Utilization of *DIVAYANA* Formula in Evaluating of Suitable Platforms for Online Learning in the *Social Distancing*

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Dewa Gede Hendra Divayana
Universitas Pendidikan Ganesha, Singaraja, Indonesia
hendra.divayana@undiksha.ac.id

Abstract—The selection of a suitable platform to facilitate online learning in *social distancing* becomes a very important thing to maintain the quality and smoothness of the learning process was carried out at home. Some educational evaluation models were able to be used to provide recommendations in choosing an online learning platform that was suitable to use in *social distancing*, such as *CIPP*, *Countenance*, and *CSE-UCLA*. However, those models are only able to provide recommendations based on narrative evaluation components so raised different understandings and high subjectivity in its implementation in the field. Those models haven't formulas that specifically and accurately provide quantitative results in determining the most priority platforms is used in online learning. Therefore, it is essential to know there is a new formula in the field of educational evaluation to determine the suitable platform for online learning that is done at home. One of the new formulas that can be used and contributed to solving problems in the field of educational evaluation is the *DIVAYANA* formula. This formula can show an accurate calculation mechanism in determining one of the platforms that the most priority from the various choices of online learning platforms. The purpose of this research was to show the mechanism for calculating the *DIVAYANA* formula to determine the priority platform suitable for online learning. This research used an evaluative approach that focused on the nominate stage in the *DIVAYANA* model because the *DIVAYANA* formula is located in that nominate stage. Eighty respondents were involved in the initial data collection by evaluating the platform selection criteria for online learning. The subjects who were involved in testing the effectiveness of the *DIVAYANA* formula were eight experts. Questionnaires were used as the initial data collection tools and testing tools for the effectiveness of the *DIVAYANA* formula. The method was used to analyze the data of effectiveness test results on the *DIVAYANA* formula was by comparing that test results with the effectiveness standard that refers to five scales. The results of the effectiveness test showed the percentage of effectiveness level was 89.79%. It means that the *DIVAYANA* formula is effective to use in determining priority platforms suitable for online learning at home.

Keywords—*DIVAYANA* Formula, Platforms, Online Learning, *Social Distancing*

1 Introduction

The entry of the *COVID-19* pandemic into Indonesia made worried all Indonesian society. This outbreak had an impact on various fields of life, such as health, trade, transportation, economics, and also in the education sector. All elements of society in Indonesia made various efforts to prevent this outbreak from spreading further. One of the prevention efforts carried out was to do *social distancing*. We can minimize the contact or close interaction between people who have contracted the virus with others who have not been infected through *social distancing*. *Social distancing* actions in Indonesia were carried out by reducing activities that caused crowds of people.

One of the activities that often causes crowd or meeting of many people is the activity of the learning process at schools or campuses. Therefore, the Ministry of Education and Culture of the Republic of Indonesia had taken a policy to temporarily close the learning activities through face to face in schools or campuses as an effort to prevent the spread of the *COVID-19* pandemic. However, the face-to-face learning process at schools or campuses was replaced via online learning that was carried out by each student and teacher/lecturer at home.

Universitas Pendidikan Ganesha, as one of the state universities in the northern Bali region, also had responsive and had implemented online learning since the policies of the Ministry of Education and Culture of the Republic of Indonesia had rolled out. Various platforms had been used by the academic community of *Universitas Pendidikan Ganesha* as an effort to support online learning at home.

Several familiar platforms that are often used by students and teachers/lecturers in schools/campuses, included: *Schoology*, *Moodle*, *Quipper School*, *Edmodo*, and *Kelase* [1-16]. In principle, all of those platforms can be used as supporting facilities for online learning, but it's just not possible that all of those platforms can be used simultaneously in one learning process. Therefore, it is necessary to determine a platform that is suitable for use in a learning process in schools/campuses that adjust to the conditions and characteristics of students.

Determination of one platform that is suitable and appropriate to be used in the learning process is not only seen from the number of people who know the existence of the platforms, but also from various other criteria that influence it. Several of the other criteria that also affect in the platform's selection, included: speed of access, completeness of learning features available, ease of operation, maximum capacity of material content, the maximum number of users who can become members, ease of manipulating data, data security, and visual display of the platform.

The recommendation results will not be optimal if there is no appropriate model used to evaluate several platforms, although the criteria that influence platform selection have been known. Therefore, it is necessary to evaluate using an appropriate evaluation model. Several evaluation models that are often used in evaluating online learning platforms included: *CSE-UCLA* [17], *Countenance* [18], and *CIPP* [19,20].

The problem arises when each of those evaluation models is unable to show an accurate calculation process mechanism in determining one of the priority platforms from several choices of online learning platforms. Therefore, we need a formula in the evaluation model that can be used to determine the priority platform that is suitable

for use in online learning during the *social distancing* period. One formula that is an innovation in the field of educational evaluation is the *DIVAYANA* formula. This formula can show the calculation process to determine a suitable platform to use in online learning during *social distancing* so that later the learning process can still be maintained and well implemented.

Based on that innovation, it raises research questions and research objectives. The research question: how was the *DIVAYANA* formula calculation mechanism in determining the most suitable platform for online learning during the *social distancing*? The purpose of this research was to show the detailed calculation mechanism of the *DIVAYANA* formula, starting from the initial data to the final result that shows a priority platform that suitable for use in online learning.

2 Literature Review

There are several studies from previous research that are used as the basis for presenting this research. The research was conducted by Basilaia and Kvavadze [21] in 2020 showed a transfer of conventional and traditional face-to-face learning processes carried out in the classroom to online learning with various platform choices. The difficulty experienced in implementing online learning is ensuring the learning process can operate honestly and quality. Basilaia and Kvavadze's research can become the reference research that is related to choosing a suitable platform to use to make quality online learning and avoid cheating in the learning process. The research was conducted by Kalogiannakis and Papadakis [22] in 2019 showed the use of *TAM (Technology Acceptance Model)* in evaluating teacher skills in using ICT and measuring teacher attitudes/perceptions of the use of mobile devices in teaching. It was also obtained an overview of mobile devices that can be used to provide learning content inside or outside of a traditional classroom environment. The results of Kalogiannakis and Papadakis' research become a trigger for researching the selection of online learning platforms that can be accessed and operated easily using a mobile device. Some of the online learning platforms can be accessed from a mobile device, such as: *Moodle*, *Kelase*, *Schoology*, *Quipper School*, and *Edmodo*. Research was conducted by Papadakis *et al.* [23] in 2018 showed that *Moodle* was not able to be used as an effective learning tool and was impressed only as a medium for electronic document storage because of its limitations in terms of reliability and usability. The research results by Papadakis *et al.* become a trigger to conducted research more deeply about *Moodle* as a platform that can be used to support the learning process during the *social distancing*.

Research was conducted by Ferdianto and Dwiniasih [24] in 2019 showed the visualization of *Schoology* as a platform that can be used in online learning. *Schoology* consist of four features, such as: features of tests and quizzes, features of content delivery, features of video viewing/link sources, and features of discussion. Research was conducted by Gunawan *et al.* [25] in 2019 showed that the *Moodle* platform has features that can increase the creativity of its users in the online learning process. Research was conducted by Mulyono [26] in 2016 showed the use of the

Quipper School platform which can be used to facilitate the online learning process both inside and outside the classroom. The research was conducted by Ekici [27] in 2017 showed the use of *Edmodo* as a platform that can be used to create online communities in the learning process. Research by Ferdianto and Dwiniasih [24]; Gunawan *et al.* [25]; Mulyono [26]; and Ekici [27]; strengthening the foundation for the author to conducted research more deeply on the selection of priority platforms used to support the learning process during *social distancing*.

Besides some of the studies above, the limitations of several previous studies have also been the trigger for the presence of this research. Limitation of the research that was conducted by Dodun *et al.* in 2015 [28], showed there is no mathematical and specific formula used in the calculation process to determine *Moodle* as the most suitable platform for e-learning based online learning. Limitation of the research that was conducted by Ouadoud *et al.* in 2016 [29] showed there is not yet demonstrated the use of mathematical formulas in the calculation process to determine the best platform for using as a facility that supports online learning. Limitation of the research that was conducted in 2018 by Chivu *et al.* [30] showed there is not yet a detail description of the calculation process to determine which platform is the main priority as a facility to support the online learning process.

Based on the limitations in the research of Dodun *et al.* [28]; Ouadoud *et al.* [29]; and Chivu *et al.* [30]; it appears that innovation in the form of the *DIVAYANA* formula has a contribution and is suitable for solving problems/limitations in those studies. That is because the *DIVAYANA* formula is presented to show a mathematical calculation process in determining the priority platform.

3 Research Methodology

This research approach was evaluative. The evaluative stage in this research refers to the *DIVAYANA* model stages, which consist of the *Description* stage, *Input* stage, *Verification* stage, *Action* stage, *Yack* stage, *Analysis* stage, *Nominate* stage, and *Actualization* stage [31]. At the *Description* stage, activity was carried out to identify the causes of the emergence of needs and problems related to online learning platforms. At the *Input* stage, activities were carried out to input several alternative solutions for problems in determining the online learning platform. At the *Verification* stage, a minimum standard was determined to achieve success in obtaining a priority platform and matching the suitability of problem-solving alternatives with those minimum standards. At the *Action* stage, it was carried out field trial activities on several alternatives of problems solutions that had verified. At the *Yack* stage, focus group discussion activities were carried out between experts and evaluators to obtain the mutual agreement in giving weight to the minimum standard of evaluation success. Besides that, at this *Yack* stage, discussions were also held to obtain mutual agreement about qualitative data used to strengthen the quantitative data obtained in evaluating online learning platforms. At the *Analysis* stage, it was carried out analysis activities related to quantitative and qualitative data. Quantitative data in the form of the percentage level of effectiveness obtained from the *Action* stage. Qualitative data

in the form of arguments/opinions of experts and evaluators obtained from the *Yack* stage. At the *Nominate* stage, a calculation process was carried out using the *DIVAYANA* formula to determine the priority platform. At the *Actualization* stage, activities to implement the priority platforms that had been selected were carried out in the actual environment.

Based on the questions and objectives of this research, the focus of this research was only on the Nominate stage contained in the *DIVAYANA* model. The *Nominate* stage was the focus of research because the *DIVAYANA* formula is located at this stage. The *DIVAYANA* formula consists of three equations, which are used as a basis in determining which platform is the best priority as an online learning facility.

Equation (1) is used to find the weighted improvement scores, equation (2) is used to find normalization scores, and equation (3) is used to determine ranking scores. Those three equations can be shown as follows.

$$(W_{Yack})_j = \frac{\overline{x_j}}{\sum_{j=1}^{n} \overline{x_j}} \quad (1)$$

Notes:
$\bar{x}$ = The average of weight given by the experts/evaluators through joint discussion
W_{Yack} = Scores of average weights improvement

$$D_i = \frac{\prod_{j=1}^{n} x_{ij}^{(W_{Yack})_j}}{m} \quad (2)$$

Where: $\sum (W_{Yack})_j = 1$; and i=1,2,3,...,n.

Notes:
D = Vector-D
x = Assessment scores for each criterion
m = Total of all experts

$$R_i = \frac{D_i}{\sum_{i=1}^{n} D_i} \quad (3)$$

Notes:
D = Vector-D
R = Vector-R

Initial data that was used to try to calculate the *DIVAYANA* formula was obtained from the results of an assessment involved 80 students who used online learning during *social distancing*. Those eighty respondents were the populations in this research. The populations of this research were all students of 2nd semester at the Informatics Education Department, *Universitas Pendidikan Ganesha* who had taken the Operating System courses at the 2019/2020 academic year. All students of 2nd semester were divided into 4 classes, included: class-A, class-B, class-C, and class-D with each class consisting of 20 students.

The tools were used to collect initial data from 80 respondents were in the form of questionnaires that included nine items related to criteria for selecting platforms for online learning. Those nine questions can be seen in Appendix 6. The effectiveness test of the *DIVAYANA* formula was carried out by eight experts (four education

experts and four informatics experts). The tools were used to conduct effectiveness tests were in the form of questionnaires, which included 12 questions. Those twelve questions can be seen in Appendix 12. The content validity of the questionnaires was tested using the *Gregory* formula. The *Gregory* formula can be seen in equation (4) [32]. The reliability of the questionnaire items was tested using the *Cronbach Alpha* formula. The *Cronbach Alpha* formula can be seen in equation (5) [33]. The interpretation of the results of the questionnaire content validity and reliability tests refers to the *Guilford* categorization [34]. The very high category is in the range of $0.800 < rxy \leq 1.000$; the high category in the range of $0.600 < rxy \leq 0.800$; the moderate category in the range of $0.400 < rxy \leq 0.600$; the low category in the range of $0.200 < rxy \leq 0.400$; and very low category in the range of $0.000 < rxy \leq 0.200$.

$$Content\ Validity = \frac{D}{A+B+C+D} \tag{4}$$

Notes:
A = cell indicating disagreement between the two raters
B and C = cells indicating the difference in views between the raters
D = cell indicating valid agreement between the two raters

$$\alpha = \frac{n}{n-1} * \left\{1 - \frac{\sum \sigma_i^2}{\sigma_t^2}\right\} \tag{5}$$

Notes:
α = The non-test instrument reliability coefficient
n = Number of items
σ_i^2 = The variant of the score of item-i
σ_t^2 = The variant of the total score

The content validity results of the questionnaires that were used for the initial data collection can be seen in Appendix 4, and its reliability can be seen in Appendix 5. The content validity results of the questionnaire that were used to test the effectiveness of the *DIVAYANA* formula can be seen in Appendix 10, and its reliability can be seen in Appendix 11. Analysis of the effectiveness of *DIVAYANA* formula test results was done by comparing the effectiveness of the test results with the effectiveness standard that refers to five scales. The effectiveness standard referring to the five scales can be seen in Table 1 [35-37].

Table 1. The formula effectiveness standard that refers to five scales

Category	Percentage
Ineffective	0-54
Less effective	55-64
Sufficient	65-79
Effective	80-89
Very effective	90-100

4 Results and Discussion

Data of weights that were given by eight experts and initial data obtained from the assessment of 80 respondents were needed to facilitate the process of calculating the *DIVAYANA* formula in determining the most appropriate platform to facilitate online learning for *social distancing* in Operation System learning at Informatics Education Department, *Universitas Pendidikan Ganesha*. Table 2 shows the data of weights from the experts, while Table 3 shows initial data from the assessment results by eighty respondents.

Table 2. Data of weights from eight experts

Names of Criteria		**C1**	**C2**	**C3**	**C4**	**C5**	**C6**	**C7**	**C8**	**C9**
Weight from Experts	Expert-1	4	4	5	4	4	5	5	4	4
	Expert-2	5	5	4	5	4	5	4	4	4
	Expert-3	4	5	5	5	5	4	4	5	5
	Expert-4	5	4	5	5	5	5	4	5	4
	Expert-5	5	5	4	5	4	4	4	5	5
	Expert-6	4	4	5	5	5	4	5	4	5
	Expert-7	5	5	5	5	4	5	4	5	4
	Expert-8	4	5	5	4	4	4	4	5	5
Average		4.500	4.625	4.750	4.750	4.375	4.500	4.250	4.625	4.500
W_{Yack}		0.110	0.113	0.116	0.116	0.107	0.110	0.104	0.113	0.110
ΣW_{Yack}		1.000								

Table 3. Initial data of assessment results from 80 respondents

Platforms		**Quipper School**	**Moodle**	**Edmodo**	**Schoology**	**Kelase**
Platforms Selection Criteria	C1	82.33	82.97	74.19	75.36	70.22
	C2	82.33	82.97	74.19	75.36	70.22
	C3	82.33	82.97	74.19	75.36	70.22
	C4	82.33	82.97	74.19	75.36	70.22
	C5	82.33	82.97	74.19	75.36	70.22
	C6	82.33	82.97	74.19	75.36	70.22
	C7	17.67	17.03	25.81	24.64	29.78
	C8	82.33	82.97	74.19	75.36	70.22
	C9	82.33	82.97	74.19	75.36	70.22

Notes:
C1: Knowing the platform existence
C2: Speed of platform access
C3: Completeness of learning features available on the platform
C4: Ease of platform operation
C5: Maximum capacity of material content on the platform
C6: The maximum number of users who can become members on the platform
C7: Ease of data manipulation (input, edit, update, and delete) in platforms
C8: Guarantee of data security in the platform
C9: Display of platform visualization

Vector-D can be calculated using the *DIVAYANA* formula, especially through equation (2), with data sourced from Table 2 and Table 3. The Vector-D calculation process entirely can be explained as follows.

$$D_1 = \frac{(82.33^{0.110})(82.33^{0.113})(82.33^{0.116})(82.33^{0.116})(82.33^{0.107})(82.33^{0.110})(17.67^{0.104})(82.33^{0.113})(82.33^{0.110})}{8} = 8.77$$

$$D_2 = \frac{(82.97^{0.110})(82.97^{0.113})(82.97^{0.116})(82.97^{0.116})(82.97^{0.107})(82.97^{0.110})(17.03^{0.104})(82.97^{0.113})(82.97^{0.110})}{8} = 8.80$$

$$D_3 = \frac{(74.19^{0.110})(74.19^{0.113})(74.19^{0.116})(74.19^{0.116})(74.19^{0.107})(74.19^{0.110})(25.81^{0.104})(74.19^{0.113})(74.19^{0.110})}{8} = 8.31$$

$$D_4 = \frac{(75.36^{0.110})(75.36^{0.113})(75.36^{0.116})(75.36^{0.116})(75.36^{0.107})(75.36^{0.110})(24.64^{0.104})(75.36^{0.113})(75.36^{0.110})}{8} = 8.39$$

$$D_5 = \frac{(70.22^{0.110})(70.22^{0.113})(70.22^{0.116})(70.22^{0.116})(70.22^{0.107})(70.22^{0.110})(29.78^{0.104})(70.22^{0.113})(70.22^{0.110})}{8} = 8.03$$

Based on the obtained Vector-D score, the Vector-R calculation process can be performed to determine to rank using the *DIVAYANA* formula, especially through equation (3). The Vector-R calculation process entirely can be explained as follows.

$$R_1 = \frac{D_1}{D_1 + D_2 + D_3 + D_4 + D_5}$$

$$R_1 = \frac{8.77}{8.77+8.80+8.31+8.39+8.03} = 0.207$$

$$R_2 = \frac{D_2}{D_1 + D_2 + D_3 + D_4 + D_5}$$

$$R_2 = \frac{8.80}{8.77+8.80+8.31+8.39+8.03} = 0.208$$

$$R_3 = \frac{D_3}{D_1 + D_2 + D_3 + D_4 + D_5}$$

$$R_3 = \frac{8.31}{8.77+8.80+8.31+8.39+8.03} = 0.196$$

$$R_4 = \frac{D_4}{D_1 + D_2 + D_3 + D_4 + D_5}$$

$$R_4 = \frac{8.39}{8.77+8.80+8.31+8.39+8.03} = 0.198$$

$$R_5 = \frac{D_5}{D_1 + D_2 + D_3 + D_4 + D_5}$$

$$R_5 = \frac{8.03}{8.77+8.80+8.31+8.39+8.03} = 0.190$$

Based on the Vector-R score was obtained, then it can be seen the recapitulation ranking visualization of each platform that was used in online learning, especially in Operating System courses at the Informatics Education Department, *Universitas Pendidikan Ganesha* during the *social distancing*. The recapitulation ranking visualization of each platform can be seen in Figure 1.

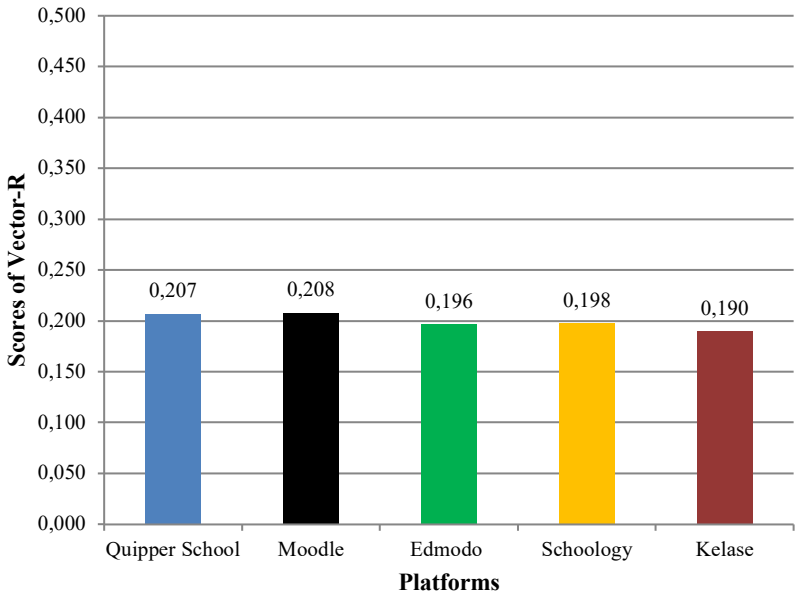

Fig. 1. Ranking recapitulation of each online learning platform

Based on Figure 1 above, it appears that the most suitable and priority platform to be used in online learning for Operating System courses at the Informatics Education Department, *Universitas Pendidikan Ganesha*, during the *social distancing* was *Moodle*. Generally, *Moodle* has advantages when compared to the other four learning platforms used in the learning process at the Informatics Education Department, *Universitas Pendidikan Ganesha*. That is because *Moodle* provides complete features to support the learning process. Besides, all components of *Moodle* can be easily configured and can be adjusted according to the needs of each institution that uses it. Those advantages of *Moodle* are reinforced by several research results conducted by Sari, Baedhowi, and Indrawati in 2017 [38]; Singh in 2016 [39]; Umek *et al.* in 2015 [40,41]; Goyal and Tambe in 2015 [42]; Gogan, Sirbu, and Draghici in 2015 [43]; Jebari, Boussedra, and Ettouhami [44]; Alghafis, Alrasheed, & Abdulghany [45]. The display of the *Moodle* platform that was used in the Operating System learning at the Informatics Education Department, *Universitas Pendidikan Ganesha*, can be seen in Figure 2.

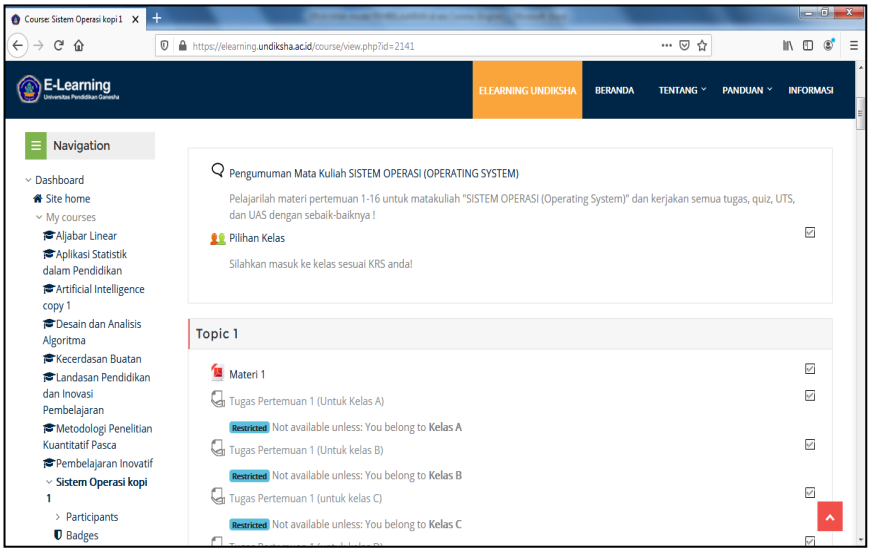

Fig. 2. *Moodle* platform for online learning of operating system courses with the introduction language of Indonesian

Figure 2 above shows the display of the *Moodle* platform that was used to facilitate the online learning process of Operating System courses at the Informatics Education Department, *Universitas Pendidikan Ganesha*. Online learning for Operating System courses was conducted in the 2nd semester of the 2019/2020 academic year using the language of instruction, namely Indonesian. All the features available on the *Moodle* platform was optimized its utilization, especially during the *social distancing* so that students were able to learn the Operating System material optimally. The features that were optimized, including: the features that provide learning resources in video format, digital modules, and features to facilitate discussion through forums.

The effectiveness measurement of the *DIVAYANA* formula utilization to determine a suitable platform for online learning during *social distancing* was carried out by an effectiveness test that involved four informatics experts and four education experts. The effectiveness test results of the *DIVAYANA* formula completely can be seen in Table 4.

Table 4. Effectiveness test results on *DIVAYANA* formula in selection of suitable platforms for online learning in the *social distancing*

Experts		E1	E2	E3	E4	E5	E6	E7	E8
Items	1	5	4	4	5	4	5	4	5
	2	5	4	4	4	4	5	5	4
	3	4	4	4	5	4	4	5	5
	4	4	5	4	5	4	5	5	4
	5	5	4	5	4	4	5	5	4
	6	5	5	5	4	5	4	5	5
	7	5	4	5	5	4	5	5	5
	8	5	5	5	4	4	4	5	4
	9	5	5	4	5	5	4	4	5
	10	5	4	5	4	4	4	5	4
	11	4	5	4	4	5	4	5	4
	12	4	4	5	4	4	4	4	5
∑		56	53	54	53	51	53	57	54
Effectiveness (%)		93.33	88.33	90.00	88.33	85.00	88.33	95.00	90.00
Average		89.79							

Notes:
E1: Education Expert-1
E2: Education Expert-2
E3: Education Expert-3
E4: Education Expert-4
E5: Informatics Expert-1
E6: Informatics Expert-2
E7: Informatics Expert-3
E8: Informatics Expert-4

The data of average weights improvement shown in Table 2 were obtained from the calculation of the *DIVAYANA* formula, especially in equation (1). The initial data shown in Table 3 were obtained from the results of 80 respondents' assessment of the criteria to determine platforms suitable for online learning. The data shown in Table 4 shows the effectiveness level percentage of the *DIVAYANA* formula utilization to determine the most suitable platform for online learning was 89.79%. It is indicated that the *DIVAYANA* formula effective to be used to determine the suitable platform for online learning.

Generally, the *DIVAYANA* formula is effectively used to determine the ranking or recommendation priority of the object being evaluated related to the field of informatics engineering education [31]. Therefore, it is true that the *DIVAYANA* formula is also effective for choosing the priority platform used in the online learning process during the *social distancing* period. That is because choosing a platform for online learning also an activity categorized in the scope of informatics engineering education.

The results of this research can answer the limitations of Dodun *et al.* [28], Ouadoud *et al.* [29], and Chivu *et al.* [30] by showing the calculation process using the *DIVAYANA* formula in determining the priority platform that is most suitable as an online learning support facility. Besides the advantages shown from the results of this research, there are also limitations found in this research. The first limitation is

the alternative platforms that are compared in this research still limited only on five platforms, whereas in fact, many other platforms also can be used as supporting facilities for online learning. The second limitation is a factor analysis has not been carried out to determine the latent factor on each platform.

5 Conclusion

The form of contribution through this research results in the field of educational evaluation is the discovery of the *DIVAYANA* formula. Generally, this formula is used to determine the recommendation priority or ranking of the object being observed. Referring to the research question and the research results that had been carried out, it can be concluded that the *DIVAYANA* formula calculation mechanism had running well and produces appropriate decisions with the real conditions in the field. The decision made through the *DIVAYANA* formula calculation mechanism in this research is to obtain a priority platform that is suitable for online learning in the *social distancing* period. This is evidenced by the research results, which showed that calculation of the *DIVAYANA* formula was able to determine the *Moodle* become the priority platform suitable to use in the Operating System courses at Informatics Education Department, *Universitas Pendidikan Ganesha*. It was as a supporting facility of online learning in the *social distancing*. Future work that can be done to anticipate the limitation in this research is to conduct further research by adding other alternative platforms as a comparison of pre-existing platforms. Besides, in the future, factor analysis is needed to obtain latent factors.

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8 Author

Dewa Gede Hendra Divayana is an Associate Professor in the field of Informatics Education at Department of Informatics Education, Faculty of Technical and Vocational, *Universitas Pendidikan Ganesha*. He obtained his Doctoral Degree in Measurement and Evaluation in Education from *Universitas Negeri Jakarta*, at Jakarta in 2016. His research interest areas are Artificial Intelligence in Education, Evaluation in Education, and Informatics in Education. (email: hendra.divayana@undiksha.ac.id)

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9 Appendix 1

9.1 Questions list of the questionnaires used for initial data collection (questions have not been validated)

1. Do you know about platforms for the following online learning?

- *Quipper School*
- *Moodle*
- *Edmodo*
- *Schoology*
- *Kelase*

2. How is the access speed of the following platforms?

- *Quipper School*
- *Moodle*
- *Edmodo*
- *Schoology*
- *Kelase*

3. How complete are the learning features available on the following platforms?

- *Quipper School*
- *Moodle*
- *Edmodo*
- *Schoology*
- *Kelase*

4. Are the following platforms easy to operate?

- *Quipper School*
- *Moodle*
- *Edmodo*
- *Schoology*
- *Kelase*

5. How is the maximum capacity of material content storage on the following platforms?

- *Quipper School*
- *Moodle*
- *Edmodo*
- *Schoology*
- *Kelase*

6. Are the following platforms able to facilitate maximally the number of users who are members?

- *Quipper School*
- *Moodle*
- *Edmodo*
- *Schoology*
- *Kelase*

7. Are input, edit, and delete data be done easily in the following platforms?

- *Quipper School*
- *Moodle*
- *Edmodo*
- *Schoology*
- *Kelase*

8. How is the guarantee of data security in the following platforms?

- *Quipper School*
- *Moodle*
- *Edmodo*
- *Schoology*
- *Kelase*

9. How is the visual display of the following platforms?

- *Quipper School*
- *Moodle*
- *Edmodo*
- *Schoology*
- *Kelase*

10. How are the prices of the following platforms?

- *Quipper School*
- *Moodle*
- *Edmodo*
- *Schoology*
- *Kelase*

10 Appendix 2

Table 5. Results of content validation test by experts on the questionnaire questions used for initial data collection

Items	Rating Score from Experts							
	Expert-1				*Expert-2*			
	Irrelevant		*Relevant*		*Irrelevant*		*Relevant*	
	1	2	3	4	1	2	3	4
1	-	-	-	√	-	-	√	-
2	-	-	√	-	-	-	-	√
3	-	-	√	-	-	-	√	-
4	-	-	-	√	-	-	√	-
5	-	-	-	√	-	-	-	√
6	-	-	√	-	-	-	-	√
7	-	-	-	√	-	-	√	-
8	-	-	√	-	-	-	-	√
9	-	-	√	-	-	-	-	√
10	√	-	-	-	-	√	-	-

11 Appendix 3

Table 6. Compilation of content validation test results by the two experts to the questionnaire questions that were used for initial data collection

Expert-1		Expert-2	
Less Relevant (Score 1 - 2)	Very Relevant (Score 3 - 4)	Less Relevant (Score 1 - 2)	Very Relevant (Score 3 - 4)
10	1,2,3,4,5,6,7,8,9	10	1,2,3,4,5,6,7,8,9

12 Appendix 4

Table 7. Cross tabulation of content validation test results by the two experts to the questionnaire questions that were used for initial data collection

		Expert -2	
		Less Relevant (Score 1 - 2)	**Very Relevant (Score 3 - 4)**
Expert -1	**Less Relevant (Score 1 - 2)**	A 10 (1)	B - (0)
	Very Relevant (Score 3 - 4)	C - (0)	D 1,2,3,4,5,6,7,8,9 (9)

Based on the *Gregory* formula shown in equation (4), the cross-tabulation results can be calculated to determine the questionnaire content validity used for initial data collection.

$$Content\ Validity = \frac{D}{A+B+C+D}$$

$$= \frac{9}{1+0+0+9}$$

$$= \frac{9}{10} = 0.900$$

The content validity value of 0.900 means that the questionnaire used for data collection was very valid. This is evidenced by *Guilford*'s categorization, where the category is very valid which in the range of $0.800 < r_{xy} \leq 1.000$.

13 Appendix 5

Table 8. Reliability test results of the questionnaire items that was used to data collection

Items	σ_i^2
I-1	0.682
I-2	1.691
I-3	2.296
I-4	2.452
I-5	2.086
I-6	1.994
I-7	2.037
I-8	1.486
I-9	1.023
I-10	0.484
$\sum \sigma_i^2$	16.230

Based on the calculation of the reliability test using Microsoft Excel, the score was obtained $\sum \sigma_i^2 = 16.230$; n = 80; $\sum \sigma_t^2 = 91.117$; so that it obtains the calculation results of the reliability coefficient using the following *Cronbach Alpha* formula that reference to equation (5).

$$\alpha = \frac{n}{n-1} * \left\{1 - \frac{\sum \sigma_i^2}{\sigma_t^2}\right\}$$

$$\alpha = \frac{80}{80-1} * \left\{1 - \frac{16.230}{91.117}\right\}$$

$$\alpha = \frac{80}{79} * \left\{1 - \frac{16.230}{91.117}\right\}$$

$$\alpha = 1.013 * 0.822$$

$$\alpha = 0.832$$

The reliability value of the questionnaire items is 0.832 means the questionnaires used for data collection were very reliable. This is evidenced by *Guilford*'s categorization, where the category is very reliable which in the range of $0.800 < r_{xy} \leq 1.000$.

14 Appendix 6

Based on the results of the content validity shown in Appendix 4, so there were nine questions retained, and one item was discarded. The item discarded was the item-10. The nine items used can be shown as follows.

Table 9. Final questions of the questionnaires that were used for initial data collection (questions had validated)

Items	Questions	Rating Score				
		1	2	3	4	5
1	Do you know about platforms for the following online learning?	Unknown	Less	Enough	Know	Very familiar
	Quipper School					
	Moodle					
	Edmodo					
	Schoology					
	Kelase					
2	How is the access speed of the following platforms?	Slow	Less	Enough	Fast	Very fast
	Quipper School					
	Moodle					
	Edmodo					
	Schoology					
	Kelase					
3	How complete are the learning features available on the following platforms?	Incomplete	Less	Enough	Complete	Very Complete
	Quipper School					
	Moodle					
	Edmodo					
	Schoology					
	Kelase					
4	Are the following platforms easy to operate?	Difficult	Less	Enough	Easy	Very Easy
	Quipper School					
	Moodle					
	Edmodo					
	Schoology					
	Kelase					
5	How is the maximum capacity of material content storage on the following platforms?	Not optimal	Less	Enough	Optimal	Very optimal
	Quipper School					
	Moodle					
	Edmodo					
	Schoology					
	Kelase					

Items	Questions	Rating Score				
		1	2	3	4	5
6	Are the following platforms able to facilitate maximally the number of users who are members?	Not optimal	Less	Enough	Optimal	Very optimal
	Quipper School					
	Moodle					
	Edmodo					
	Schoology					
	Kelase					
7	Are input, edit, and delete data be done easily in the following platforms?	Difficult	Less	Enough	Easy	Very Easy
	Quipper School					
	Moodle					
	Edmodo					
	Schoology					
	Kelase					
8	How is the guarantee of data security in the following platforms?	Un-guaranteed	Less	Enough	Guaranteed	Very guaranteed
	Quipper School					
	Moodle					
	Edmodo					
	Schoology					
	Kelase					
9	How is the visual display of the following platforms?	Not Interesting	Less	Enough	Interesting	Very Interesting
	Quipper School					
	Moodle					
	Edmodo					
	Schoology					
	Kelase					

15 Appendix 7

15.1 Questions list of the questionnaires used to effectiveness test the *DIVAYANA* formula (questions have not been validated)

1. Are the criteria used to obtain the initial data correctly?
2. Is the number of respondents involved in assessing the platform appropriate?
3. Are the initial data collected has been presented properly?
4. Is the weighted assessment for each criterion is following the agreement of the experts?
5. Is the number of experts involved in the weighting assessment appropriate?
6. Is the field of knowledge of the experts involved does not match the object under study?

7. Is the weighting formula for determining W_{yack} correct?
8. Is the formula of Vector-D determination for normalization correct?
9. Is the formula of Vector-R determination for ranking correct?
10. Are the calculation results of each equation correct?
11. Is the platform chosen through the *DIVAYANA* formula calculation process following the existing reality empirically in the field?
12. Is the formula easy to understand?
13. Can the formula be combined with other formulas?
14. Is the formula easy to apply?

16 Appendix 8

Table 10. Results of content validation test by experts to the questionnaire questions that were used to effectiveness test of the *DIVAYANA* formula

Items	Rating Score from Experts							
	Expert-1				*Expert-2*			
	Irrelevant		*Relevant*		*Irrelevant*		*Relevant*	
	1	2	3	4	1	2	3	4
1	-	-	√	-	-	-	√	-
2	-	-	-	√	-	-	√	-
3	-	-	√	-	-	-	√	-
4	-	-	-	√	-	-	√	-
5	-	-	√	-	-	-	-	√
6	-	√	-	-	√	-	-	-
7	-	-	-	√	-	-	√	-
8	-	-	√	-	-	-	-	√
9	-	-	√	-	-	-	-	√
10	-	-	-	√	-	-	√	-
11	-	-	√	-	-	-	-	√
12	-	-	-	√	-	-	√	-
13	-	√	-	-	√	-	-	-
14	-	-	-	√	-	-	-	√

17 Appendix 9

Table 11. Compilation of content validation test results by two experts to the questionnaire questions that were used to effectiveness test of the *DIVAYANA* formula

Expert-1		Expert -2	
Less Relevant (Score 1 - 2)	Very Relevant (Score 3 - 4)	Less Relevant (Score 1 - 2)	Very Relevant (Score 3 - 4)
6,13	1,2,3,4,5,7,8,9,10,11,12,14	6,13	1,2,3,4,5,7,8,9,10,11,12,14

18 Appendix 10

Table 12. Cross tabulation of content validation test results by two experts to the questionnaire questions that were used for the effectiveness test of the *DIVAYANA* formula

		Expert -2	
		Less Relevant (Score 1 - 2)	**Very Relevant (Score 3 - 4)**
Expert -1	**Less Relevant (Score 1 - 2)**	A 6,13 (2)	B - (0)
	Very Relevant (Score 3 - 4)	C - (0)	D 1,2,3,4,5,7,8,9,10,11,12,14 (12)

Based on the *Gregory* formula shown in equation (4), the cross-tabulation results can be calculated to determine the questionnaire contents validity that was used to the effectiveness test of the *DIVAYANA* formula.

$$Content\ Validity \frac{D}{A+B+C+D}$$

$$= \frac{12}{2+0+0+12}$$

$$= \frac{12}{14} = 0.857$$

The content validity value of 0.857 means that the questionnaires used for data collection were very valid. This is evidenced by *Guilford*'s categorization, where the category is very valid which in the range of $0.800 < r_{xy} \leq 1.000$.

19 Appendix 11

Table 13. Reliability test results of questionnaire items that were used to effectiveness test of the *DIVAYANA* formula

Items	σ_i^2
I-1	3.125
I-2	1.071
I-3	0.125
I-4	0.500
I-5	3.071
I-6	0.554
I-7	1.643
I-8	1.071
I-9	0.268
I-10	0.554
I-11	1.643
I-12	1.696

Items	σ_i^2
I-13	0.214
I-14	0.411
$\sum \sigma_i^2$	15.946

Based on the calculation of the reliability test using Microsoft Excel, the score was obtained $\sum \sigma_i^2 = 15.946$; n = 8; $\sigma_t^2 = 54.109$; so that it obtains the calculation results of the reliability coefficient using the following *Cronbach Alpha* formula that reference to equation (5).

$$\alpha = \frac{n}{n-1} * \left\{1 - \frac{\sum {\sigma_i}^2}{{\sigma_t}^2}\right\}$$

$$\alpha = \frac{8}{8-1} * \left\{1 - \frac{15.946}{54.109}\right\}$$

$$\alpha = \frac{8}{7} * \left\{1 - \frac{15.946}{54.109}\right\}$$

$$\alpha = 1.143 * 0.705$$

$$\alpha = 0.806$$

The reliability value of the questionnaire items is 0.806 means questionnaires used for data collection were very reliable. This is evidenced by *Guilford*'s categorization, where the category is very reliable which in the range of $0.800 < r_{xy} \leq 1.000$.

20 Appendix 12

Based on the results of the content validity shown in Appendix 10, there were 12 questions retained, and two items were discarded. The items discarded were item-6 and item-13. The twelve items used can be shown as follows.

Table 14. Final questions of the questionnaires that were used for the effectiveness test of the *DIVAYANA* formula (questions had validated)

Items	Questions	Rating Score				
		1	2	3	4	5
		Unsuitable	***Less***	***Enough***	***Suitable***	***Very Suitable***
1	Are the criteria used to obtain the initial data correctly?					
2	Is the number of respondents involved in assessing the platform appropriate?					
3	Are the initial data collected has been presented properly?					
4	Are the weighted assessment for each criterion is following the agreement of the experts?					
5	Is the number of experts involved					

Items	**Questions**	**Rating Score**				
		1	2	3	4	5
		Unsuitable	***Less***	***Enough***	***Suitable***	***Very Suitable***
	in the weighting assessment appropriate?					
6	Is the weighting formula for determining W_{yack} correct?					
7	Is the formula of Vector-D determination for normalization correct?					
8	Is the formula of Vector-R determination for ranking correct?					
9	Are the calculation results of each equation correct?					
10	Is the platform chosen through the *DIVAYANA* formula calculation process following the existing reality empirically in the field?					
11	Is the formula easy to understand?					
12	Is the formula easy to apply?					