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K-Means Clustering With Decision Support System using SAW

Determining Thesis Topic

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***Abstract*—Thesis is an essential requirement for students to graduate. Students choose thesis topic according to their interests. In fact, many students choose inappropriate topic for their thesis and cause their thesis quality are bad. One of ways to solve the problem is to develop information system in form of Decision Support System (DSS). DSS needs data modeling and process to generate alternative decisions. Data modeling is in form of clustering using K-Means. This process generates clusters and weights to each topic. Weight is used to generate alternative decisions using Simple Additive Weighting Method. Combination K-Means and SAW can generate calculatioan fast to produce alternative decisions. This solution to support topic selection is excepted to contribute choosing thesis topic according to students ability.**

***Index Terms*— Clustering, Decision Support System, K-Means, SAW**

INTRODUCTION

Thesis is a document consist of the texts of students' research result in bachelor level which describes a problem in any science. However, many students are confused to prepare their thesis. They are confused to determine what topic for their thesis. Furthermore, They do not know which thesis topic in line with their skills. Even more, some students seems give up, never see the supervisor and have gone away for several months. When they come to see the supervisors, they have nothing and said that they are confused to select the topic for their thesis. One of means to solve is to establish Information System in the form of decision support system.

The information system is a regular combination of any of those - people, hardware, software, communication networks, and data resources that collect, transform, and distribute information within an organization [1]. This information system process data input and generates data output in form of information which has been ready to present for users. In terms of software, information system can be websites or desktop software. In addition, the type of users of information systems also vary, ranging from operator level to the level of the owner.

The information systems related to Decision Support Systems. Decision Support System (DSS) was first introduced in the early 1970s by Michael S. Scott with the terms Decision Management System, which is a computer-based system that helps decision to utilize data and models to solve problems of unstructured [2]. The purpose of DSS to support decision-makers choose the alternative decisions with models of decision making and to resolve problems that are semi-structured and unstructured.

Decision Support Systems also has the multiple methods. One of method in decision support systems is Simple Additive Weighting (SAW). The main process in the SAW method is the sum of the weight value of the performance level at each alternative on all attributes [3]. SAW method requires a process of normalizing the decision matrix (X) to a scale that can be compared with all levels of alternatives. The decision maker must determine weights for each attribute. The total score of each alternative is obtained by adding all of the multiplication of rating and weights. The rating of each attribute should be free. It means that it has passed the process before normalization matrix. SAW method has a calculation time shorter so it has an efficient process in making decision.

Weighting for each attribute makes the decision makers should think about some consideration. This can be aided by a process of clustering that generates weights for each attribute. The clustering method uses K-Means. K-Means is a data analysis or data mining methods which processes modeling without supervision (unsupervised) and it is one of method to clustering data by partition system [4]. K-means method attempts to group the data into several groups, where data in a group have similar characteristics to each other and have different characteristics with the data that is in the other group. In other words, this method seeks to minimize the variation between the data that is in a cluster and maximize variation with existing data in the other cluster.

Procurement of Decision Support System needs an analysis in order to the implementation of this system has appropriate effect [5]. The first analysis done on the analysis of weakness in the system using a PIECES framework. This framework has 6 domains, namely Performance, Information, Economic, Control, Efficiency, and Service. Once the weaknesses of the old system gained further procurement of the new system should be able to fix some flaws earlier. It is the need for a

feasibility study to the new system. The feasibility study contains technical, operational, and economic feasibility.

THE CONDITION OF PREVIOUS SYSTEM

In general, the determination of the topic thesis is done by the students. In some colleges, students determine topic in their thesis is based on the object of interest or theme that refers to their intuition. The students have not been able to use their reference values for these determinations. In addition, the theme paper filing system is still manual. This means that the submission of the thesis is determined directly and written in the paper, causing some weaknesses. The weaknesses of this system with the framework PIECES shown in Table 1. Analysis of these weaknesses taken under direct observation in the example of universities.

TABLE I. ANALYSIS RESULT OF SYSTEM WEAKNESS USING PIECES

No.	Domain	Weakness
1.	Performance	a. Students fill out the submission form for 5 minutes. b. The approval title process takes 1-2 days. c. Students determine topic need 1-2 days.
2.	Information	Output:
		a. Received Information for student is only a letter of acceptance of thesis title. b. The description of thesis topic whether is accepted or rejected, but only qualitative. c. The format of the received information is changed frequently. d. Information is not supported by relevant data for decision support.
		Input: a. No selection of parameters for determining the thesis topic. b. Data is inputted by students then operator inputs again to word processing software. c. Student must input the personal data in the system that already contains biographical data of students.
		Stored Data: a. Storing data takes long time because it occurs twice kind of data input. b. It occurs data duplication. c. There is not data validation d. Relationship of data is not organized well.
3.	Economic	a. It needs cost supply of paper. b. It requires printer ink costs.
4.	Control	a. Inputted data can still be changed. b. The data lost due to storing form is not good. c. Filling form is not secret.
		d. Thesis topic submission rules are less binding. e. Data may be accessed by unauthorized users.
5.	Eficiency	a. Filling form takes long time so obtained result are not productive. b. Paper wastage occurs because form filling is not used anymore after the input to the computer. c. Data redundancy occurs when the inputting data occurs many times.
6.	Services	a. System generates inaccurate data. b. The system stores the data inconsistent. c. There is no integration of the system sharing. d. The applied system is still confusing students in determining the topic thesis. e. The system is not flexible to change.

DESIGN OF DECISION SUPPORT SYSTEM

Development methods will include the steps shown in Fig. 1. These steps include the study of literature, data collection, analysis, design, and discussion. Some of these procedures are expected to generate a combination of clustering K-Means and Decision Support Systems SAW that this combination generates an alternative decision in determining the topic thesis. Those steps are shown in Fig. 1.

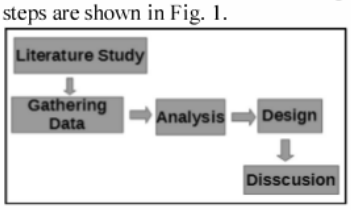

Fig. 1. *Development Phase*

A. Gathering Data

Gathering data is done by understanding the problem formerly. The collected data is the data associated with this research topic. These data are the data of students, courses, conversion value, and the study results card. The data collection is done by sampling and random that not all data is retrieved.

B. Phase Of Literature Study And Review

In this phase, the literature study and review of some of the references that are relevant to the research topic. As for the references referred to in this study are the basics of data mining, K-Means Algorithm, Decision Support Systems, Decision Making phases, Simple Additive Weighting Method, and Analysis Design based on object oriented.

C. Analysis Phase

This phase is done by analyzing the problems and

requirement of this study. A problem analysis was conducted to learn and understand the problem domain well for a thorough analysis of problems, opportunities, and limitations. Phase of the analysis consists of the analysis of problems and solutions by reference to the previous phase. Analysis of problems and solutions is explained the focus of the problem to be solved in the research and determine the probability of success of proposed solutions. The analysis needs to be done to generate the requirement specification. It is a detailed specification of the things that will be done when the system is implemented. This requirement analysis is required to determine the output by the system, the required input system, and the description of the process is used to process inputs into outputs. The problems that will be solved in this study is providing a website to support the student's decision in determining the type of topic thesis. Formerly, the preferences model is inputed by Information Systems staff. Then, students can input the criteria supplied. The final result of this system is an alternative in the form of an thesis topic rankings so students can use these alternative options to determine the topic thesis.

D. Design Phase

Phase of the design is a continuation of the analysis phase and it is divided into 2 sub phase, namely logic and physical design. The final target of this phase is produced designs that meet the defined requierment during the analysis phase of the system. The final result of the detail of design specifications so easily realized at the time of programming. In the logical design, user requierment and solving problems is identified during the analysis phase began to be implemented.

E. Discussion Phase

At the implementation phase include programming and testing activities under the program code. Some disscused process in this phase consist of clustering thesis method using K-Means and generating alternatif decision using SAW.

COMBINATION OF K-MEANS AND SAW

The general achitecture in this system is shown in Fig. 2. Early, there are a few samples of Study Results Card of students who have graduated. The samples contain Grade Point Average (GPA) of students from each course. Then, the value of GPA is done on average to each semester to produce GPA per semester. Thus, each student has a GPA per semester is from the semester 1 to semester 7.

Once, it generates GPA per semester, then the next step is to determine the number of groups and their members. The determination of this group using the K-Means algorithm. The algorithm will be repeatedly done or pass several iterations until the members of the group do not change. Once the group is generated, the next step is giving name to the groups. The generated groups have members in the form of students with GPA from semester 1 to semester 7. Then, each group is conducted average so it produces an average value of each group. Comparison of the average value is used to determine the weight of each group from the proportion of each group. Then, students can also use this system to support its decision in selecting the topic thesis. Before use this system, operators or staff department must determine the value of course criteria which is a prerequisite of any group thesis. Then, the students fill this prerequisite with each GPA of their courses. Furthermore, the system will calculate weights and sort each group thesis so generate the ranking of selection topic group of thesis. Students can easly choose topic groups. It will be selected with decision support in the form of an thesis topic group rankings. Furthermore, the title of the thesis that match their topic can also be inputed as well.

Based on Fig. 2, Simulation Case for Decision Support System of Determination Thesis with K-Means and SAW, initially is shown in Table II. In Table II, there are samples of students to do clustering. In this sample there is a list of students showing the Grade Point Average (GPA) of semesters 1 through 7. The clustering is done based on value of GPA each semester. The sample of simulation uses 12 students. Thus, each student has seven attributes to be used as the basic for clustering.

In Table III, there is a central point of beginning. The center point or centroid is several rows of data selected number of groups to be formed. Thus, the number of groups is always equal to the number of the centroid. This centroid can be selected by random or systematic.

Clustering or grouping is done repeatedly. Condition of centroid is always changed on each iteration. This cause the membership of each group is also changed. However, in certain iteration, the membership will always be the same. When the next iteration has the same members of iteration previously, this indicates that the iteration clustering using K-Means should be terminated. In this simulation, there are 4 iterations. On the 4th iteration, it is obtained the centroid as shown in Table IV. Furthermore, members of the group on the 4th iteration has similar with the members of the group from the 3rd iteration. Membership in the 4th iteration is shown in Table 4.

Clustering results in Table V are the group and its members. Each sample of students is included in particular group. So, there is not students who do not have a group. In addition, each group also has members although only one member.

After clustering results is obtained, the next step is finding the value of the weight criteria. These criteria of weighted value is obtained by the average of the entire GPA semester included in the particular participant. In Table VI, there is an average value of C1. This value is obtained by the average of the value of GPA students in the group A. Then, C2 is the average value of all GPA incoming students in groups B and same result with C3, C4, and C5. The proportion value is obtained by calculating average column involved and it divided by sum of average C1 to C5. For example, the proportion value of C1 = 3.300 / sum of C1 to C5 average. This is done for several other weights.

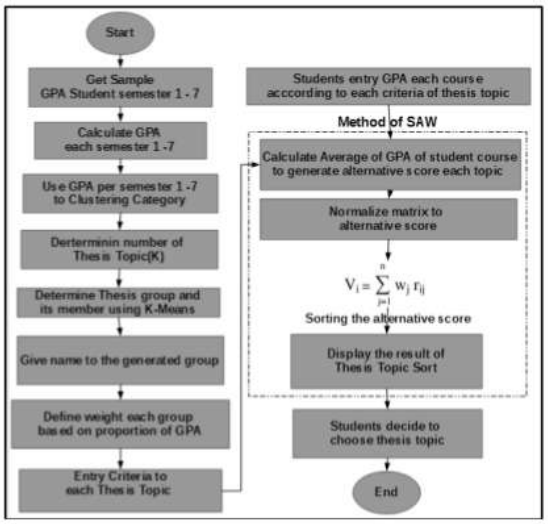

Fig. 2. *General System Architecture*

TABLE II. GPA PER SEMESTER OF STUDENS

Student Name	GPA Per Semester						
	GPA-1	GPA-2	GPA-3	GPA-4	GPA-5	GPA-6	GPA-7
AFLAKHATIS RATNA C.	3.35	3.25	3.42	3.35	3.16	3.26	3.31
ANIS YULIASIH	3.4	3.25	3.18	3.3	3.29	3.21	3.31
AHMAD ARIF SETYO UTOMO	2.65	2.5	2.93	3.4	3.16	2.79	3
APRIZAL EFENDI	2.55	1.44	1.16	0.86	2.68	2.47	2.5
AHMAD EFENDI	3.25	3.55	3.18	3.5	3.39	3.11	3.44
ANI BINTI FITRIAH	3.3	3.28	2.53	3.2	3.45	3	3.13
APRILIA DITA HENING SUCI	3.1	3.05	2.89	2.9	3.37	3.13	2.81
ELFA MIFTAKHUL JANNAH	3.25	3.28	3.29	3	3.26	3.16	3.18
ADITYA RAMADHAN TRY P.	2.85	3.1	2.92	2.9	3.24	3	3.21
AHMAD SETYO UTOMO	3.4	3.48	3.39	3.53	3.61	3.42	3.94
AGUNG FEBRIANSAH	2.7	2.9	2.89	1.7	3.39	2.97	2.57
AHMAD PRASETYA PUTRA	2.55	2.9	2.05	1.69	2.91	2.45	3.42

TABLE III. INITIAL CENTROID

Centroid	ID	Student Name	GPA-1	GPA-2	GPA-3	GPA-4	GPA-5	GPA-6	GPA-7	Cluster
centroid A	13.11.5473	AFLAKHATIS RATNA C.	3.35	3.25	3.42	3.35	3.16	3.26	3.31	A
centroid B	13.11.5474	ANIS YULIASIH	3.4	3.25	3.18	3.3	3.29	3.21	3.31	B
centroid C	13.11.5477	AHMAD EFENDI	3.25	3.55	3.18	3.5	3.39	3.11	3.44	C
centroid D	13.11.5481	ADITYA RAMADHAN TRY P.	2.85	3.1	2.92	2.9	3.24	3	3.21	D
centroid E	13.11.5484	AHMAD PRASETYA PUTRA	2.55	2.9	2.05	1.69	2.91	2.45	3.42	E

TABLE IV. CENTROID OF 4TH ITERATION

Centroid	GPA-1	GPA-2	GPA-3	GPA-4	GPA-5	GPA-6	GPA-7	Cluster
centroid A	3.35	3.25	3.42	3.35	3.16	3.26	3.31	A
centroid B	3.325	3.265	3.235	3.15	3.275	3.185	3.245	B
centroid C	3.325	3.515	3.285	3.515	3.5	3.265	3.69	C
centroid D	2.92	2.966	2.832	2.82	3.322	2.978	2.944	D
centroid E	2.55	2.17	1.605	1.275	2.795	2.46	2.96	E

TABLE V. CLUSTERING RESULT OF 4TH ITERATION

ID	Student Name	GPA Semester							distance to centroid A	distance to centroid B	distance to centroid C	distance to centroid D	distance to centroid E	Cluster
		GPA-1	GPA-2	GPA-3	GPA-4	GPA-5	GPA-6	GPA-7						
13.11.5473	AFLAKHATIS RATNA C.	3.35	3.25	3.42	3.35	3.16	3.26	3.31	0.000	0.313	0.613	1.064	3.210	A
13.11.5474	ANIS YULIASIH	3.4	3.25	3.18	3.3	3.29	3.21	3.31	0.286	0.191	0.570	0.923	3.066	B
13.11.5480	ELFA MIFTAKHUL JANNAH	3.25	3.28	3.29	3	3.26	3.16	3.18	0.413	0.191	0.809	0.736	2.880	B
13.11.5477	AHMAD EFENDI	3.25	3.55	3.18	3.5	3.39	3.11	3.44	0.522	0.519	0.342	1.141	3.291	C
13.11.5482	AHMAD SETYO UTOMO	3.4	3.48	3.39	3.53	3.61	3.42	3.94	0.845	0.933	0.342	1.808	3.641	C
13.11.5475	AHMAD ARIF SETYO UTOMO	2.65	2.5	2.93	3.4	3.16	2.79	3	1.276	1.194	1.563	0.837	2.576	D
13.11.5478	ANI BINTI FITRIAH	3.3	3.28	2.53	3.2	3.45	3	3.13	1.001	0.761	1.054	0.728	2.686	D
13.11.5479	APRILIA DITA HENING SUCI	3.1	3.05	2.89	2.9	3.37	3.13	2.81	0.947	0.693	1.269	0.304	2.484	D
13.11.5481	ADITYA RAMADHAN TRY P.	2.85	3.1	2.92	2.9	3.24	3	3.21	0.899	0.672	1.130	0.339	2.424	D
13.11.5483	AGUNG FEBRIANSAH	2.7	2.9	2.89	1.7	3.39	2.97	2.57	2.057	1.806	2.361	1.206	1.776	D
13.11.5476	APRIZAL EFENDI	2.55	1.44	1.16	0.86	2.68	2.47	2.5	4.091	3.860	4.381	3.158	1.062	E
13.11.5484	AHMAD PRASETYA PUTRA	2.55	2.9	2.05	1.69	2.91	2.45	3.42	2.475	2.236	2.631	1.645	1.062	E

TABLE VI. CRITERIA WEIGHT DETERMINATION

	C1	C2	C3	C4	C5
Average:	3.300	3.240	3.442	2.969	2.259
Proportion:	0.217	0.213	0.226	0.195	0.149
Weight	**0.217**	**0.213**	**0.226**	**0.195**	**0.149**

Then, the students input the GPA of each subject for some criteria of topic thesis. In Table VII are shown some of the subjects that are included in criteria of thesis topic Business Intelligence. Students get a GPA of thesis topic Business Intelligence after input the GPA value for each subject. The GPA is 2.05. The GPA is divided by 5 due to the amount of defined thesis topic is 5. The result of this division is 0.41. The result of the division is an input value to the table 7.

Thus, the value for the column C1 to C5 in the thesis topic of Business Intelligence is 0.41. Likewise with other values of thesis topic, it is calculated in the same manner. In Table 6, it is obtained a list of values.

In Table VIII is the basic for calculating the normalization of alternative values in Table VIII. It will be taken as an example for the calculations of System Analyst and Design. In Table VIII, System Analyst and Design has a value of 0.43 in the column C1 to C5. Then, the calculation for each column System Analyst and Design in table 8 are as follows:

C1 = 0.43 / max(C1 on Table VII) ➔0.843137255
C2 = 0.43 / max(C2 on Table VII) ➔0.843137255
C3 = 0.43 / max(C3 on Table VII) ➔0.843137255
C4 = 0.43 / max(C4 on Table VII) ➔0.843137255
C5 = 0.43 / max(C5 on Table VII) ➔0.843137255

Furthermore, the calculation of alternative decisions is shown in Table IX. The calculation of the weight of alternative decisions for each topic refers to Tables VII and VIII. For example, the calculation of interest Networking described as follows:

Networking = C1 table VII * C1 Table VIII +
C2 table VII * C2 Table VIII +
C3 table VII * C3 Table VIII +
C4 table VII * C4 Table VIII +
C5 table VII * C5 Table VIII ➔ 0.662745098

TABLE VII. ENTRIYING GPA OF EACH THESIS TOPIC COURSE

1. Business Intellegence:	Credit	Letter Grade	Numeric Grade	Total Grade
Informastion System Concept	4	B+	3.5	14
Statistic	2	C+	2.5	5
Management Information System	2	B	3	6
Database	3	C+	2.5	7.5
Analysist of Proses Business	2	C	2	4
Operation Research	2	C	2	4
Analysist and Design of IS	4	C+	2.5	10
Object Oriented Programming	3	C+	2.5	7.5
Development of IS	4	B+	3.5	14
Distributed System	3	E	0	0
DSS	4	D	1	4
Data Mining	3	E	0	0
Expert System	2	D	1	2
	GPA:	**2.05**		**0.41**

TABLE VIII. GRADE LIST

Topic Group	C1	C2	C3	C4	C5
Business Intelle	0.41	0.41	0.41	0.41	0.41
System Analyst	0.43	0.43	0.43	0.43	0.43
Audit and Contr	0.51	0.51	0.51	0.51	0.51
Software Devel	0.26	0.26	0.26	0.26	0.26
Networking	0.35	0.35	0.35	0.35	0.35

TABLE IX. ALTERNATIVE NORMALIZATION

Topic Group	C1	C2	C3	C4	C5
Business Intellegence	0.803921569	0.803921569	0.80392157	0.803922	0.803922
System Analyst and Design	0.843137255	0.843137255	0.84313725	0.843137	0.843137
Audit and Control	1	1	1	1	1
Software Development	0.509803922	0.509803922	0.50980392	0.509804	0.509804
Networking	0.68627451	0.68627451	0.68627451	0.686275	0.686275

TABLE X. ALTERNATIVE DECISION

Business Intellegence:	1.648039216
Audit and Control:	1.812745098
System Analyst and Design:	2.55
Networking:	0.662745098
Software Development:	1.200980392

Highest score of weight of each group is System Analyst and Design, so student who input criteria is recomendate to take thesis using topic of System Analyst and Design.

Evaluation Method fprt test the qualitif of cluste is generated in clustering using silhoueete coeficient [6]. This method is cluster validation method that combine cohesion and separation method. There are 3 step that need to be done for calculating silhoueete coeficient:

1. Each object of i, calculate average distance of objek i using all of object in a cluster. It will be gain the average ai.
2. Each object of i, calculate average distance of object I to other cluster object. The average of distance is gain minimun value. This value is called bi.
3. So, the object i has silhouette coeficient:

$$S_i = (b_i - a_i) / \max(a_i, b_i) \quad (1)$$

Evaluation result of this clustering is shown in Tabel 11. There are silhouette value under 0. That is shown that cluster member still can be change the membership in other cluster. So, it needs iteration in order to be stable in membership change.

TABLE XI. SHILOUETTE COEFICIENT

Students ID	Cluster	GPA-1	GPA-2	GPA-3	GPA-4	GPA-5	GPA-6	GPA-7	a(i)	b(i)	Silhoutte
13.11.5473	A	3.35	3.25	3.42	3.35	3.16	3.26	3.31	0	0.286356	1
13.11.5474	B	3.4	3.25	3.18	3.3	3.29	3.21	3.31	0.381838	0.286356	-0.25006
13.11.5480	B	3.25	3.28	3.29	3	3.26	3.16	3.18	0.381838	0.432666	0.117477
13.11.5477	C	3.25	3.55	3.18	3.5	3.39	3.11	3.44	0.683301	0.435201	-0.36309
13.11.5482	C	3.4	3.48	3.39	3.53	3.61	3.42	3.94	0.683301	0.832646	0.179363
13.11.5475	D	2.65	2.5	2.93	3.4	3.16	2.79	3	1.208792	1.198874	-0.0082
13.11.5478	D	3.3	3.28	2.53	3.2	3.45	3	3.13	1.087683	1.001049	-0.07965
13.11.5479	D	3.1	3.05	2.89	2.9	3.37	3.13	2.81	0.863415	0.79806	-0.07569
13.11.5481	D	2.85	3.1	2.92	2.9	3.24	3	3.21	0.872601	0.780513	-0.10553
13.11.5483	D	2.7	2.9	2.89	1.7	3.39	2.97	2.57	1.577608	1.396961	-0.11451
13.11.5476	E	2.55	1.44	1.16	0.86	2.68	2.47	2.5	2.124218	2.571303	0.173875
13.11.5484	E	2.55	2.9	2.05	1.69	2.91	2.45	3.42	2.124218	1.396961	-0.34236

After a general overview is defined, functional requirements can be documented using use case. Use case describes the functions of the system from external user point of view, in the manner and terms have been understood. Fig. 3 shows the use case diagram for the documentation of functional requirements. In Fig. 3 there are 2 actors, namely Operator (Department) and students. Each actor has a case. Case is a representation of the functional requirements resulting from the analysis of functional requirements. Related Case to the operator account is registration, processing student data, process the data subjects, data processing Study Result Card, and clustering students based on GPA per semester. Then, related case of students is register an account, input the IP value, and generate alternative decisions.

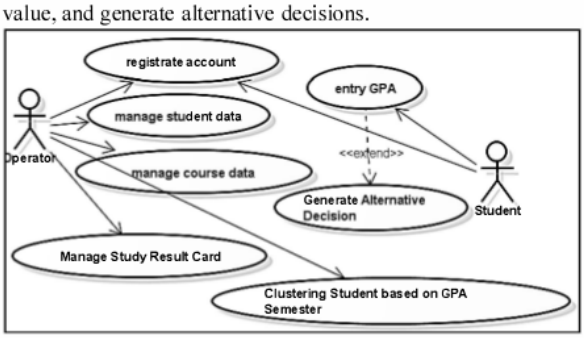

Fig. 3. *Use Case Diagram*

The design logic is a phase that will reveal the business needs in the system built. This design is still using modeling UML (Unified Modeling Language) based on an object-oriented. This initial phase is modeling step of the process or activity of the system. Modeling the activity of this system uses activity diagrams. The activity diagram illustrates the steps of the defined use case previously.

In Fig. 4 is shown the flow of the clustering of thesis topic. This clustering starting from displaying clustering. Next, the operator selects clustering. The system then calculates the value of GPA semester for each student. GPA Semester is used as a reference for clustering. Early clustering is also characterized by determining the centroid early. Then, find the value closest to the centroid of the candidates so generating the group. This is done repeatedly until the members of the group from the previous iteration unchanged.

In Fig. 5 there is activity diagram of generating alternative decision. Initially, the computer system displays input field values for each subject. Then, students choose advanced features and fills GPA value for each subject are shown. The next step, the system calculates an alternative value as in the simulation calculations Table VII. This calculation matrix is continued by matrix normalization in accordance with the Table VIII. Furthermore, the weight calculation is shown in Table X. The final result provides a list of alternative decisions and can be sorted by greatest value. The value is a recommendation for a student to choose the thesis topic.

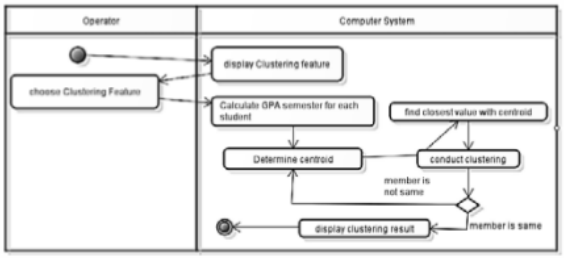

Fig. 4. *Activity Diagram of Clustering Student*

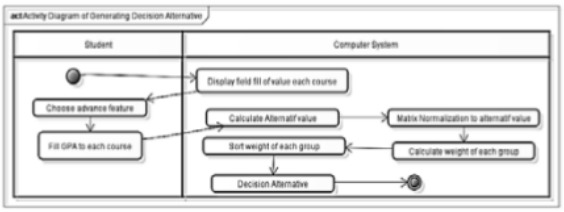

Fig. 5. *Activity Diagram of Generating Decision Alternative*

FEASIBILITY STUDY OF DSS PROCUREMENT

Procurement system is the need for a feasibility study to assess the value of the resulting benefits. Expectations of this system is to help students determine the interest thesis. The results of this feasibility study are shown in Table 11.

TABLE XII. RESULT OF FEASIBILITY STUDY

No.	Domain	Analysis Result
1.	Technical	a. Generated Information is real time and can be traced. b. Data is stored securely. c. Existing infrastructure need budget about USD 500. d. Maintenance is done continuely by monitoring during a week.
2.	Operational	a. The process of inputting data takes 1-2 minutes. b. The use of system need training about 3 times of meeting. c. Instalation and konfiguration need a hour.
3.	Economic	a. Reducing cost about the use of paper is 10%. b. Maintaince system is done by monitoring every week uses cost about USD 2. c. Every year gains intangible benefit about USD 200.

CONCLUSION

Determination of topic thesis in which students can use Decision Support System. This is because the previous system had several weaknesses. Those weaknesses were obtained with the framework PIECES. Each domain of the framework generates the weakness. Method of generating alternative decisions is using Simple Additive Weighting. Furthermore, the weight of each attribute is generated from the value of the group that obtained using K-Means methods. SAW and K-Means are two methods that have great speed calculation so as to accelerate the process of generating alternative decisions. Furthermore, the new system is the need for a feasibility study to accommodate the weaknesses of the previous system. The feasibility analysis shows that the Decision Support System for the determination of thesis topic.

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