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Job Selection of the Infrastructure Section in Foundation X with C4.5 Algorithm

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Abstract*---*An institution generally requires a draft job that costs must be prepared well in advance. In relation to the effectiveness of time and budget efficiency, a mechanism is needed for ease in determining criteria or feasibility of a royalty to be included in the Budget Plan. This needs to be prepared every fiscal year, not least as the X Foundation's Infrastructure Section and Infrastructure does. To obtain the ease of decision-making with respect to the feasibility of the type of work to be budgeted within the RAB, the Infrastructure Section shall make predictions and classifications of the various types of work for which data has been recorded. For this purpose, Algorithm C4.5 can be utilized in conducting clustering process or work clasification based on information / data available. With the help of the C4.5 Algorithm the classification process can produce a Decision Tree associated with the type of work that is feasible to prepare in the RAB in the coming year. Decision-making process is done by processing existing data, and it is important for institutional sustainability process in moving company's business process. With the results that have been obtained, Section of Facilities & Infrastructure will be easier in doing the cost draft which subsequently submitted to RAB Yayasan X University.

Keywords*---*Algoritma C4.5, Jenis Pekerjaan, Kelayakan, Pohon Keputusan.

I. INTRODUCTION

The Section of Infrastructure is a work unit under the auspices of the University X Foundation. This work unit is responsible for the continuity of building maintenance activities as well as the procurement of goods and facilities supporting academic activities and office administration of other work units under the auspices of University X. a separate building becomes a separate problem for supervising or controlling maintenance and procurement activities.

This work unit has 2 divisions, namely the Building Maintenance Section and the Procurement of Goods and Services Section. Various types of maintenance activities and requests for goods / facilities alternated with the turnover of the fiscal year. This of course correlates with cost efficiency and the effectiveness of time and energy. For this reason, a mechanism is needed so that the activities can be managed properly with the aim of budget order on the one hand and the timeliness of implementation.

Requests for maintenance / procurement of supporting facilities have been carried out based on submissions by work units within the University of X. However, in the process, there are obstacles in the form of the length of the process or realization of the request for the requested activity. Although it has been recorded in data on maintenance and provision of facilities, there are still difficulties in determining the type of work activities that can be selected, so that the type of work can be considered feasible to be included in the Budget Plan design process, which is validated on an annual basis in August.

Departing from the above problems, it is necessary to make a method that can classify various types of building maintenance activities and provide facilities for the continuity of business processes that exist in this institution. So,

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for the following years, the application for building maintenance activities and the procurement of goods can be realized as soon as possible with the availability of the ceiling or the activity budget referred to in the draft Budget Plan.

II. LITERATURE STUDY

C4.5 is an algorithm created based on the results of the development of ID3 Algorithm (Iterative Dichotomiser) based on supervised learning and obtaining its heyday with improvements that include methods for handling numeric attributes, noisy data, missing value and rules of regulation that produce a Decision Tree and rules.

Decision Tree is one technique that provides a function to make changes to data and facts so that it becomes a Decision Tree that describes rules / rules. So that the resulting rules can be used to explore existing data and then create correlations that were initially not found among input variables with goal / goal attributes.

Implementation of the C4.5 Algorithm is usually done by conducting a classification process on existing data with the intention of creating a distinguishing pattern based on certain objects / classes on the object / other classes. Then after obtaining the same class / object, clustering is carried out for different grouping processes, by forming data elements that are processed into new groups / classes along with attributes where the data in question will be identified by certain rules or patterns. In short, Data Clustering is a process of grouping data that has similar variables / attributes based on the similarities or differences possessed by the data in question.

In the process, making a decision tree architecture was created to approach the original tree with several components, namely:

- Root Node, this component has the top position of the Decision Tree
- Internal Node, is the part that results from branching that requires input and produces a minimum of two outputs
- Leaf Node, is a component located at the end of a decision tree and only accepts input without producing output.

The steps in creating a Decision Tree using the C4.5 Algorithm are as follows:

1. Looking for source data that can be obtained based on history that has ever existed before and has been classified in its own classes.
2. Determine the root (root) of the tree, by taking the highest Gain value from the calculation of each attribute / variable. The highest Gain value is used as the earliest root, by calculating the entropy value of each attribute with the formula:

$$Entropy\ (S) = \sum_{i=1}^{n} -P_i\ log_2 P_i$$

S = set of cases
n = number of participants S
Pi = the proportion of Si to S

Whereas to obtain a Gain value, a formula can be used:

$$Entropy\ (S, A) = \sum_{i=1}^{n} \frac{|S_i|}{|S|}\ \ Entropy\ (S_i)$$

S = set of cases
A = feature
n = number of partition attributes
| Si | = the proportion of Si to S
| S | = number of cases in S

Repeat the second and third steps until the record is divided, and the process is stopped when:

a) All records in node n are in the same class
b) There are no attributes in the record that were added again
c) No records found on branch nodes that are empty.

III. RESEARCH METHODS

With regard to research methods, carried out by observing literal studies related to decision-making support systems, C4.5 Algorithm, Data mining in the form of references in the form of online journals, application usage tutorials used to obtain Decision Tree.

While in terms of data collection methods, obtained by opening the archive in the form of Recapitulation of Building Maintenance Work Activities and Procurement of Goods at the Foundation X Infrastructure Section. This

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data is processed by converting the news archive to the handover of the work and the delivery of goods in the form of Microsoft Excel table. The converted data is taken from the last 4 Budget Years (2015, 2016, 2017 and 2018).

The first process is to process data by selection by type, frequency of implementation of activities per year. After the data is collected, a process for granting criteria is carried out so that it can be grouped according to the budget year and how often the work appears in the year concerned.

The ultimate goal of the decision tree making process is the creation of rules that produce two categories of values, namely "YA" and "TIDAK" intended for the type of activity / work that has the feasibility to make the budget.

IV. DATA ANALYSIS

Information in the Decision Tree is often described as a table containing attributes and records that present a parameter as a criterion in creating a decision tree. Among the attributes, one of them states data as a way out per unit of data known as the destination attribute. Attributes contain values called instances.

After obtaining data amounting to 85 types of work activities, the next step is to determine a variable that is key in deciding the feasibility of the type of work to be included in the RAB. The data has 3 variables, namely the 2014-2015 Budget Year, 2015-2016, 2016-2017 and 2017-2018. While the criteria used are based on factors that will be key in the above process, namely the frequency of the implementation of maintenance and procurement activities in three classifications, namely:

Table 1:*Frequency Classification*

Classification	Frequency
0 - 10	Rendah
10 - 11	Sedang
> 20	Tinggi

Table 2:*Pre-Process Results Data*

No.	Job Name	Fiscal year				RAB
		2014 - 2015	2015 - 2016	2016 - 2017	2017 - 2018	
1.	Penggantian Lampu TL 18	Tinggi	Tinggi	Tinggi	Tinggi	Ya
2.	Penggantian Lampu TL 36	Tinggi	Tinggi	Tinggi	Tinggi	Ya
3.	Penggantian Lampu TL Ring	Rendah	Sedang	Rendah	Tinggi	Ya
4.	Ganti Tabung Lampu Taman	Rendah	Rendah	Rendah	Rendah	Tidak
5.	Penggantian Kap Lampu	Rendah	Sedang	Sedang	Rendah	Ya
6.	Penggantian Starter	Tinggi	Tinggi	Tinggi	Tinggi	Ya
7.	Penggantian Lampu SL	Tinggi	Sedang	Rendah	Rendah	Ya
8.	Penggantian Lampu Lift	Rendah	Rendah	Rendah	Rendah	Tidak
9.	Penggantian Lampu Tornado	Tinggi	Tinggi	Rendah	Rendah	Ya
10.	Penggantian Lampu LED	Rendah	Rendah	Tinggi	Tinggi	Ya
11.	Penggantian Kran Dinding	Tinggi	Tinggi	Tinggi	Tinggi	Ya
12.	Penggantian Kran Wastafel	Sedang	Rendah	Tinggi	Tinggi	Ya
13.	Penggantian Sifon	Sedang	Sedang	Tinggi	Sedang	Ya
14.	Penggantian Jet Spray	Rendah	Rendah	Rendah	Sedang	Ya
15.	Ganti Handle Pintu	Rendah	Rendah	Rendah	Rendah	Ya
16.	Ganti Saklar	Rendah	Rendah	Rendah	Rendah	Ya
17.	Ganti Pipa Flexible	Rendah	Rendah	Rendah	Rendah	Tidak
18.	Ganti Trafo	Sedang	Sedang	Tinggi	Sedang	Ya
19.	Ganti Silinder Kunci	Rendah	Sedang	Sedang	Sedang	Ya
20.	Ganti Sifon Angsa	Sedang	Tinggi	Tinggi	Tinggi	Ya
21.	Ganti Lampu PAR 18W	Sedang	Tinggi	Tinggi	Sedang	Ya
22.	Ganti MCB	Rendah	Sedang	Rendah	Sedang	Ya
23.	Ganti Push Kran	Rendah	Rendah	Rendah	Rendah	Tidak
24.	Penggantian Radar Air	Rendah	Rendah	Rendah	Rendah	Ya
25.	Ganti Stecker	Rendah	Rendah	Sedang	Rendah	Ya

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26.	Penggantian Stop Kontak	Sedang	Rendah	Rendah	Sedang	Ya
27.	Penggantian Blower	Rendah	Rendah	Rendah	Rendah	Tidak
28.	Penggantian Hanger	Rendah	Rendah	Sedang	Rendah	Ya
29.	Pembuangan Brangkal	Rendah	Sedang	Rendah	Rendah	Ya
30.	Pemasanan Bracket	Rendah	Rendah	Rendah	Rendah	Tidak
31.	Perbaikan Pintu	Rendah	Rendah	Rendah	Rendah	Ya
32.	Penggantian MFB	Rendah	Rendah	Rendah	Rendah	Tidak
33.	Perbaikan Kaca Jendela	Rendah	Rendah	Rendah	Sedang	Ya
34.	Pengantian Kipas Plafond	Rendah	Rendah	Sedang	Rendah	Tidak
35.	Perbaikan Saluran Air Bersih	Sedang	Sedang	Sedang	Rendah	Ya
36.	Perbaikan Saluran Air Kotor	Rendah	Sedang	Tinggi	Rendah	Ya
37.	Pemasangan Sticker Sunblast	Rendah	Sedang	Tinggi	Sedang	Ya
38.	Penggantian Switch/Router	Rendah	Sedang	Rendah	Rendah	Ya
39.	Service Rutin AC Split	Sedang	Sedang	Tinggi	Tinggi	Ya
40.	Perbaikan Lantai Keramik	Tinggi	Tinggi	Tinggi	Tinggi	Ya
41.	Pengadaan AC Split	Tinggi	Tinggi	Tinggi	Tinggi	Ya
42.	Pemasangan Vertical Blind	Rendah	Rendah	Sedang	Rendah	Tidak
43.	Pengecatan Ruangan	Tinggi	Sedang	Sedang	Rendah	Ya
44.	Penggantian Closet Duduk	Rendah	Rendah	Rendah	Rendah	Tidak
45.	Pengadaan AC StandingFloor	Rendah	Rendah	Rendah	Rendah	Tidak
46.	Pembuatan Sekatan	Rendah	Sedang	Sedang	Tinggi	Ya
47.	Pengadaan Meja Kantor	Tinggi	Sedang	Tinggi	Sedang	Ya
48.	Pengadaan Kursi Sandaran	Rendah	Sedang	Tinggi	Sedang	Ya
49.	Pengadaan Kursi Kuliah	Tinggi	Sedang	Sedang	Rendah	Ya
50.	Pembuatan Jaringan Internet	Tinggi	Sedang	Sedang	Sedang	Ya
51.	Pemasangan Instalasi Lab.	Sedang	Sedang	Rendah	Rendah	Ya
52.	Pengeboran Sumur Baru	Rendah	Rendah	Rendah	Rendah	Tidak
53.	Kuras Rutin Torn	Sedang	Sedang	Tinggi	Rendah	Ya
54.	Sedot Septic Tank	Sedang	Sedang	Sedang	Sedang	Ya
55.	Perbaikan Plafond	Sedang	Rendah	Rendah	Rendah	Tidak
56.	Perbaikan Lantai Parkiran	Rendah	Rendah	Rendah	Rendah	Tidak
57.	Pengadaan PC Dekstop	Sedang	Tinggi	Tinggi	Sedang	Ya
58.	Pengadaan Laptop/Notebook	Tinggi	Sedang	Tinggi	Sedang	Ya
59.	Pemasangan Karpet	Rendah	Rendah	Sedang	Rendah	Tidak
60.	Pengadaan Tripood	Sedang	Rendah	Sedang	Rendah	Ya
61.	Pemasangan Papan Tulis	Rendah	Rendah	Rendah	Rendah	Tidak
62.	Pemasangan Pintu Alumunium	Rendah	Rendah	Sedang	Rendah	Tidak
63.	Pemasangan CCTV	Rendah	Rendah	Rendah	Rendah	Tidak
64.	Pengadaan TV LED	Rendah	Sedang	Rendah	Rendah	Tidak
65.	Penggantian Paving Block	Rendah	Rendah	Rendah	Rendah	Tidak
66.	Perbaikan Pompa Air	Rendah	Rendah	Rendah	Rendah	Tidak
67.	Pembuatan Kirmir	Rendah	Rendah	Rendah	Rendah	Tidak
68.	Pembuatan Locker	Sedang	Sedang	Tinggi	Sedang	Ya
69.	Pengadaan Filling Cabinet	Sedang	Rendah	Sedang	Rendah	Ya
70.	Pembuatan Kitchen Set	Rendah	Rendah	Rendah	Rendah	Tidak
71.	Pemasangan Wallpaper	Rendah	Sedang	Rendah	Rendah	Tidak
72.	Pemasangan Lampu Sorot	Rendah	Rendah	Rendah	Rendah	Tidak

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73.	Pembuatan Rak Susun	Rendah	Rendah	Rendah	Rendah	Tidak
74.	Pengadaan Alat Teknik	Sedang	Sedang	Rendah	Rendah	Ya
75.	Perbaikan Peturasan	Rendah	Sedang	Sedang	Rendah	Ya
76.	Pengadaan Freon	Rendah	Rendah	Rendah	Rendah	Tidak
77.	Pengadaan Printer	Sedang	Sedang	Sedang	Sedang	Ya
78.	Pengadaan Cartridge	Sedang	Sedang	Rendah	Rendah	Ya
79.	Pengadaan Toner	Rendah	Sedang	Rendah	Sedang	Ya
80.	Pengadaan Tinta	Tinggi	Sedang	Sedang	Rendah	Ya
81.	Pengadaan Infocus	Sedang	Sedang	Sedang	Rendah	Ya
82.	Penarikan Barang inventaris	Tinggi	Tinggi	Tinggi	Tinggi	Ya
83.	Pemasangan Pemanas Air	Rendah	Rendah	Rendah	Rendah	Tidak
84.	Pengadaan HDD Eksternal	Rendah	Tinggi	Sedang	Sedang	Ya
85.	Distribusi Barang Inventaris	Tinggi	Tinggi	Tinggi	Tinggi	Ya

VI. RESULTS AND DISCUSSION

Based on the steps performed using C4.5 Algorithm, the results of the entropy calculation and the Gain value for each attribute and frequency are obtained as described below:

Total Entropy is calculated using the formula:

$$Entropy\ (S) = -P_{Ya} * (log_2 P_{Ya}) - P_{Tidak} * (log_2 P_{Tidak})$$

S = Entropy / Node
P_{Ya} = Value attribute that is valuable Ya
P_{Tidak} = Value attribute that is worth Tidak
$Log_2\ P_{Ya}$ = Logarithmic value with value Ya
$Log_2\ P_{Tidak}$ = Logarithmic value with value Tidak

$$\begin{aligned} Entropy\ (S) &= -P_{Ya} * (log_2 P_{Ya}) - P_{Tidak} * (log_2 P_{Tidak}) \\ &= \left(-\frac{57}{85}\right) * log_2\left(\frac{57}{85}\right) - \left(\frac{28}{85}\right) * log_2\left(\frac{28}{85}\right) \\ &= (-0{,}6706) * log_2(0{,}6706) - (0{,}3294) * log_2(0{,}3294) \\ &= ((-0{,}6706) * (-0{,}5765)) - ((0{,}3294) * (-1{,}6020)) \\ &= (0{,}3866) - (-0{,}5277) \\ &= 0{,}9143 \end{aligned}$$

Calculation of Entropy Budget Year

1. *Budget Year 2014-2015*

Entropy Rendah

$$\begin{aligned} Entropy\ (S) &= -P_{Ya} * (log_2 P_{Ya}) - P_{Tidak} * (log_2 P_{Tidak}) \\ &= \left(-\frac{22}{49}\right) * log_2\left(\frac{22}{49}\right) - \left(\frac{27}{49}\right) * log_2\left(\frac{27}{49}\right) \\ &= (-0{,}4490) * log_2(0{,}4490) - (0{,}5102) * log_2(0{,}5510) \\ &= ((-0{,}4890) * (-1{,}1553)) - ((0{,}5102) * (-0{,}8598)) \\ &= (0{,}5187) - (-0{,}4738) \\ &= 0{,}9925 \end{aligned}$$

Entropy Sedang

$$\begin{aligned} &= \left(-\frac{19}{20}\right) * log_2\left(\frac{19}{20}\right) - \left(\frac{1}{20}\right) * log_2\left(\frac{1}{20}\right) \\ &= (-0{,}95) * log_2(0{,}95) - (0{,}05) * log_2(0{,}05) \\ &= ((-0{,}95) * (-0{,}0740)) - ((0{,}05) * (-4{,}3219)) \\ &= 0{,}0703 - (-0{,}2161) \\ &= 0{,}2864 \end{aligned}$$

Entropy Tinggi

$$\begin{aligned} &= \left(-\frac{16}{16}\right) * log_2\left(\frac{16}{16}\right) - \left(\frac{0}{16}\right) * log_2\left(\frac{0}{16}\right) \\ &= 0 \end{aligned}$$

Information Gain :

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$$Gain\ (S,A) = Entropy\ (S) \sum_{i=1}^{n} \frac{|S_i|}{S} * Entropy\ (Si)$$

$$= 0{,}9143 - \left(\left(\frac{49}{85}\right) * 0{,}9925\right) - \left(\left(\frac{20}{85}\right) * 0{,}2864\right) - \left(\left(\frac{16}{85}\right) * 0\right)$$
$$= 0{,}9143 - ((0{,}5765 * 0{,}9925) - (0{,}2353 * 0{,}2864) - (0{,}1882 * 0))$$
$$= 0{,}9143 - (0{,}5721 - 0\ 0674)$$
$$= 0{,}9143 - (0{,}5074)$$

2. *Budget Year 2015-2016*

Entropy Rendah

$$Entropy\ (S) = -P_{Ya} * (log_2 P_{Ya}) - P_{Tidak} * (log_2 P_{Tidak})$$
$$= \left(-\frac{13}{39}\right) * log_2\left(\frac{13}{39}\right) - \left(\frac{26}{39}\right) * log_2\left(\frac{26}{39}\right)$$
$$= (-0{,}3333) * log_2(0{,}3333) - (0{,}6667) * log_2(0{,}6667)$$
$$= ((-0{,}3333) * (-1{,}5850)) - ((0{,}6667) * (-0{,}5850))$$
$$= (0{,}5283) - (-0{,}39)$$
$$= 0{,}9183$$

Entropy Sedang

$$= \left(-\frac{31}{33}\right) * log_2\left(\frac{31}{33}\right) - \left(\frac{2}{33}\right) * log_2\left(\frac{2}{33}\right)$$
$$= (-0{,}9394) * log_2(0{,}9394) - (0{,}0606) * log_2(0{,}0606)$$
$$= ((-0{,}9394) * (-0{,}0902)) - ((0{,}0606) * (-4{,}0444))$$
$$= (0{,}0847) - (-0{,}2451)$$
$$= 0{,}3298$$

Entropy Tinggi

$$= \left(-\frac{13}{13}\right) * log_2\left(\frac{13}{13}\right) - \left(\frac{0}{13}\right) * log_2\left(\frac{0}{13}\right)$$
$$= 0$$

$$Gain\ (S,A) = Entropy\ (S) \sum_{i=1}^{n} \frac{|S_i|}{S} * Entropy\ (Si)$$

$$= 0{,}9143 - \left(\left(\frac{39}{85}\right) * 0{,}9183\right) - \left(\left(\frac{33}{85}\right) * 0{,}3298\right) - \left(\left(\frac{13}{85}\right) * 0\right)$$
$$= 0{,}9143 - \left((0{,}4588) * 0{,}9183\right) - \left((0{,}3882) * 0{,}3298\right) - (0{,}1529 * 0))$$
$$= 0{,}9143 - (0{,}4213 - 0{,}1281 - 0)$$
$$= 0{,}9143 - 0{,}2933$$
$$= 0{,}6210$$

3. *Budget Year 2016-2017*

Entropy Rendah

$$Entropy\ (S) = -P_{Ya} * (log_2 P_{Ya}) - P_{Tidak} * (log_2 P_{Tidak})$$
$$= \left(-\frac{17}{41}\right) * log_2\left(\frac{17}{41}\right) - \left(\frac{24}{41}\right) * log_2\left(\frac{24}{41}\right)$$
$$= (-0{,}4146) * log_2(0{,}4146) - (0{,}5854) * log_2(0{,}5854)$$
$$= ((-0{,}4146) * (-1{,}2701)) - ((0{,}5714) * (-0.7726))$$
$$= (0{,}5266) - (-0{,}4522)$$
$$= 0.9789$$

Entropy Sedang

$$= \left(-\frac{17}{21}\right) * log_2\left(\frac{17}{21}\right) - \left(\frac{4}{21}\right) * log_2\left(\frac{4}{21}\right)$$
$$= (-0{,}8095) * log_2(0{,}8095) - (0{,}1905) * log_2(0{,}1905)$$
$$= ((-0{,}8095) * (-3{,}3049)) - ((0{,}1905) * (-2{,}3923))$$
$$= (0{,}2468) - (-0{,}4557)$$

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$= 0{,}7025$

Entropy Tinggi

$$= \left(-\frac{23}{23}\right) * \ log_2\left(\frac{23}{23}\right) - \left(\frac{0}{23}\right) * \ log_2\left(\frac{0}{23}\right)$$
$$= 0$$

$$Gain\ (S, A) = Entropy\ (S) \sum_{i=1}^{n} \frac{|S_i|}{S} * Entropy\ (Si)$$
$$= 0{,}9143 - \left(\left(\frac{41}{85}\right) * 0{,}9789\right) - \left(\left(\frac{21}{85}\right) * 0{,}7025\ \right) - \left(\left(\frac{23}{85}\right) * 0\ \right)$$
$$= 0{,}9143 - ((\ 0{,}4824 * 0{,}9789\ ) - (\ 0{,}2471\ \ * 0{,}7025\ ) - (\ 0{,}2706 * 0\ ))$$
$$= 0{,}9143 - (\ 0{,}4722 - 0{,}1736 - 0\ )$$
$$= 0{,}9143 - 0{,}2986$$
$$= 0{,}6157$$

4. *Budget Year 2017-2018*

Entropy Rendah

$$Entropy\ (S) = -P_{Ya} * (log_2 P_{Ya}) - P_{Tidak} * (log_2 P_{Tidak})$$
$$= \left(-\frac{24}{52}\right) * \ log_2\left(\frac{24}{52}\right) - \left(\frac{28}{52}\right) * \ log_2\left(\frac{28}{52}\right)$$
$$= (-0{,}4615\ ) * \ log_2(\ 0{,}4615\ ) - (\ 0{,}5385\ ) * \ log_2(\ 0{,}5385\ )$$
$$= ((-0{,}4615\ ) * (-1{,}1155\ )) - ((\ 0{,}4231\ ) * (-0{,}8931\ ))$$
$$= (0{,}5148) - (-0{,}4809\ )$$
$$= 0{,}9957$$

Entropy Sedang

$$= \left(-\frac{19}{19}\right) * \ log_2\left(\frac{19}{19}\right) - \left(\frac{0}{19}\right) * \ log_2\left(\frac{0}{19}\right)$$
$$= 0$$

Entropy Tinggi

$$= \left(-\frac{14}{14}\right) * \ log_2\left(\frac{14}{14}\right) - \left(\frac{0}{14}\right) * \ log_2\left(\frac{0}{14}\right)$$
$$= 0$$

$$Gain\ (S, A) = Entropy\ (S) \sum_{i=1}^{n} \frac{|S_i|}{S} * Entropy\ (Si)$$
$$= 0{,}9143 - \left(\left(\frac{52}{85}\right) * 0{,}9957\right) - \left(\left(\frac{19}{85}\right) * 0\ \right) - \left(\left(\frac{14}{85}\right) * 0\ \right)$$
$$= 0{,}9143 - \big((\ 0{,}6118\ ) * 0{,}9957\big) - \big((\ 0{,}2235\ ) * 0\ \big) - \big((\ 0{,}1647\ ) * 0\ \big)$$
$$= 0{,}9143 - 0{,}6092\ )$$
$$= 0{,}3052$$

Based on the explanation of the above calculation, the Information Gain (IG) value for each Budget Year variable is obtained with the largest value held by the Fiscal Year 2015-2016 as well as the complete table of entropy calculation results for each attribute as follows:

IG : 2015 - 2016 = 0,6210
IG : 2016 - 2017 = 0,6157
IG : 2017 - 2018 = 0,3052
IG : 2014 - 2015 = 0,4096

Node			Number of Cases	Ya	Tidak	Entropy	Gain
	Total		85	57	28	*0.9143*	
	TA 2014-2015						
		Rendah	49	22	27	0.9925	
		Sedang	20	19	1	0	
		Tinggi	16	16	0	0	

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		0.4096			
2015-2016	Rendah	39	13	26	0.9183
	Sedang	33	31	2	0.3298
	Tinggi	13	13	0	0
		0.6210			
2016-2017	Rendah	41	17	24	0.9789
	Sedang	21	17	4	0.7025
	Tinggi	23	23	0	0
		0.6157			
2017-2018	Rendah	52	24	28	0.9957
	Sedang	19	19	0	0
	Tinggi	14	14	0	0
		0.3052			

To describe the decision tree, the attributes that have the best Information Gain value are taken in this case owned by the FY 2015-2016 variable with a value of 0.6210.

V. IMPLEMENTATION

Testing and analysis processes play an important role in determining whether the results obtained are in line with expectations. To implement the results of this study, it is done with a help tool, the Rapid Miner application. The data to be implemented in this application is xlsx format.

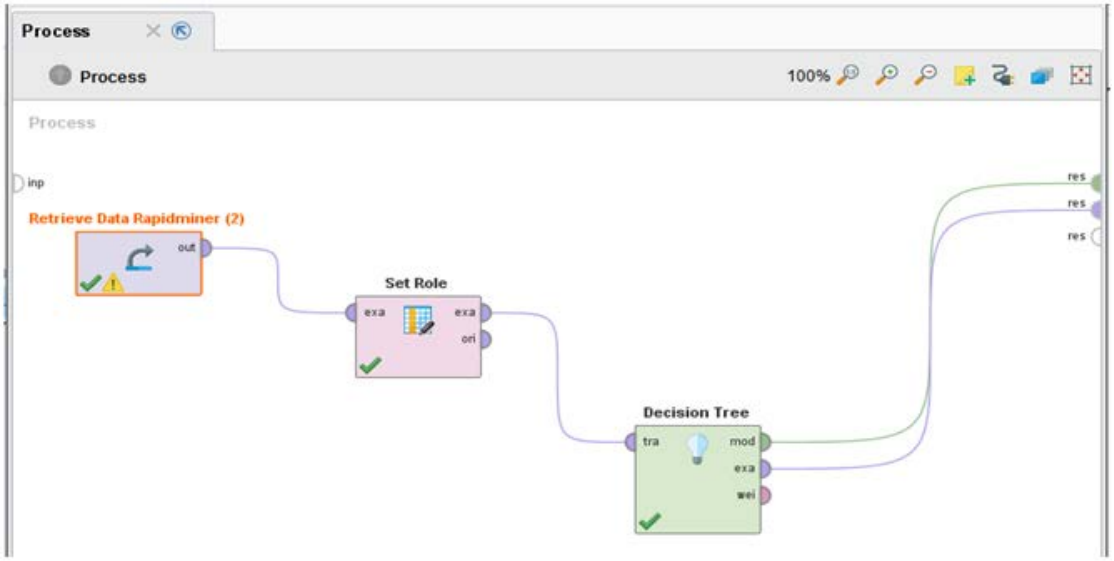

Figure 1:*Rapid Miner Process Panel*

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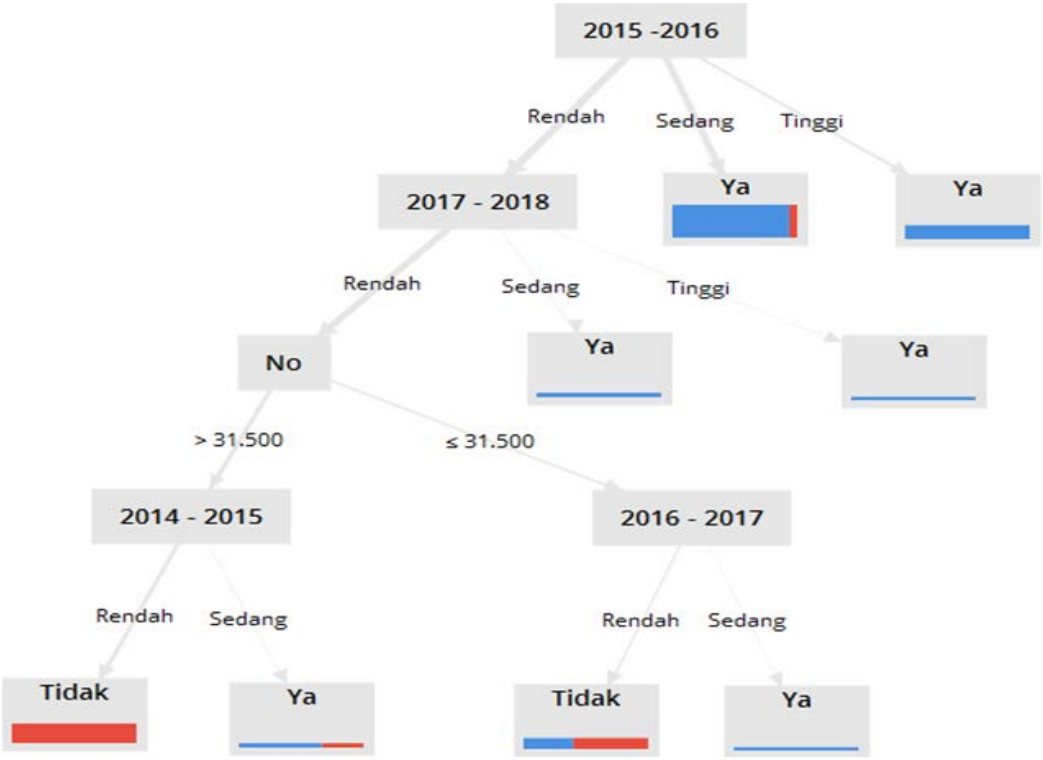

Figure 2:*Decision Tree.*

```
2015 -2016 = Rendah
|   2017 - 2018 = Rendah
|   |   No > 31.500
|   |   |   2014 - 2015 = Rendah: Tidak {Ya=0, Tidak=19}
|   |   |   2014 - 2015 = Sedang: Ya {Ya=2, Tidak=1}
|   |   No ≤ 31.500
|   |   |   2016 - 2017 = Rendah: Tidak {Ya=4, Tidak=6}
|   |   |   2016 - 2017 = Sedang: Ya {Ya=2, Tidak=0}
|   2017 - 2018 = Sedang: Ya {Ya=3, Tidak=0}
|   2017 - 2018 = Tinggi: Ya {Ya=2, Tidak=0}
2015 -2016 = Sedang: Ya {Ya=31, Tidak=2}
2015 -2016 = Tinggi: Ya {Ya=13, Tidak=0}
```

Figure 3:*Rules produced*

VI. CONCLUSION

By paying attention to the description above, the C4.5 Algorithm has been successfully implemented to make predictions or selection of various types of work that have the feasibility to make the budget. For future research, it is expected that trials can be carried out using data in greater numbers in the hope of obtaining more satisfying accuracy.

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