## Calculation of Unit Cost School Information System Development using **ABC** (Activity Based Costing) Method

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Abstract. In developing an information system the school must determine a strategy in its development. Look for managers who are reliable in making decisions that are oriented to reliable development. One of the proper management concepts is cost accuracy. Accuracy of charging costs on cost objects is very important for users of cost information. Beside the accuracy, it is also needed to find out the cost per unit needed in the information system. This is intended to have a price benchmark for the development of information systems in the future. In this study the unit cost calculation uses the ABC (Activity Based Costing) method which emphasizes the cost calculation for the activities involved. The allocation of costs is based on salary data from trusted institutions, namely the Pedoman Standard Minimal 2019 by INKINDO. The results of this study get a total cost value of 18.407.082,00 while the cost of each complexity is 5,301.00 with the standard cost of procurement of goods and services issued by the government and several survey institutions.

Keyword: cost, accuracy, calculation, Activity Based Costing

### **INTRODUCTION**

Education is very important to educate the nation's life. One of the providers of Education is the school. Schools are required to utilize and maximize the available staff and infrastructure. So that the school is able to provide the best academic services. Utilization of various technologies and experts will certainly cost more operational costs as well. Therefore it is necessary to maximize school finances.

In Indonesia at this time most schools only rely on the manual academic system in carrying out education, ranging from academic acceptance, the KBM process, financial management, etc. If this continues, it will add to the complexity of the process and physical activity in the school. This needs to be supported by the use of technology that is growing today. One way to make the process in schools effective is by developing information systems that can be accessed by all parties online. Therefore, it is necessary to hold a school information system. Online-based information system will facilitate all activities involved in school. In addition to reducing physical activity, it also reduces cost reductions such as communication, stationery etc.

In developing an information system the school must determine a strategy in its development. Look for managers who are reliable in making decisions that are oriented towards reliable development. One of the proper management concepts is cost accuracy. Accuracy of charging costs on cost objects is very important for users of cost information. Cost accuracy is also needed to anticipate overhead that can occur without careful

calculation. In addition, the determination of costs must also be based on available sources, such as SBU (Standard Biaya Umum/General Cost Standard) and other costs referred to by the official party. It is intended that the cost estimate is not just an estimate or input from parties who take advantage of the opportunity for profit.

Developing a school information system is certainly related to costs. Appropriate cost allocation is needed so that finance is well managed. Therefore, the authors analyze the unit cost (unit cost) with the ABC model (Activity Based Costing) to determine the standard costs of developing information systems. The ABC method bases the calculation of costs on the imposition of activity costs, so that the resulting costs are the result of the costs of all activities carried out on the development of Information Systems. In addition, costs can also be calculated for each complexity, as the complexity of information systems is a standard unit in the software world. So that in addition to getting prices and costs for the development of information systems can also be a reference for the development of other information systems that only use the value of its complexity. It is expected that schools can manage finances for developing information systems effectively.

Generally, the calculation of costs by the ABC method, namely: determine the initial costs for product development. After that the costs are allocated to all existing activities. Once obtained, the activity costs are calculated for each unit. Costs are also calculated based on the scale of complexity.

#### Literature Review

#### 1. Cost

Cost (cost) is defined as a resource that is sacrificed (sacrified) or released (forgone) to achieve certain goals. A cost is usually measured in units of money that must be spent in order to get goods/services. In the context of education, Nanang Fattah defines "Education costs as the amount of money generated and spent for various purposes of organizing Education (Nanang, 2009).

#### 2. School

According to KBBI School is a building or institution for learning and teaching and a place to receive and give lessons (according to level, there is).

#### 3. System Development

System development/application development is developing a solution to business problems using an information syste/software (O'Brien and Marakas, 2011). Software development is usually used by the project approach (project approach). Projects are defined as a collection of activities with clear start and end to achieve organizational goals (Laudon, 2014; O'Brien and Marakas, 2011). Every project has limitations, both in terms of budget and time. For this reason, the project needs to be managed so that the target can be achieved with a certain budget and time. Existing activities in project management are planning, risk assessment, cost estimation, gathering needed resources, organizing work, directing, controlling project execution, reporting progress, and analyzing results (Laudon, 2014)

#### 4. Information Systems

Information systems are interrelated components that work together to collect, process, store, and display information to support decision making, coordination, regulation, analysis, and visualization in an organization (Laudon, 2016).Information system is a system within an organization that meets the needs of daily transaction processing that supports the managerial functions of an organization's operations with the strategic activities of an organization to be able to provide certain external parties with the reports that are needed. (Sutabri, 2012: 46)

According to Whitten, Bentley, and Ditman (2009: 10) information systems are arrangements of people, data, processes, and information (IT) or information technology that interact to collect, process, store, and provide as output the information needed to support an institution. or organization.

#### METHODOLOGY

The method used in the study is as follows below.



Figure 1. Flow of Research Methods.

#### **Data collection**

Data collection is a way to gather information, data, facts related to research. There are 2 kinds of data collection in this study, namely primary and secondary data. Primary data collection is from documentation and literature studies, secondary data is from interviews. The explanation is as follows:

1. Literature Study

Literature study that is by reading, understanding, analyzing the research that has been done in order to find the theoretical basis that will be conducted to analyze in this study.

2. Documentation

Documentations are written items, archives related to this research, such as employee salary data, etc.

#### 3. Interview

The interview is looking for sources in the form of oral sources obtained from experts who understand about research in order to expedite the research process.

#### Data analysis

The data that has been obtained is then analyzed, starting from the creation of a Class Diagram as a source for determining information system units. In addition, class diagrams are also applied to web services and will be used to determine the scale of complexity. The class diagram is as follows.

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#### Figure 2. Academic Class Diagram.



#### Figure 3. Accounting Class Diagram.



Figure 4. Staff Class Diagram.

#### Calculation of Unit Cost Using ABC Method

The Unit Cost calculation stage with the ABC method is as shown below:



Figure 5. Flow of ABC Method.

- 1. Identifying cost object products.
- 2. Identifying the direct cost value of the product
- 3. Choose the basis of cost allocation that will be used to allocate indirect costs to the product and cost driver volume
- 4. Identifying the indirect costs associated with each basis of cost allocation
- 5. Calculation of tariff per Unit from each basis of indirect cost allocation
- 6. Calculation of indirect costs allocated to the product
- 7. Calculation of total direct and indirect costs per unit

#### Calculation of Information SystemsComplexity

The scale of complexity is of many kinds, one of which is code complexity representing the level of code complexity in a program. In general, program code is represented based on the Object Oriented Programming (OOP) standard. Based on OOP, the structure of program code can be configured in the form of class diagrams. Class diagrams consist of methods (Methods), attributes (Attributes), and relations (Relationships). Codescale can be formulated as follows:

Codescale =  $(0.637 \sum \sum Method) + (0.258 \cdot \sum Attribute) + (0.105 \cdot \sum Relation)$ 

#### Calculation of Unit Cost per Unit Complexity

The main objective of this research is to find out the Unit Cost for the school information system based on its

#### 2. Identifying the direct cost value of the product

Table 2. Value of Product Direct Cost.

complexity. The total costs that have been obtained from ABC calculations are finally divided by the measured complexity, both from the method, the business process or the code. And in this research the code complexity is used.

#### **RESULT AND DISCUSSION**

## Calculation of Unit Cost by ABC Method 1. Identifying cost object products.

Table 1. Product (Information System) that Become Cost Object.

No.	Information System Type	Number of Units
1.	Admin Dashboard System (ADS)	5
2.	Student Dashboard System (SDS)	4
3.	Staff Dashboard System (StDS)	4
4.	Infrastructure Management (IM)	4
5.	Finance Management (FM)	5
6.	General Journal (GJ)	3
7.	School Management (SM)	4
8.	Finance Report (FR)	3
9.	Recapitulation (Rc)	3
10.	User Management (UM)	2
11.	Application Management (AM)	2

No.	IS Type	Direct Cost (IDR)	Development Time (Hour)	Consumption Cost (IDR)	Main Cost	%time
1.	ADS	750.000,00	30	250.000,00	1.000.000,00	15%
2.	SDS	500.000,00	12	100.000,00	600.000,00	6%
3.	StDS	650.000,00	26	200.000,00	850.000,00	13%
4.	IM	550.000,00	24	400.000,00	950.000,00	12%
5.	FM	575.000,00	23	350.000,00	925.000,00	12%
6.	GJ	450.000,00	15	250.000,00	700.000,00	8%
7.	SM	450.000,00	20	100.000,00	550.000,00	10%
8.	FR	400.000,00	16	250.000,00	650.000,00	8%
9.	Rc	300.000,00	10	400.000,00	700.000,00	5%
10	UM	350.000,00	12	200.000,00	550.000,00	6%
11.	AM	350.000,00	12	200.000,00	550.000,00	6%
	TOTAL	5.325.000,00	200	2.700.000,00	8.025.000,00	100%

Classifying the cost of an object that becomes the cost of the object then the direct costs that have been set, then proceed to determine the value of the cost.

3. Choose the basis of cost allocation that will be used to allocate indirect costs to the product and cost driver volume.

Table 3. Identification of Activities and its Units.

No.	Activity	Unit
1.	Communication (C)	Communication Time (CT)
2.	Briefing (P)	Briefing Time (BT)
3.	System Analysis (SA)	Number of Process (NP)
4.	Design Frontend (DF)	Number of Design (ND)
5.	Program Documentation (PD)	Number of Document (NDoc)
6.	Write Help Guide (WH)	Number of Sheet (NS)
7.	Network Setting (NS)	Setting Time (ST)
8.	Coding System (CS)	Number of Method (NM)
9.	Implementation (I)	Number of Feature(NF)
10.	Testing (T)	Number of Testing (NT)

Table 4. The Basic Allocation of Costs That Will be Used to Allocate Indirect Costs.

No.	IS Type	СТ	BT	NP	ND	NDoc	NS	ST	NM	NF	NT
1.	ADS	2	2	3	4	4	2	3	20	3	3
2.	SDS	2	2	3	4	4	2	3	20	3	3
3.	StDS	2	2	3	4	4	2	2	20	3	2
4.	IM	2	2	2	4	4	2	2	5	2	2
5.	FM	2	2	3	3	3	2	2	15	2	2
6.	GJ	1	1	2	2	2	1	1	10	1	1
7.	SM	2	2	3	4	4	2	1	5	2	2
8.	FR	1	2	2	2	2	2	1	10	1	1
9.	Rc	1	1	2	2	2	1	1	5	2	2
10.	UM	1	1	2	2	2	2	1	5	1	1
11.	AM	1	1	2	2	2	2	1	5	1	1
	TOTAL	17	18	27	33	33	20	18	120	21	20

Each cost driver is specified for the amount and volume and value. The breakdown is based on the units used by each part of the information system.

## 4. Identify the indirect costs associated with each basis of cost allocation

Table 5. Indirect Costs Related to Each Basis of Cost Allocation.

No.	Activity	Cost
1.	С	1.027.083,00
2.	Р	600.000,00
3.	SA	735.000,00
4.	DF	1.733.333,00
5.	PD	671.666,00
6.	WH	600.000,00
7.	NS	1.605.000,00
8.	CS	2.700.000,00
9.	Ι	277.500,00
10.	Т	757.500,00
	TOTAL	10.707.082,00

Indirect costs come from workers' salaries obtained from reliable sources, one of which is the 2019 Minimum Standard Guidelines by INKINDO.

# 5. Calculate the rate per Unit from each basis of indirect cost allocation

**Table 6.** Tariffs per Unit of each basis of indirect cost allocation.

No.	Activity	Cost	Volume	Unit	Pool Rate	Unit
1.	С	1.027.083,00	17	Hours	60.416,65	Per
						Hours
2.	Р	600.000,00	18	Hours	33.333,33	Per
2	S 1	725 000 00	27	Process	22 222 22	Hours
5.	SA	735.000,00	21	FIOCESS	21.222,22	Process
4.	DF	1.733.333.00	33	Sketch	52.525.24	Per
					,	Sketch
5.	PD	671.666,00	33	Sketch	20.353,52	Per
						Sketch
6.	WH	600.000,00	20	Sheet	30.000,00	Per
7	NC	1 605 000 00	10	TT	80.166.67	Sheet
7.	INS	1.605.000,00	18	Hours	89.100,07	Hours
8	CS	2,700,000,00	120	Method	22,500,00	Per
0.	00	2.700.000,00	120	methou	22.000,00	Method
9.	Ι	277.500,00	21	Feature	13.214,29	Per
						Feature
10.	Т	757.500,00	20	Testing	37.875,00	Per
	TOTAL	10 707 000 00				Testing
	TOTAL	10.707.082,00				

After getting the costs required for each activity, the activity costs are broken down again, so that a poll rate will be based on the price for each activity.

#### 6. Calculate the indirect costs allocated to the product

Table 7. Indirect costs allocated to the product.

IS/ Activity	ADS	SDS	StDS	IM	FM	GJ	SM	FR	RC	UM	AM	TOTAL
С	120.833	120.833	120.833	120.833	120.833	60.417	120.833	60.417	60.417	60.417	60.417	1.027.0 83
Р	66.667	66.667	66.667	66.667	66.667	33.333	66.667	66.667	33.333	33.333	33.333	600.000
SA	81.667	81.667	81.667	54.444	81.667	54.444	81.667	54.444	54.444	54.444	54.444	735.000
DF	210.101	210.101	210.101	210.101	157.576	105.050	210.101	105.050	105.050	105.050	105.050	1.733.3 33
PD	81.414	81.414	81.414	81.414	61.061	40.707	81.414	40.707	40.707	40.707	40.707	671.666
WH	60.000	60.000	60.000	60.000	60.000	30.000	60.000	60.000	30.000	60.000	60.000	600.000
NS	267.500	267.500	178.333	178.333	178.333	89.167	89.167	89.167	89.167	89.167	89.167	1.605.0 00
CS	450.000	450.000	450.000	112.500	337.500	225.000	112.500	225.000	112.500	112.500	112.500	2.700.0 00
Ι	39.643	39.643	39.643	26.429	26.429	13.214	26.429	13.214	26.429	13.214	13.214	277.500
Т	113.625	113.625	75.750	75.750	75.750	37.875	75.750	37.875	75.750	37.875	37.875	757.500
TOTAL	1.491.45 0	1.491.4 50	1.364.4 08	986.471	1.165.8 15	689.208	924.527	752.541	627.797	606.708	606.708	10.707. 082

Pool rate is used to calculate the cost needed by multiplying the number of units in each activity.

# 7. Calculate the total cost of each unit (direct cost and indirect cost)

Table 8. The Total Cost of Each Unit Direct And Indirect.

No.	IS Units	S Units Direct In Cost		Total Cost
1.	ADS	1.000.000	1.491.450	2.491.450
2.	SDS	400.000	1.491.450	1.891.450
3.	StDS	850.000	1.364.408	2.214.408
4.	IM	1.000.000	986.471	1.986.471
5.	FM	925.000	1.165.815	2.090.815
6.	GJ	625.000	689.208	1.314.208
7.	SM	600.000	924.527	1.524.527
8.	FR	650.000	752.541	1.402.541
9.	Rc	650.000	627.797	1.277.797
10.	UM	500.000	606.708	1.106.708
11.	AM	500.000	606.708	1.106.708
	TOTAL	7.700.000	10.707.082	18.407.082

The final result is a total cost **IDR 18,407,082.00** which will be calculated based on its complexity.

#### 8. Calculation of IS Complexity

Research with the title Pengukuran Metrik Kompleksitas Web Service Sekolah (Ahmad Riza et. Al., 2019) measures the complexity of the Information System code in the form of Web Service which is the same case as this research. The formula is as follows:

Codescale =  $(0.637 \cdot \sum Method) + (0.258 \sum \sum Attribute) + (0.105 \sum \sum Relation)$ . The obtained results

is measure the complexity of school Web Services ie. 3,472.

#### 9. Calculation of Unit Cost per Unit of Complexity

After getting the total cost, the cost per complexity is calculated. The total cost is **IDR 18,407,082.00**, while the complexity is **3,472**. After dividing the total cost by its complexity, the cost for each complexity is **IDR 5,301**.

### CONCLUSION

Developing a school information system is certainly related to costs. Appropriate cost allocation is needed so that finance is well managed. Therefore, the authors analyze the unit cost (unit cost) with the ABC model (Activity Based Costing) to determine the standard costs of developing information systems. The ABC method bases the calculation of costs on the imposition of activity costs, so that the resulting costs are the result of the costs of all activities carried out on the development of Information Systems. In addition, costs can also be calculated for each complexity, as the complexity of information systems is a standard unit in the software world. So that in addition to getting prices and costs for the development of information systems can also be a reference for the development of other information systems that only use the value of its complexity. After getting the total cost, the cost per complexity is calculated. The total cost is IDR 18,732,082.00, while the complexity is 3,472. After dividing the total cost by its complexity, the cost for each complexity is IDR 5,395. With this, schools are expected to be able to

manage finances for developing information systems effectively

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