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A PROPOSED OF RECOMMENDER MODEL FOR ONLINE TEACHING TOOL USING ANALYTIC HIERARCHY PROCESS (AHP)

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ABSTRACT

Pandemic covid-19 has affected all sector around the world. The academic sector is one of the sectors that affected by the increasing of pandemic covid-19 cases. Universities, colleges, and school has been closed to prevent it from being spread. Therefore, the online teaching method are applied to replacing the conventional teaching method. Due to the sudden emergence of the covid-19, most of the educator are not well prepared to used online teaching tool to replace the conventional method. Because of the lacking of experience in applying online teaching tool, educator facing an issues and challenges in choosing the suitable online teaching tool. Some online teaching tool having technical and functional problem that impact the online teaching process. Thus, it has been critic by student and also educator. Therefore, a tool is needed to assist the educator in finding the suitable web 2.0 tools that can be used in online teaching environment. Recommender model for online teaching tool was proposed to help the educator to find the preferred web 2.0 tool for the teaching purpose. Hence, the teaching environment will meet the student and educator preferred.

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1. INTRODUCTION

The increasing of pandemic covid-19 cases in the world has impact all sector around the world including education. Because of this pandemic, universities, colleges, and school activities has been halted (Jena, 2020; Upoalkpajor & Upoalkpajor, 2020). Learners doesn't have permission to having a face to face learning session to prevent the spread of the pandemic. Thus, online teaching method is used to replace the conventional teaching method (Chen et al., 2020). However, due to some technical and functional problem, some of online teaching tools has been critic by the student and also educator (Chen et al., 2020). Besides, due to the sudden emergence of the covid-19, the educator having some challenges in online teaching because of the lacking of experience. Educator also facing an issues in choosing the preferred online teaching tool (Bao, 2020). Due to this issues and challenges, a tool is needed to find the suitable online teaching tool that are preferred by the student and also educator. Thus, this research aims to proposed a recommender model to determine the suitable web 2.0 tool that can be used in online learning. The proposed recommender model will assist lecturer or educator in determining the suitable web 2.0 tool that can be used in online learning based on student preferred. Hence, the online teaching tool will suit with the need of student and also the educator. The reminding paper is organized as follows. In Section 2 is more on the important concept of recommender model with Web 2.0 tool and analytic hierarchy process (AHP). Then follows by the recommender model for online teaching tool in Section 3. The paper is concluded in section 4.

2. LITERATURE REVIEW

2.1 Web 2.0 Tool

Web 2.0 tool is an internet tool that allow the user to interact and creating content with others (Barhoumi, 2017). Web 2.0 tool can be useful in various of field including education. There are various of Web 2.0 tool that can be used in education environment such as Google Classroom, Google Meet, Quizziz, Canva, and etc. Web 2.0 tool can give positive impact to the education due to its capability (Caliskan, Guney, Sakhieva, Vasbieva, & Zaitseva, 2019). Before this, educator has applied some technologies likes Microsoft Office application. Instead of using this technologies, educator can apply web 2.0 tool to give a new perspective to the learning environment (Balbay & Erkan, 2018).

2.2 Analytic Hierarchy Process (AHP)

Analytic Hierarchy Process (AHP) was designed to solve the issues in decision making. Using AHP, the pairwise comparison will be made to get the overall priorities based on the order ranking (Agustin, Kurniawan, Yusfrizal, & Ummi, 2018). AHP consist of several steps which is: (1) Develop the hierarchy structure, (2) Pairwise comparison to find the priorities of the criteria and also the alternative, (3) Synthesizing Final Priorities to find the highest overall priorities and making a decision (Mu & Pereyra-Rojas, 2017). The advantage of AHP is it can be used to find a decision for individually and in group decision (ŞAHİN & YURDUGÜL, 2018).

3. RECOMMENDER MODEL FOR ONLINE TEACHING TOOL

The recommender model will be used to find the suitable web 2.0 tool that can be used for online teaching. This model will get the input with the method of collecting data by spreading the recapitulation questioner to the student and expert lecturer. The questioner will use the AHP fundamental scale for the purposed of converting the result into the concept of AHP. The criteria questioner will be given to the student using google form to find their preferred criteria that have in online teaching tool. The alternative questioner will be given to the expert lecturer using google form to find the weight of each criteria for each of the web 2.0 tool. Using knowledge and experience, the lecturer experts need to evaluate the web 2.0 tool with respect to each of the criteria. After that, the questioners result will be calculated to find maximum scale for each criteria that derived from criteria questioner and the maximum scale for each criteria in each alternative that derived from alternative questioner. The input from the criteria questioner will be process using pairwise comparison (alternative vs criteria) to find the weight of the criteria that the student preferred. The input from the alternative questioner will be process using pairwise comparison (alternative vs criteria) to find the weight of the criteria in each alternative. The result from the both pairwise comparison (alternative vs criteria) and pairwise comparison (criteria vs objective) will be process using synthesizing final priorities to ranking the web 2.0 tools based on the student preferred. Based on the synthesizing final priorities result, this model will suggest the suitable web 2.0 tool that can be used form online teaching for the lecturer or educator. Fig. 1 shows the purposed conceptual model that will be used in recommender model for online teaching tool.

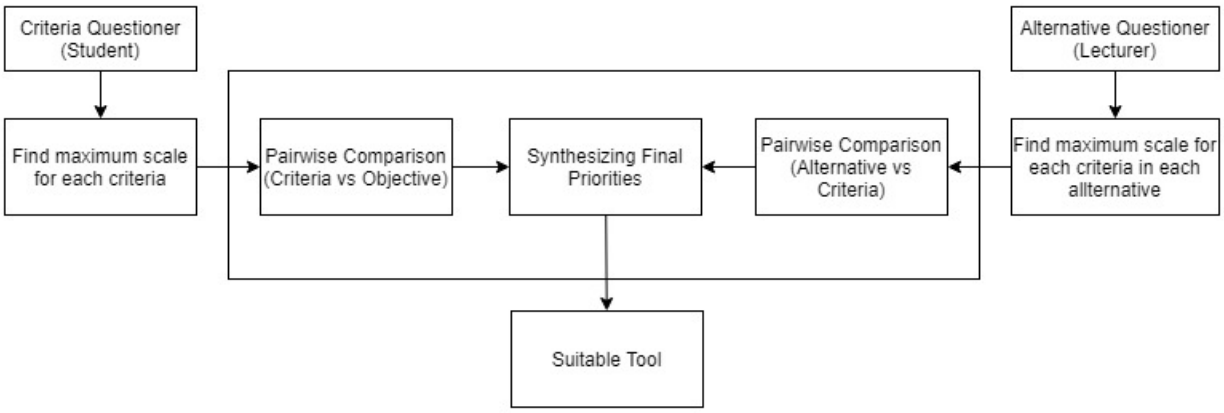

Fig. 1. Recommender Model for Online Teaching Tool

3.1 Hierarchy Structure

Fig. 2 shows the hierarchy structure for the proposed recommender model. The objective is to determine the suitable web 2.0 tool for online teaching. The criteria's in this hierarchy are define using the preferred criteria of web 2.0 tool which is easy to learn, easy to use, user friendly, interesting and support by many platforms. The alternatives in this hierarchy are web 2.0 tool.

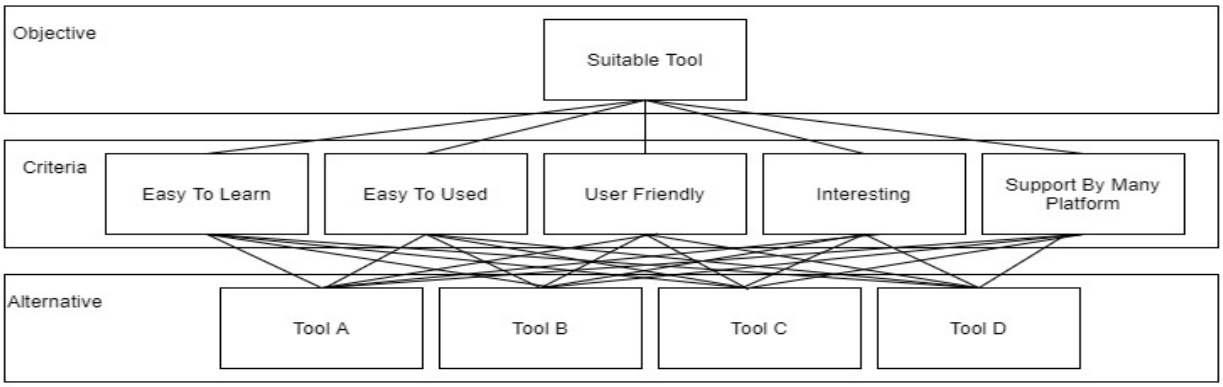

Fig. 2. Hierarchy Structure

3.2 Calculating Recapitulation Questioner

Table 1 shows the example of the criteria questioner data collection. The criteria questioner was distributed to the student to find their preferred criteria that have in online teaching. Based on the data collection, the calculation will be made to find the max scale for each of criteria. Table 2 shows the example of the criteria data collection calculation. Table 3 shows the example of alternative questioner data collection. The alternative questioner was distributed to the expert lecturer to find the weight of criteria for each of web 2.0 tool. Based on the data collection, the calculation will be made to find the max scale for each of criteria in each alternative. Table 4 shows the example of the alternative data collection calculation.

Table 1. Example of Criteria Questioner Data Collection

	Easy To Learn	Easy To Use	Interesting	Support By Many Platform
Student 1	9	7	3	5
Student 2	7	7	7	7
Student 3	9	5	5	5
Student 4	5	9	5	3
Student 10	3	9	3	9

Table 2. Example of Criteria Data Collection Calculation

	Equal Importance 1	Moderate Importance 3	Strong Importance 5	Very Strong Importance 7	Extreme Importance 9	Max Scale
Easy To Learn	0	2	15	30	25	7
Easy To Use	0	5	20	15	37	9
Interesting	1	7	0	15	45	9
Support By Many Platform	1	2	50	27	0	5

Table 3. Example of Alternative Questioner Data Collection

Tool A	Easy To Learn	Easy To Use	Interesting	Support By Many Platform
Lecturer 1	9	7	3	5
Lecturer 2	7	7	7	7
Lecturer 3	9	5	5	5
Lecturer 4	5	9	5	3
Lecturer 10	3	9	3	9

Table 4. Example of Alternative Data Collection Calculation

Tool A	Equal Importance 1	Moderate Importance 3	Strong Importance 5	Very Strong Importance 7	Extreme Importance 9	Max Scale
Easy To Learn	0	2	15	30	25	7
Easy To Use	0	5	20	15	37	9
Interesting	1	7	0	15	45	9
Support By Many Platform	1	2	50	27	0	5

3.3 Pairwise Comparison

Based on the hierarchy structure and the calculation of recapitulation questioner, pairwise comparisons will be made by comparing the alternative with criteria and then criteria with objective. The result of recapitulation questioner will be transform to the AHP concept.

3.3.1 Alternative Vs Criteria

Based on the alternative data collection calculation, the result will be transform into the pairwise comparison matrix as show in Table 5. After that, the sum of column for each tool will be calculated.

Table 6 shows the example of the sum for each column calculation. Normalization will be process after calculating the sum of column. Table 7 shows the example of normalization process. The value in every column will be divided with the sum of the tools. The normalization value is used to calculate the priority ordering for each tool with respect to each of the criteria

Table 5. Example of Pairwise Comparison Matrix for Alternative

Easy To Learn	Tool A	Tool B	Tool C	Tool D
Tool A	1	9	9	9/9
Tool B	7/9	1	7	7/9
Tool C	5/9	5/7	1	5/9
Tool D	9/9	9	9	1

Table 6. Example of Sum each column for alternative

Easy To Learn	Tool A	Tool B	Tool C	Tool D
Tool A	1.0	9.0	9.0	1.0
Tool B	0.78	1.0	7.0	0.78
Tool C	0.56	0.71	1.0	0.56
Tool D	1.0	9.0	9.0	1.0
SUM	3.34	19.71	26.0	3.34

Table 7. Example of normalization of column for alternative

Easy To Learn	Tool A	Tool B	Tool C	Tool D
Tool A	0.3	0.46	0.35	0.3
Tool B	0.23	0.05	0.27	0.23
Tool C	0.17	0.04	0.03	0.17
Tool D	0.3	0.45	0.35	0.3
TOTAL	1.0	1.0	1.0	1.0

After normalization process, sum of each rows for AHP matrix will be calculate to get average value for each row. The average value is called the Criteria Weight (W). To get the priority vector or we called Eigen Value, the sum of each rows is divided by number of tools. Table 8 shows the example of priority vector.

Table 8. Example of priority vector for alternative

Easy To Learn	Tool A	Tool B	Tool C	Tool D	Priority
Tool A	0.3	0.46	0.35	0.3	0.35
Tool B	0.23	0.05	0.27	0.23	0.20
Tool C	0.17	0.04	0.03	0.17	0.10
Tool D	0.3	0.45	0.35	0.3	0.35

3.3.2 Criteria Vs Objective

Based on the criteria data collection calculation, the result will be transform into the pairwise comparison matrix as show in Table 9 . After that, the sum of column for each of criteria will be calculated. Table 10 shows the example of the sum for each column calculation. Normalization will be process after calculating the sum of column. Table 11 shows the example of normalization process. The value in every column will be divided with the sum of the column. The normalization value is used to calculate the priority ordering for each criteria.

Table 9. Example of pairwise comparison matrix for criteria

Criteria	Easy To Learn	Easy To Use	Interesting	Support By Many Platform
Easy To Learn	1	7/9	7/9	7
Easy To Use	9	1	9/9	9
Interesting	9	9/9	1	9
Support By Many Platform	5/7	5/9	5/9	1

Table 10. Example of Sum each column for criteria

Criteria	Easy To Learn	Easy To Use	Interesting	Support By Many Platform
Easy To Learn	1.0	0.78	0.78	7.0
Easy To Use	9.0	1.0	1.0	9.0
Interesting	9.0	1.0	1.0	9.0
Support By Many Platform	0.71	0.56	0.56	1.0
SUM	19.71	3.34	3.34	26

Table 11. Example of normalization of column for criteria

Criteria	Easy To Learn	Easy To Use	Interesting	Support By Many Platform
Easy To Learn	0.05	0.23	0.23	0.27
Easy To Use	0.46	0.3	0.3	0.35
Interesting	0.46	0.3	0.3	0.35
Support By Many Platform	0.03	0.17	0.17	0.03
TOTAL	1.0	1.0	1.0	1

After normalization process, sum of each rows for AHP matrix will be calculate to get average value for each row. The average value is called the Criteria Weight (W). To get the priority vector or we called Eigen Value, the sum of each rows is divided by number of criteria. Table 12 shows the example of priority vector.

Table 12. Example of priority vector for criteria

Criteria	Easy To Learn	Easy To Use	Interesting	Support By Many Platform	Priority
Easy To Learn	0.05	0.23	0.23	0.27	0.19
Easy To Use	0.46	0.3	0.3	0.35	0.35
Interesting	0.46	0.3	0.3	0.35	0.35
Support By Many Platform	0.03	0.17	0.17	0.03	0.01

3.4 Synthesizing Final Priorities

After knowing the priorities of the criteria with respect to the objective, and the priorities of the alternatives with respect to the criteria, the priorities of the alternatives with respect to the objective will be calculate as shown in Table 13. After that, the result of calculation between alternative with respect to the objective will be transfer to the matrix as shows in Table 14. The web 2.0 tool that have highest priority with the respect to the objective is the most preferred tool that can be used in online teaching.

Table 13. Example of calculating of alternative with respect to the objective

Criteria vs Objective		Alternative	Alternative vs Objective
Easy To Learn	0.19	Tool A	0.35 x 0.19 = 0.07
		Tool B	0.20 x 0.19 = 0.04
		Tool C	0.10 x 0.19 = 0.02
		Tool D	0.35 x 0.19 = 0.07
			1.00 0.20
Support By Many Platform	0.10	Tool A	0.35 x 0.10 = 0.04
		Tool B	0.20 x 0.10 = 0.02
		Tool C	0.10 x 0.10 = 0.01
		Tool D	0.35 x 0.10 = 0.04
			1.00 0.11

Table 14. Example of overall priority

	Easy To Learn	…….	Support By Many Platform	Objective
Tool A	0.07	…….	0.04	0.550
Tool B	0.04	…….	0.02	0.078
Tool C	0.02	…….	0.01	0.120
Tool D	0.07	…….	0.04	0.252
Total	0.2	…….	0.11	1.00

4. CONCLUSION

The issues and challenges in choosing the preferred online teaching tool has motivated this research to proposing a recommender model for online teaching tool. This model will assist lecturer or educator in identifying the suitable online teaching tool for them. In the future work, the work will be extending and performed its experiments on a real dataset to test its accuracy. In addition, comparison will be made with existing methods to evaluate the proposed model.

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