

Abstract— *The budget is a tool of extreme importance in construction. It is from this that a cost forecast is obtained. In this way, this work had as objective to compare analytical budget with real cost obtained in the construction of a public nursery school held Construtora Monteiro & Pereira Ltda. For its development, it was used as methodology the analysis of budgetary worksheets and descriptive memorials that referred to the budgeting of the construction of a public nursery school. The results showed that the budget developed by the developer clearly showed the services and their respective costs, where they were detailed in a clear and precise way. At the end it was concluded that although the result was satisfactory, it was verified that there was an increase in the real cost of the work because the fixed costs incur changes in values, as the employees were admitted and / or fired.*

Keywords— *Analytical Budget, Real cost, Reliability.*

I. INTRODUCTION

This study proposed to analyze the budget spreadsheet developed by a construction company located in the city of Canaa dos Carajás-PA in order to make a comparative analysis between budget and actual cost obtained.

The budget is a business planning tool that has information on estimated revenues and estimated expenses that aims to control the necessary activities for the services provided by the company, where its elaboration starts before the beginning of the work, and its preparation must follow certain criteria regarding the composition of costs so that there are no uncertain considerations that affect the efficient decision of the company (SANTOS, SILVA and OLIVEIRA, 2012).

The budget should encompass all activities of the company, establish relationships between revenues, costs,

expenses, investments, as well as compare the expected results with those actually carried out and mainly, should determine the operations that will be performed. It should also establish and coordinate objectives so that all areas of the work are covered, addressing all its dimensions (ROCHA, 2013).

Cardoso (2013) presents some basic and obligatory characteristics of the budget, where these characteristics are expressed in Law N° 8.661 / 93, these being: The indication of the global cost of the work - shown in an estimation spreadsheet must describe all values of the direct and indirect costs, and profit. Presentation of the composition of the unit costs that comprise the final price - the unit costs should be presented which must correspond to the prices available on the market. From the adequacy of the spreadsheet quantitative to the basic project - where all the work to be executed must be indicated, discriminating it, quantifying and valuing the budget spreadsheets.

The elaboration of the budget, according to Mattos (2014), comprises three stages, being these: study of the conditioners, composition of costs and determination of the price.

The study of the constraint helps in the identification of the conditions of the work through the study of the project that is carried by floor plans, cuts seen, clarifying notes, among others. In the study of the constraints, the budget should also analyze the qualitative description of the materials, finishing pattern, dimensional tolerances of the structural elements and pipes, among others (TISAKA, 2006).

In the composition of the costs it is important to have knowledge of the materials, labor, social charges and the BDI1. For the composition of the costs it is necessary first to identify all the services pertinent to the work,

quantifying each service. It is through the composition of the costs that the profitability is analyzed, as well as it is possible to establish the selling price and the BDI (BACKER; JACOBSEN, 2012).

In social and labor costs, the same is defined by the percentage applied in the labor force, involving taxes that affect the hour worked and the benefits that workers are entitled to that are paid by the employer (GOLDMAN, 2014).

The BDI is the percentage related to all indirect expenses, which will reach the direct costs, where, in the budget, it is determined that unit sales prices are linked to all the charges that bind the services that will be executed. Among the various projects that can be carried out, the indirect cost is altered by the fact that it varies according to its location, the requirements that the work requires, as well as the type of work to be performed (DIEFENTHÄLER, 2016).

Thus, the present study aimed to develop a research focused on the budget study and the real cost obtained, since from forecasts, the budget generates estimates used in the enterprise to meet the demands necessary for its execution, giving conditions for the evaluate the results that can be achieved.

In this way a problematic guided the present study, where it was based on knowing how the budget of the work of a kindergarten in the public network was realized and how this budget worked the cost to realize the work?

To target better the study, it was aimed to compare analytical budget with real cost obtained in the construction of a public school nursery conducted by Construction company X.

II. MATERIAL AND METHODS

This study used as a methodology the analysis of budget spreadsheets and descriptive memorials that referred to the budgeting of the construction of a public kindergarten school.

The sample of the study was composed of the budget spreadsheets referring to a work that is a construction of

the pavement of a kindergarten school built of masonry, reinforced concrete, mortar coating, metallic cover, fiber cement tile.

In accordance with this analysis of the spreadsheets, a bibliographic review was also carried out in order to obtain a theoretical and substantial basis for the results obtained and consequently the discussion of these results.

III. RESULTS AND DISCUSSIONS

The work, object of this study, is characterized in Table 01. Its conclusion and delivery took place on April 17, 2017.

Table.1: Characterization of the work

Total construction area		979,02 M ²
Nº Floors		01
Place of work		Canaã dos Carajás-PA
Structure		Structure Reinforced concrete
Walls		Solid ceramic bricks 5,7x9x1 9cm
Roofing		Metallic structure and tile E=8mm
Installations		Hydrosanitary facilities; Electrical installations
Purpose of construction	of	Construction of a children's school
Contractor		City Hall
Value of the Bid		R\$: 2.044.712,15
Start Date		May de 2016
End date		17 de April de 2017

The analytical structure of the analyzed construction's budget was elaborated in the execution and control of the activities. The activities are open in the same manner both for planning and budget. Chart 1 shows how was divided the budget of the analyzed construction, as well as presenting an average percentage representatively of each budget group, where this budget is defined as basis in the average of budgeted costs.

Chart.1: Analytical structure of the budget

Description	Representatividade no orçamento (%)
Initial / General Service	3,14
Earth moving	3,08
Reinforced concrete structure (Building)	9,73
Reinforced concrete structure (Reservoir)	0,80
Hydrosanitary installations (cold water)	1,23
Hydrosanitary installations (rainwater drainage)	3,29
Electrical installations	15,23
Walls and panels	3,08
Scaffolding	4,75
Roofing	22,47
Lining	5,00
Coating	4,90
Paving	7,80
Plinth	0,29
Paintings	6,34
Decorative and other elements	1,48
Wall, gates and access facade	6,26
Finishing Services	1,13
GRAND TOTAL	100

In this demonstration is possible to visualize only the analytical structure of the “construction cost”. It is important to emphasize that the technical documents extracted on Monteiro & Pereira Construction Company were considered, among those: spreadsheet of quantitative and prices, physical-financial schedule, spreadsheets of cash flow, spreadsheet of payment receipts, spreadsheet of payments made for suppliers and service providers.

It was observed that the budget spreadsheet was divided between construction steps. Hermani; Daré (2014, p.2) predict: “Generally, the detailed budget is subdivided in services, or groups of services, facilitating the partial costs determination”. Chart 2 shows a part of the services specifications, with the execution steps and the respective costs.

It is important to emphasize that every service process with their respective costs were placed in the Excel

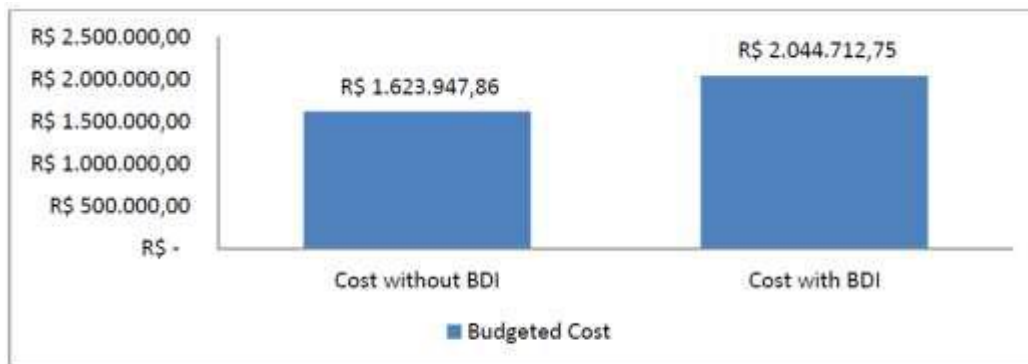
spreadsheet. The demonstration above shows the manner which these services and their respective costs were described in a detailed way. With this regard, Soares (2016) states that the budget for civil construction works and the survey of service quantities, their respective unit prices and the global price of the investment must be well detailed with the following specifications in the spreadsheet: description of the services with their respective units of measurements and quantities, composition of unit prices involving staff and material, unit price of each service and preferentially the total price by item, and, finally, the global price of the construction work.

It was specified the planned budget, percentage between the cost of the construction work without the BDI and the cost with the BDI, as illustrated in the chart below.

Table.2: Description of the services specifications in steps and its respective costs

QUANTITATIVES AND PRICES WORKSHEET							
MONTEIRO & PEREIRA CONSTRUTORA LTDA - EPP							
CNPJ : 10.614.595/0001-29							
ITEM	SOURCE	CODE	DESCRIPTION OF SERVICES	QUNT.	UNID.	UNIT PRICE (RS)	TOTAL PRICE (RS)
1.0			INITIAL / GENERAL SERVICES				
L.1.1	SEDOP	0002	MOBILL. OF STAFF AND EQUIPMENT	1,00	VB	24.999,00	24.999,00
1.2			LICENSES AND FEES				
L.2.1	SEDOP	10000	LICENSES, TAXES, CREATES, TAX IN ACCORDANCE WITH NORM. DOU DE 01/15/97.	1,00	VB	9.834,00	9.834,00
L.2.2	SINAPI	74209/001	PLATE OF WORK IN GALVANIZED STEEL SHEET	9,00	M2	273,47	2.461,23
1.3			LAND CLEANING				
L.3.1	SINAPI	73822/002	CLEANING MECAN. OF TER. WITH OAR. OF PLANT LAYING, USING MOTOR MOWER	3.786,37	M2	0,49	1.855,32
1.4			PROVISIONAL INSTALLATIONS				
L.4.1	SINAPI	73960/001	ELECTRICAL PROVISIONAL CONNECTION - INSTAL / LIG. PROV. ELECTRIC LOW VOLTAGE FOR CANT WORK, M3-KEY 100A LOAD 3KWH, 20CV EXCL FORN	1,00	UND	1.187,95	1.187,95
L.4.2	SINAPI	74217/001	PROVISIONAL CONNECTION OF COLD WATER - HYDROMETER 3.00M3 / H, D = 1/2" - SUPPLY AND INSTALLATION	1,00	UND	84,53	84,53
L.4.3	SINAP	73784/001	CONNECTION PROV. SEWER - ON. SEALED IN PVC PIPE SERIES-R DN 100MM, FROM BOX TO NETWORK, INCL. ESCAV. AND REAT. UP TO 1.00M, COMP. BY 10.50M OF PVC TUBE SERIES-R ESG. DN 100MM, SIMPLE PVC JUNCTION FOR ESG. PREDIAL DN 100X100MM AND CURVE PVC 90GRAUS FOR NET COL. DE ESG. DN 100MM - FORN./INST.	1,00	UND	821,00	821,00
L.4.4	SEDOP	10005	WOODEN / ALMOX BARRACÃO.	20,00	M2	156,04	3.120,80
1.5			CONVENTIONAL WORK LEASE				
L.5.1	SINAPI	73992/001	CONVENTIONAL LOCATION OF WORK, THROUGH GABARITO DE TÁBUAS RIDES PONTALETADAS AT EACH 1.50M, WITHOUT REAPROVEITAMENTO	979,02	M2	6,71	6.569,22
TOTAL DO ITEM							50.933,06

Graph.1: Difference between the construction work cost without the BDI and the Construction Cost with the BDI.



SOURCE: Monteiro & Pereira Construtora Ltda-EPP, modified by the author (2018)

When analyzing the chart below, it is possible to verify that that BDI is responsible for 17% of the total value of the construction work, which means that the value was R\$ 420.764,89. For Diefenthaler (2016, p.23) the BDI is the “percentage related to indirect expenses, which will lead to the direct costs, because in the budget it is determined

that the unit sale prices are interconnected to every cost related to the services about to be executed”.

It is verified that the researched construction company follows the parameters indicated for the elaboration of the budget spreadsheet of the construction work, where this spreadsheet makes possible the execution of the services,

minimizing the risks of executing a work that is not in agreement with what was budgeted.

As for the physical financial schedule of the construction work, it was elaborated with an execution planning for the

construction work to be finished in 210 days, as shown in the figure below.

Table.3: Physical Financial Schedule of the construction work of a public kindergarten school.

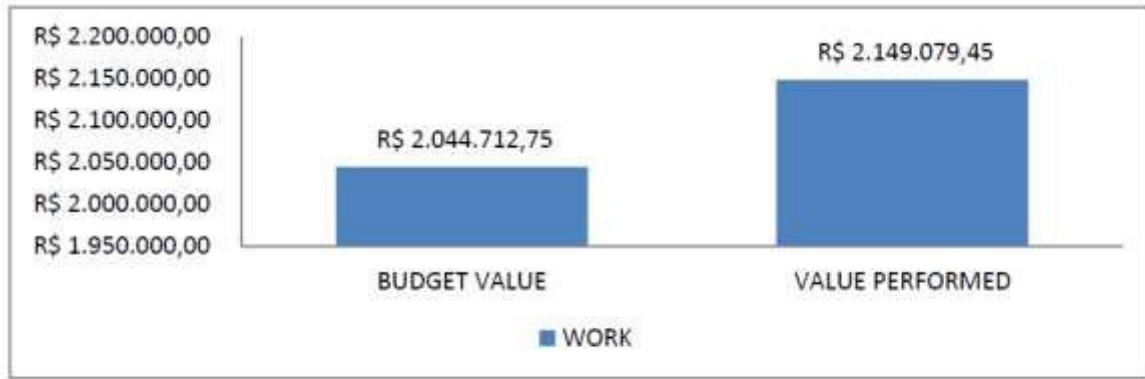
FINANCIAL PHYSICAL SCHEDULE										DATA	
WORK: CONSTRUCTION OF CHILDREN'S SCHOOL										mai/16	
LOCATION OF THE WORK: STREET H4, QD 40 - GARDEN AMERICA										VALUE OF THE WORK	2.044.712,75
PERIOD OF EXECUTION 210 DAYS										ITEM VALUE	
ITEM	DESCRIPTION	TIME OF IMPLEMENTATION (on working days)							210	ITEM VALUE (RS)	
		30	60	90	120	150	180	RS			
1	INITIAL / GENERAL SERVICES	100%								64.129,81	
2	EARTH MOVEMENT	100%								63.063,58	
3	ARMED CONCRETE STRUCTURE (BUILDING)	25%	50%	25%						199.008,72	
4	ARMED CONCRETE STRUCTURE (RESERVOIR)		50%	50%						16.427,89	
5	HYDROSURIAL INSTALLATIONS - COLD WATER		10%	25%	40%	25%				25.186,51	
6	HYDRO-SAFETY INSTALLATIONS - SEWAGE AND PLUVIAL			25%	75%					67.234,03	
7	ELECTRICAL INSTALLATIONS		10%	15%	25%	25%	15%	10%		311.338,67	
8	WALLS AND PAINTS		50%	50%						63.001,48	
9	SQUARES					50%	50%			97.044,07	
10	ROOFING				50%	50%				459.496,16	
11	LINING					100%				102.209,10	
12	COATING				50%	50%				100.122,49	
13	PAVING				30%	50%	20%			159.416,22	
14	FOOTWEAR				20%	70%	10%			5.855,48	
15	PAINTINGS					50%	25%	25%		129.723,62	
16	DECORATIVE AND OTHER ELEMENTS					25%	50%	25%		30.354,75	
17	WALL, GATES AND ACCESS FACADE	50%	50%							127.984,29	
18	FINAL SERVICES						50%	50%		23.115,87	
TOTAL	TOTAL PARTIAL	240.937,72	236.863,71	159.272,80	467.140,09	670.929,20	186.857,84	82.711,39		2.044.712,75	
	TOTAL ACCUMULATED	240.937,72	477.801,43	637.074,23	1.104.214,31	1.775.143,52	1.962.001,36	2.044.712,75			

It is observed that the construction company, in accomplishing the physical financial schedule of the work, performed the monitoring of the costs each month, based on the physical planning of the work. In preparing the physical financial schedule, the construction company ensures that the actions established are performed in order to meet the execution goals of each service. As can be seen, the schedule shows the stages of execution of the work and the estimate of the term from the beginning established through the order of service until completion and final delivery.

Regarding the physical financial schedule, Tisaka (2011: 53) states that: "Graphic representation of the development of the services to be executed over the duration of the work, demonstrating in each period the physical percentage to be executed and the respective financial value involved".

Although the construction company was able to comply with the pre-established deadlines, it was verified that the final budget was lower than the real cost of the construction work, as shown in the chart below.

Graph.2: Demonstration the budgeted value with the real cost obtained in the execution of the construction work.



SOURCE: Monteiro & Pereira Construtora Ltda-EPP, modified by the author (2018)

According to the precepts of the NPC - 17 of NPC - Accounting Standards and Procedures of IBRACON - Brazilian Institute of Accounting, costs of production are considered all the expenses included in the process of obtaining goods and services in contracts for construction works.

The Normative Instruction IN-003/05 from the INSS considers as cost all expenses incurred in a contract for construction works and services launched at the "Center of Costs" of the work in the general accounting of the company, according to previous registration in the "CEI - Specific register of the INSS".

Thus, in order to produce a scale of magnitude, according to figures obtained with the company, the analytical structure related only to the cost of construction represents approximately 40% of all costs involved in the business. It is an estimative, because as the total cost involves fixed costs of the central administration, these costs are constantly changing, as employees are admitted or fired.

As previously stated, the completion of the construction work was done on April 17, 2017. When analyzing the budget spreadsheets developed by the construction company, it was verified that the work is related to the physical schedule and the contractual deadline, where the company was able to fulfill all the steps as planned and deliver the work within the specified time, but with an increase in the real cost of 5% of the budgeted amount.

The fulfillment of the deadline determined by the city hall proves the warranty of the construction work, proving that the project followed the norms and security standards of the civil construction (SANTOS; SILVA; OLIVEIRA, 2012).

IV. CONCLUSION

This study aimed to compare the analytical budget with real cost obtained in the construction of a public kindergarten school made by Monteiro & PereiraLtd Construction Company. When analyzing the budget

elaborated by the construction company, it was concluded that the objective was to carry out the survey of the costs that were used for the execution of the work, where it was demonstrated, through a preliminary study, the estimation of the values that correlate with the quantities of materials and processes necessary for the execution of the work, which in this case was a kindergarten school of one pavement.

For the development of the budget, the construction company carried out a price survey of all the inputs, characterizing the composition of the costs, which provided an analytical and detailed budget, where the construction company managed to reduce the degree of uncertainty for the decision making and execution of the project.

During the analysis of all the material made available by the construction company to carry out the present study, it was possible to conclude that the analytical budget developed resulted in the reliability of the presented value, since the construction company considered all the resources and variables measured by direct cost and indirect costs plus BDI, thus forming the final price of the work, which demonstrated a satisfactory result. Although the result was satisfactory, it was verified that there was an increase in the real cost of the work because the fixed costs incur changes in values, as employees were admitted and/or fired.

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