BREAK EVENT POINT ANALYSIS OF STANDARD INPUT COST OF PUBLIC SERVICE AGENCY'S COMPUTER ASSISTED TEST ACTIVITIES (CASE STUDY IN POLYTECHNIC OF XXX YEAR 2019)

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Article Information

Abstract

This study aims to determine the break-even point (BEP) of Computer Assisted Test (CAT) activities so that the revenue from the CAT is not less than the cost of the implementation. CAT has been proven to increase transparency in employee recruitment. However, for the Public Service Agency (BLU) and the public sector organization that organize the CAT, it is deemed necessary to pay attention to the costs and the revenues from these activities. The question in this research is how to determine the BEP from the standard cost of CAT activities. This is descriptive qualitative research with a case study. The research uses data collected from the standard input costs for CAT activities. This study separates costs into fixed costs and variable costs. Semivariable costs are separated using the least-squares method. The result shows that the total revenue to reach the BEP is IDR 55,400,776, with at least 222 participants per day. This research shows that cost-volume-profit analysis in cost accounting can be used as an administratorial tool for managing activities in the public sector.

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1. Introduction

Public Service Agency (BLU) is a government agency that is expected to provide more services to the community through financial management flexibility. BLU is expected to be managed by referring to sound business practices even though not prioritizing profits. The service tariff that will become BLU revenue must be determined by considering continuity and service development, fair competition, people's purchasing power, and the principles of justice and propriety (Government of the Republic of Indonesia, 2005). Government regulations regarding BLU financial management state that cost accounting is used as a tool for preparing budget work plans. Cost accounting is expected to be an administratorial tool by providing financial information for public sector organizations (Mardiasmo, 2009).

As part of the government, BLU uses performance-based budgeting in preparing work plans. There is a standard input cost as the highest estimated budget. Based on that standard, budget for an activity can be prepared.

In the public sector, the standard cost is expected to be a form of allocative efficiency and operational efficiency in the budgeting system (Walidi, 2017). Standard input cost is a benchmark cost in the form of unit prices, tariffs, and indices, which are set to produce cost component outputs in work plans and budgets preparation (Minister of Finance, 2018). Furthermore, the Minister of Finance (2018) states that standard input cost is used as the highest upper limit or estimate.

One of the budget function is a tool for controlling and efficiency of resources in operational activity (Horngren, Datar, & Rajan, 2015). Efficiency cannot be obtained when the result/income is less than the burden cost on the use of available resources. For this reason, budgeting can be accompanied by projecting the revenue to be achieved.

One of the activities in the government sector and BLU is the recruitment of prospective employees through computer-assisted test (CAT) system. With the help of computers and technology information, this system allows participants to find out the results or scores immediately after they have already finished working on the questions. The application of this system is motivated by the need for transparency in the process of accepting prospective employees to the public. The National Civil Service Agency (BKN) began introducing the CAT system in 2004. In 2017 and 2018, the implementation of the CAT was carried out simultaneously in more than 20 locations throughout Indonesia. There were registration charges for the recruitment of prospective employees, one of which was to fund the implementation of the CAT. Several studies have shown that this CAT system can work well and improve the publication of the results (Hardiyanti, 2011; and Wirakusuma & Buana, 2015).

CAT is generally held in several sessions in one day at a location. In one day, the implementation of a location can hold more than one exam session. Although it has been going well, research conducted by Bhaswari (2013) shows that the CAT needs improvements such as budget constraints, lack of time efficiency, and the composition of the committee that has not been streamlined. From the standpoint of the administrator of CAT activity, it shows that the CAT should be better managed through consideration of resource efficiency. Determination of sessions in one day and the number of participants per session can be used to optimize the cost of CAT.

In cost accounting, there is an analysis of cost volume profit (CVP). CVP is an analysis of income from the expected output volume based on the type of cost in producing the output. Several studies also reveal that the CVP analysis is able to provide a break event point (BEP) of private-sector production activities (Alonso, Beloni, & Moraes, 2019; Vinsensia, 2019; Kartika & Sunarka, 2019; and Lasimun & Setiawan, 2019). By using CVP analysis, resource efficiency can be better estimated.

Some research on CVP in the private sector uses actual costs as data (Vinsensia, 2019; Kartika & Sunarka, 2019; and Lasimun & Setiawan, 2019). Unlike the private sector, the public sector is driven more by the budget (Granof,

Khumawala, Calabrese, & Smith, 2016). In government work units, the budget is the highest expenditure limit. Thus, based on standard input costs in performance-based budgeting, analysis of the amount of output and amount of costs can be required. Horngren et al. (2015) suggest that an analysis of production targets and budgets can be used as a management tool in making decisions.

Based on the description above, the problem in this study is how to determine the BEP from the standard input costs for CAT activities. The purpose of this study is to determine the BEP of CAT activities so that the revenue from CAT is not less than the cost of the implementation. This research is expected to provide information to activity administrators in making decisions about the number of participants in one location by paying attention to the BEP of the activity.

To achieve the research objectives, this research uses a case study on the implementation of CAT at the Polytechnic XXX in 2019. Polytechnic XXX has implemented CAT in 2018 and 2019 in 30 locations in Indonesia. Although this research is a case study, the cost of implementing the CAT in this study is based on the standard input costs. This study is expected to provide an illustration for other public sector organizations in preparing work plans based on input cost standards.

2. Methods

This research is descriptive qualitative research with a case study. Primary data is obtained from observations. Secondary data obtained are standard costs and operational instructions. The relevant cost periods are determined based on operational activities and the standard unit of cost.

The research step begins with the classification of costs and analysis of the interrelationship between cost standards. Costs can be grouped according to cost behaviour in relation to changes in the volume of activities (Mulyadi, 2014). Costs are sorted out into fixed costs, variable costs, and semi-variable costs.

Referring to Carter (2006), semi-variable costs can basically be separated into fixed costs and variable costs. This study separates semi-variable costs into fixed costs and variable costs with the least square method. Linear relationships are described by equations (Carter, 2006):

$$\bar{y} = a + b\bar{x} \ldots\ldots\ldots (1)$$

Where:
a = Fixed Cost
b = Variable Cost
$\bar{y}$= Average Cost
$\bar{x}$= Average number of the participants
Variable costs (b) are determined by the equation (Carter, 2006):

$$b = \frac{\Sigma(x_i - \bar{x})(y_i - \bar{y})}{\Sigma(x_i - \bar{x})^2} \ldots\ldots\ldots (2)$$

Where:
b = Variable Cost
$\bar{y}$ = Average Cost
$\bar{x}$ = Average number of participant
x_i = the number of participants in i
y_i = the cost in i
The correlation coefficient (r) is calculated (Carter, 2006):

$$r = \frac{\Sigma(x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\Sigma(x_i - \bar{x})^2 \Sigma(y_i - \bar{y})^2}} \ldots\ldots\ldots(3)$$

The third step is calculating the breakeven point (BEP). From the cost-volume-profit relationship, it can be further elaborated that to break even (profit equal to 0) then the total revenue to reach the break event (Carter, 2006):

$$R(BE) = \frac{F}{1-V} \ldots\ldots\ldots(4)$$

Where:
R(BE) = total revenue
F   = total fixed cost
V   = Variable cost per Rp of revenue
Calculation of BEP in units (participants) with equations (Carter, 2006):

$$Q(BE) = \frac{F}{P-C} \ldots\ldots\ldots(5)$$

Where:

$Q(BE)$ = Unit BEP
F = Total fixed cost
P = Tariff
C = Variable cost

3. Results and Discussion

3.1 Cost Classification and Standard Cost Correlation

CAT implementation refers to a predetermined budget. The amount of the budget for each activity item refers to the cost standard. The standard input costs and capacity of each unit cost are in Table 1.

Table 1. Types and Standard Cost Unit

No	Type of Standard Cost	Standard Input Cost (IDR)	Cost Denomination	Cost Type
A	Committee			
1	Daily Responsibility Honorarium	400,000	1 Officer per 1 Region	Semi Variable Costs
2	Location Coordinator honorarium	350,000	1 Officer per 30 participants	Semi Variable Costs
3	Assistant Officer TIK honorarium	225,000	1 Officer per 1 location	Semi Variable Costs
4	Invigilator honorarium	100,000	1 Officer per 50 participants	Semi Variable Costs
5	Verifier honorarium	125,000	1 Officer per 40 participants	Semi Variable Costs
6	Regional Administrative Officer honorarium	250,000	1 Officer per 360 participants	Semi Variable Costs
7	Secretariat Officer honorarium	225,000	1 Officer per 400 participants	Semi Variable Costs
8	Equipment Officer honorarium	225,000	1 Officer per 400 participants	Semi Variable Costs
9	Doctor honorarium	200,000	1 Officer per 400 participants	Semi Variable Costs
10	Paramedic honorarium	150,000	1 Officer per 400 participants	Semi Variable Costs
11	Security Officer honorarium	225,000	2 Officers per 1 location	Semi Variable Costs
12	Information Officer honorarium	225,000	1 Officer per 400 participants	Semi Variable Costs
13	Bag Depository honorarium	75,000	1 Officer per 120 participants	Semi Variable Costs
14	Consumption of Coordination Meetings	22,000	All Committee	Semi Variable Costs
15	Briefing snack	22,000	All Committee	Semi Variable Costs
16	Implementation Consumption	69,000	All Committee	Semi Variable Costs
B	Goods/services Activities			
1	Rent a laptop	93,595	per participant	Variable Cost
2	ATK participants	1,500	per participant	Variable Cost
3	Rent a Finger Server	458,552	1 server per 360 participants	Semi Variable Costs
4	Rent Uninterrupted Power Supply (UPS)	90,968	1 UPS per 360 participants	Semi Variable Costs
5	ATK activity	5,000,000	By area	Fixed cost
6	Information banners	500,000	By area	Fixed cost
7	Rent supporting equipment	1,000,000	By area	Fixed cost

In Table 1, the operating costs can be grouped into two main parts, namely the costs of the committee, and the cost of goods/services activities. One exam invigilator can only oversee 50 participants so that if there are 51 participants, the total cost of the invigilator will increase, but if the number of participants is less than 50, then the total cost of the invigilator is fixed. Costs with this behaviour are classified as semi-variable costs.

3.1.1 Variable Cost

The main variable cost is the cost of renting the main equipment. The cost of renting the main

equipment is the cost of providing participants' laptops and stationery. These costs increase with the number of days and the number of units rented. Each participant in one session will use a laptop and supporting equipment. In this study, there were three exam implementation sessions in one day of implementation. This means that the cost of renting one laptop is shared by three participants. In addition to rental fees, variable costs that can be detected are participant's stationery cost. Each participant gets writing equipment used during the exam. The stationery cost increases with the number of participants. Table 2 shows the variable costs that can be identified directly.

Tabel 2. Variable Cost

Cost Item	Amount (IDR)
Laptop rental	93,595
ATK participant	1,500
Total Variable cost	95,095

3.1.2 Fixed Cost

The fixed costs for implementing a CAT consist of costs at the location concerned plus the cost allocation from the central committee. Costs at the location of activities that are not affected by the number of participants include the cost of CAT office stationery, information banners, and rental of supporting equipment. The allocation of costs from the central committee is the overhead of national CAT implementation. Table 3 shows the fixed costs that can be identified directly.

Tabel 3. Fixed Cost

Cost Item	Amount (IDR)
Office stationery	5,000,000
Information banners	500,000
Supporting equipment rental	1,000,000
Central committee cost allocation	8,510,780
Total Fixed Cost	IDR 15,010,780

3.2 Separation of Semi Variable Costs

Costs that cannot be classified directly in variable costs and fixed costs are classified as semi-variable costs. The cost classification cannot be directly done, considering that a cost item is influenced by another cost item. Each cost item has a different capacity.

To separate variable cost and fixed costs, a simulation is performed. Referring to Tarno (2007), the simulation is carried out by looking at the response generated by the predictor variables entered. In this study, the data used is the amount of semivariable costs (Y) in response to the number of participants (X). The simulation uses random numbers in a certain capacity range. The number of participants is limited to the capacity of organizing CATs on research objects, which is 781 participants per day. According to Levin and Rubin (1998), the number of data samples that are too small can lead to less objective analysis, but if it is too large, it will consume resources. Levin and Rubin (1998) state a sample size of more than 30 can be said to be a large sample.

This study uses 40 data in the simulation. Withdrawal of random numbers is made with the help of Microsoft Excel for numbers between 1-781 and an interval of 1. The simulation included all identified variable costs and fixed costs previously mentioned in Table 2 and Table 3. Table 4 shows the complete data of the simulations.

Table 4. Data Simulation

No	X	Y	No	X	Y
1	210	53.499.250	21	322	68.835.890
2	59	32.866.905	22	470	91.781.470
3	724	128.535.600	23	286	63.825.470
4	125	42.242.175	24	233	55.686.435
5	124	42.147.080	25	208	53.309.060
6	588	108.496.680	26	719	126.119.125
7	435	86.866.145	27	457	90.545.235
8	576	107.355.540	28	553	104.060.355
9	200	50.961.300	29	458	90.640.330
10	436	86.961.240	30	226	55.020.770
11	19	27.476.105	31	557	104.440.735
12	662	119.111.710	32	263	60.530.285
13	626	114.101.290	33	573	107.070.255
14	702	124.502.510	34	319	67.442.605
15	729	129.011.075	35	498	95.956.130
16	610	112.579.770	36	542	102.535.310
17	662	119.111.710	37	595	109.162.345
18	547	103.010.785	38	766	134.116.590
19	490	95.195.370	39	96	37.493.420
20	234	55.781.530	40	492	95.385.560

Based on Table 4, the value of equation (2) can be determined using the calculations in Table 5.

Table 5. Calculation of Equation (2)

No	xi	yi	xi-$\bar{x}$	yi-$\bar{y}$	$(x_i - \bar{x})^2$	$(x_i - \bar{x})(y_i - \bar{y})$
1	210	53.499.250	-225	-32.845.029	50.524	7.382.741.309
2	59	32.866.905	-376	-53.477.374	141.207	20.095.460.074
3	724	128.535.600	289	42.191.321	83.651	12.202.784.925
4	125	42.242.175	-310	-44.102.104	95.961	13.661.729.150
5	124	42.147.080	-311	-44.197.199	96.581	13.735.384.403
6	588	108.496.680	153	22.152.401	23.478	3.394.301.701
7	435	86.866.145	0	521.866	0	117.420
8	576	107.355.540	141	21.011.261	19.945	2.967.315.388
9	200	50.961.300	-235	-35.382.979	55.119	8.307.038.807
10	436	86.961.240	1	616.961	2	755.778
11	19	27.476.105	-416	-58.868.174	172.869	24.475.914.889
12	662	119.111.710	227	32.767.431	51.631	7.445.579.594
13	626	114.101.290	191	27.757.011	36.567	5.307.834.500
14	702	124.502.510	267	38.158.231	71.409	10.196.833.379
15	729	129.011.075	294	42.666.796	86.568	12.553.638.163
16	610	112.579.770	175	26.235.491	30.704	4.597.113.976
17	662	119.111.710	227	32.767.431	51.631	7.445.579.594
18	547	103.010.785	112	16.666.506	12.594	1.870.398.678
19	490	95.195.370	55	8.851.091	3.050	488.801.521
20	234	55.781.530	-201	-30.562.749	40.311	6.136.235.855
21	322	68.835.890	-113	-17.508.389	12.718	1.974.508.527
22	470	91.781.470	35	5.437.191	1.241	191.525.066
23	286	63.825.470	-149	-22.518.809	22.134	3.350.235.753
24	233	55.686.435	-202	-30.657.844	40.713	6.185.986.397
25	208	53.309.060	-227	-33.035.219	51.427	7.491.561.704
26	719	126.119.125	284	39.774.846	80.784	11.305.005.711
27	457	90.545.235	22	4.200.956	494	93.366.255
28	553	104.060.355	118	17.716.076	13.977	2.094.483.129
29	458	90.640.330	23	4.296.051	539	99.775.793
30	226	55.020.770	-209	-31.323.509	43.587	6.539.565.513
31	557	104.440.735	122	18.096.456	14.939	2.211.839.380
32	263	60.530.285	-172	-25.813.994	29.507	4.434.198.755
33	573	107.070.255	138	20.725.976	19.106	2.864.848.084
34	319	67.442.605	-116	-18.901.674	13.404	2.188.341.264
35	498	95.956.130	63	9.611.851	3.997	607.709.303
36	542	102.535.310	107	16.191.031	11.497	1.736.083.339
37	595	109.162.345	160	22.818.066	25.672	3.656.024.685
38	766	134.116.590	331	47.772.311	109.710	15.823.383.835
39	96	37.493.420	-339	-48.850.859	114.769	16.549.449.631
40	492	95.385.560	57	9.041.281	3.275	517.387.327
Sum	17.391	3.453.771.145	0	0	1.737.291	252.180.838.558
$\bar{x}$	435					
$\bar{y}$		29.488.570				

From table 5 the value of equation (2):

$$b = \frac{\Sigma(x_i - \bar{x})(y_i - \bar{y})}{\Sigma(x_i - \bar{x})^2}$$

$$b = \frac{252,180,838,558}{1,737,291}$$

$b = 145,158$

Equation (1):

$y = a + bx$

$a = 23,233,421$

$y = 23,233,421 + 145,158x$

Based on testing of the correlation coefficient (r) using equation (3), the value of the correlation coefficient is 0.9996. At the 95% confidence level, the critical values of the Pearson correlation coefficient are 0.312. The correlation coefficient value of equation (2) is between 0.312 and 1. Refer to Triola (2015); this means that the

number of participants (x) has a linear correlation on total costs (y). The equation also produces a determinant coefficient of 0.992. According to Levin and Rubin (1998), the determinant coefficient 0.9992 means that other variables affect the total cost of 0.077%. Thus, the resulting equation is good enough to predict the costs based on the number of participants.

Based on the regression equation, if the number of participants (x) is 435, then the cost (y) is IDR 86,376,939. According to Carter (2006), the regression equation can be used to predict cost at any level. However, because the regression equation is determined from a limited sample and because variables that are not included in the regression equation may have some influence on the cost being predicted, the estimated cost will usually be different from the actual at the same level of activity (Carter, 2006). The standard error of the estimate is the actual data points' standard deviation from the regression line.

Using the calculations proposed by Carter (2006), the standard error of estimate in this study was IDR 860,528. If the number of participants entered 435 as mentioned earlier, and the level of confidence 95%, then the cost could be higher or lower than IDR 86,376,939 with a range of IDR 86,376,939 ± (1.960)(IDR 860,528). For the study, based on the regression equation, fixed costs are set at IDR 23,233,421 and variable costs at IDR 145,158.

3.3 Break-Even Point

The break-even point is a condition where total revenue equals total costs. The registration fee received by the Polytechnic XXX in the implementation of CAT 2019 is IDR 250,000.00 per participant. Calculation of total revenue to break even with equation (4) is (Carter, 2006):

$$R(BE) = \frac{F}{1 - V}$$

$$R(BE) = \frac{23,233,421}{1 - (\frac{145,158}{250.000,00})}$$

$$R(BE) = 55,400,776$$

From these calculations, it can be interpreted that the BEP will occur when the total

income received is IDR 55,400,776. The minimum number of participants can be calculated by equation (5) as follows (Carter, 2006):

$$Q(BE) = \frac{F}{P - C}$$

$$Q(BE) = \frac{23,233,421}{250.000 - 145,158}$$

$$Q(BE) = \frac{23,233,421}{104,842}$$

$$Q(BE) = 221,60 \text{ participants}$$

By rounding up, the number of participants to reach the break event is 222 participants.

4. Conclusion

Based on the results of this study, the total fixed cost is IDR 23,233,421, and the variable cost per participant is IDR 145,158. The analysis shows that the Break event point occurs when the total revenue is IDR 55,400,776. The minimum number of participants to avoid losses is 222 participants per day.

This study is expected to assist the management of CAT activities in the future in determining the number of participants per day. Thus the CAT funding constraints revealed in previous studies can be reduced. This study found that there is a complicated relationship between standard input costs. A change from the standard unit of input costs to standard input costs that are fixed costs or variable costs can help to analyze cost-volume-profit more accurately in the future. This research shows that the use of cost-volume-profit analysis in cost accounting can assist administrators in the public sector through the provision of financial information. With better information, it is expected to help administrators of public sector activities be more efficient.

This research is limited by data from the standard input costs for CAT activities at the Polytechnic XXX. Analysis of another object with different input cost standards and different CAT activity policies will produce different conclusions. This research uses standard input cost as data analysis. Future research can use cost realization as CVP analysis data.

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